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A Data-Driven And Mixed Methods Analysis Of Automotive Retail Operations Management

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A DATA-DRIVEN AND MIXED METHODS ANALYSIS OF AUTOMOTIVE RETAIL OPERATIONS MANAGEMENT

by

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DISSERTATION

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Advisor   Date

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DEDICATION

To the Colosimo family and my Urban Science family

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One day, the company I worked for asked me if I knew anyone that would be interested in pursuing a PhD. Finding a doctoral program for someone that would want to maintain their full-time job was something I did not think existed. Thanks to people like Dr. Kenneth Chelst, Dr. Ratna Babu Chinnam, and Dr. Julia Gluesing, the Global Executive Track program they created allowed me to pursue this degree that otherwise would have not been possible through a traditional PhD program.

This experience helped me understand that I love speaking with, learning from, and experiencing a variety of people at automotive dealerships. They may call it a disease, but the hustle-and-bustle and constant activity I found very enjoyable. Thank you to Bobby Baillargeon for opening his dealership's doors and allowing his people and their processes to be evaluated, scrutinized, and tracked. Also, I appreciate all of those in NADA Academy class 322 who willingly completed the dealership surveys so that Chapter 3 could finally be finished!

The Urban Science family also played a big role in completing this research. Thank you most of all to Jim Anderson for supporting and sponsoring this opportunity and your involvement throughout its completion, both professionally and as part of the committee. In addition, the input and efforts of Randy Berlin and David Creech, who worked alongside me during much of the research period, was also helpful and insightful. On the vehicle manufacturer side, Reinhard Fischer played a large role in facilitating much of the initial analysis and hands-on research at dealerships as well as participating on the dissertation committee, for that I greatly appreciate his unique role from industry.

The academic guidance I received from my dissertation committee was priceless. Having to apply their experience with typical PhD candidates to hard-headed, know-it-all industry

practitioners is quite a task. Thank you for your hours of patience and assistance in completing this work, Dr. Ratna Babu Chinnam, Dr. Toni Somers, and Dr. Leslie Monplaisir.

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CHAPTER 1 INTRODUCTION

Running any business can be a challenge. There are many complications between the product, the people, the facility, business processes and a host of other variables. With ever-changing markets, economic undulations, competitive attacks, and an evolving global scene, change generates great uncertainty (Bachmann, Elstner, & Sims, 2010). As the hardships from the recent economic downturn subsided, a retail industry looking for the right way to move forward remained. More importantly, operating to handle struggling times can help to avoid the challenges felt. When we consider the high price of vehicles, it is no surprise that the automotive sector felt an especially large impact (see Figure 1).

Figure 1. The economic downturn in 2008-2009 had a particularly strong impact on automotive dealers
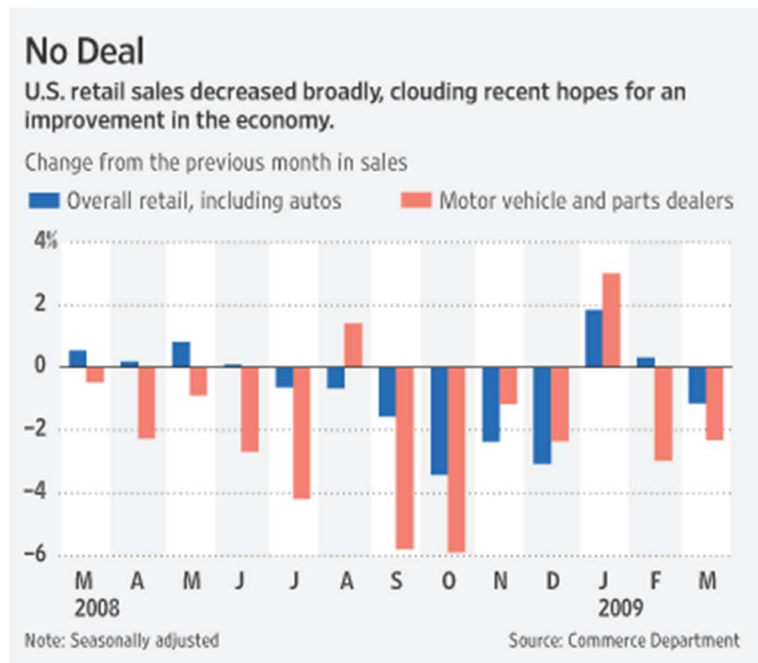
Dealerships can employ a variety of processes, hoping that they have the right mix to achieve their targets. They typically have set beliefs, structures, and procedures that are used to obtain the goals that they set out to achieve (Wilson, 2013). With broader and new economic challenges, though, dealers must employ new methods in order to obtain success. The retail environment's

interaction with the Internet and related services provides new tests and opportunities. Through the downturn, dealers that were considered the gold standard of profitability fell into bankruptcy due to a lack of preparation and unwillingness or inability to adjust and utilize the massive amounts of data collection to their advantage (Hardigree, 2008).

Beyond assisting the dealer, we must not forget those producing the vehicles and providing the dealer operator the opportunity to be a franchise owner. The selling of good and services directly to customers for personal and non-business use in small quantities identifies a business as retail, while there are many variations (AMA, 1995; Investopia, 2017). Manufacturers create products which are wholesaled to retailers where the customer can then shop to purchase the product at smaller quantities. Retail outlets, as a whole, share commonalities as they all have several locations where the goods are sold. They determine the mix of desired products and then purchase, store, and sell them to the consumer (Agarwal, 2017). The manufacturer places great investment in the research and development of a product to provide dealers an opportunity to sell and generate profits. Vehicle manufactures generate revenue through retailing new vehicles and parts in order to be successful in their own right. This occurs through the brand's dealers selling their product, as their representative to the end user. Many legal constraints exist, so the brand's dealer network is very difficult to adjust, thus generating the need for successful outlet performance supported through consistent operations management.

As a more complicating factor, manufacturers and dealers believe they each have the correct formula for success, but, in reality, many factors can contribute to their success or failure (Dant, Weaven, & Baker, 2013). The goals can be different for each side (i.e. manufacturers and dealers) in a scenario where both sides must work together for overall success (Eisenhardt, 1988; Gillis, McEwan, Crook, & Michael, 2011). Not always will the sale of more new vehicles and parts at

the dealership be desirable to the dealer, given the effort necessary and the risk associated to generate results. Dealerships also have other ways of generating profits where the manufacturer's involvement is limited or nonexistent. Selling used vehicles obtained at auctions or providing labor to service vehicles generates substantial profit at the dealership level, with limited positive or negative impact on manufacturers.[1]

Note, conversely, that actions relative to the sustainment of loyal customers to the dealership or brand may not have an immediate impact on sales or profits. For instance, every manufacturer will want customers to be thoroughly satisfied with the experience at the dealership during any transaction – vehicle purchase, service event, over-the-counter parts purchase, body shop visit, etc. For each and all of these, the current value of the transaction will have a larger direct benefit to one party or the other, but in the long run, there may be opportunities for additional sales and profit through having customers return. Additionally, "conquesting" or attracting customers away from the competition is also much more expensive to obtain than retaining customers. All of these factors make it clear that the dealer and manufacturer must work synergistically to obtain their objectives. This analysis will take both parties' goals into account when deriving final recommendations.

Considering the vast activities and points of sale within a dealership, there are many possible avenues to follow to improve its performance. As a first-hand approach, it can personally understand current sales volumes (potentially by department) and compare to the opportunity that exists in the marketplace. By having an understanding of the portion of opportunity obtained and with the ability to benchmark (compare) themselves through many different third party and/or manufacturer systems they can purchase, finding this information is rarely a challenge. Still, there

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[1] For used vehicles, manufacturers have an interest in the ability of vehicles to "hold value" over time through residuals to show that their products do not depreciate as quickly as the competition.

are many of these systems that dealers typically have available with many varieties of reports and figures, all attempting to provide direction. However, beyond knowing that the dealership is underperforming, they must understand what actions can be taken in order to improve and associate these with the appropriate metrics that drive desired results. Second, "twenty groups" are very popular where dealers meet or discuss best practices; however, they may not be thorough and specific as dealers do not want to give away all of their competitive advantages, to either intra-brand or inter-brand competitors. Third, for tailored dealership analyses, consultants are hired to assess the current situation and provide rationale for improvement. They are typically former dealership employees or have substantial experience working with dealerships (such as through experiences as an employee of the manufacturer). The recommendations from these consultants tend to be mostly based on anecdotal experiences and do not necessarily constitute the most effective or holistic options for a specific dealership.

As the new world of "business analytics" has exploded, the automotive industry has gathered the necessary information to evolve into new practices based upon new insights or while at least validating those assumptions that have existed (Piatetsky-Shapiro, 2007; Trkman, McCormack, De Oliveira, & Ladeira, 2010). Data mining can be used for retail businesses, but that requires that the right data is collected, the appropriate metrics can be created, and that the owner is willing to utilize the results to make change (Ahmed, 2004). With or without detailed analysis, dealership management need to increase knowledge and experience to be efficient at utilizing all resources (human, data, and otherwise) to build a successful business through economic, industry, personnel, relationship, or process challenges. Manufacturers will also benefit from extra insights through additional new vehicle and parts sales as well as having data-driven guidance to assist novice

employees or representatives in the field that work directly with dealers on what is most critical for dealer success.

In many industries, big data projects are being utilized to drive decisions in a variety of areas. A top industry utilizing big data, banking and securities, is using data available to them for securities fraud, card fraud detection, audit trails, and many other applications (Gaitho, 2015). Even the Securities and Exchange Commission is using data to monitor financial markets to catch illegal trading activity. Communications, media, entertainment, healthcare, and educations are all top business sectors accumulating and analyzing the data they have to mine for valuable bits of insight.

Of course, many times these the actions taken would be non-quantitative evaluations such as a SWOT-type analysis that would help to develop objectives, strategies, and tasks that would result in a time-based series of steps to make change (Creswell & Creswell, 2017). These are situations where the data analysis can provide direction but specific evaluations and actions would occur at the individual retail outlet. For instance, through dealership interviews, we understood that culture was recurring theme that dealers found to be important to their success, but this cannot be easily measured. Culture may impact certain KPIs and outcomes but it would require additional research and knowledge to derive a practical action plan.

Regarding the data-to-day management of businesses, which is a focus of our analysis here, dashboards and scorecards are widely used by CEOs from large companies such as Microsoft, Verizon, General Electric, and Oracle to assess the current status of their operation and determine what needs improvement (Taulli, 2006). Business leaders often require business unit management to maintain and provide their dashboard content for their regular discussions on successes and failures. Performance scorecards are also commonly utilized to provide a timely view of selected

measures that are particularly relevant to an area of responsibility (Chang & Morgan, 2000). These can specifically grade an individual on what is deemed important to the business. However, these examples are the traditional method of using data for business management purposes. Instead, opportunities exist to utilize the details within this data to provide more insights than just a general overview.

Often, to take this a step further, Key Performance Indicators (KPIs) are generated on a regular basis, many times for use in dashboards and scorecards. This term is used loosely to refer to important ratios or simple calculations that have been identified as important to business results. In many cases, however, their development is not well-vetted through mathematical relationships and statistical analysis. They, instead, can be based on experience or in relation to current initiatives within the business (e.g. increase customer satisfaction). While many of these have value, most will suggest there are too many (undermining the use of the word "Key" in the acronym), which makes it challenging for anyone with limited time to thoroughly evaluate them to make prudent business decisions. In an attempt to avoid basing decisions solely on circumstantial experiences, our goal is to provide a scientific basis for analyzing dealership operations that benefits multiple parties

Regarding the use of KPIs, Rasmussen, Chen, and Bansal noted several key concepts to help businesses in selecting and defining KPIs (Rasmussen, Bansal, & Chen, 2009):

- KPIs are metrics but not all metrics are KPIs

- KPIs include both financial and non-financial metrics

- KPIs help to define organizational goals

- KPIs help to measure process toward goal achievement

In automotive, KPIs and data-filled reports are common. KPI value, impact and trustworthiness may vary, but despite perceptions, there is little analysis on the root cause of the KPI result and what actionable steps can be taken to improve.

Additionally, much of the data that exists in the automotive space is difficult to obtain in robust quantities (highly protected by the owner/dealer) at the dealership level as it is highly guarded by the dealers. Broad mentions of brand or manufacturer performance are commonly observed in current publications (e.g. Automotive News) or mass media relative to industry-related synopses or securities interests; however, even when data is available, a complete, actionable picture often cannot be painted due to a lack of detail. Having dealership data from financials, sales transactions, service repair orders, customer satisfaction, and others are all valuable in providing a robust portrayal of dealership operations.

The challenge in the detail of information provided is to identify if the dealer does "this" (a specific action), then they will observe or experience "that" (a measurable result) which is what dealerships truly desire. If data does not exist at a 'this' or 'that' level, then recommendations cannot be created to drive specific action. As most know, business (and dealerships strongly falling into this category) is at least part art (Lee & Sai On Ko, 2000). One may be able to manage high-level performance, opportunities, and expectations with available quantitative data, but there remains a portion of the analysis missing without detailed, granular information regarding all aspects of the business. Because of this, any given dealer can question the applicability of the evaluation and can consequently struggle to find routes to improvement.

Motivation

As discussed, there is substantial opportunity to use robust dealership-level data to derive correlations with attributes of successful dealerships. We are motivated by this challenge and have

obtained access to the appropriate data to provide recommendations based on the current state of a dealership's operations. Currently, data in the industry is available but data science has typically not been applied to delve deeper into actionable steps to obtain sales and profit opportunities. Dealers care to improve their operation and increase profits, while the manufacturers desire an objective-based formulation to capturing market potential. Additionally, existing literature has not addressed these issues thoroughly. Some works exist that address areas that could apply to automotive, but few, if any, have a comprehensive analysis that includes a thorough breadth and detailed depth to provide conclusive results with a broad application. They generally focused on financial measures only and attempted to indicate that variables existed that could impact high-level financial outcomes without any definitive action to accomplish this (Keegan, Eiler, & Jones, 1989). Overall, we found very few manuscripts addressing the automotive sector. This may be due to the need for dealers and manufacturers to protect intellectual property or because the sharing of data to do the analysis would have been difficult in gaining the necessary permissions. For this research, we desire a valuable solution for both manufacturers and dealers to increase their desire to share information.

Research Objectives

This study intends to guide dealers in the direction of those factors and drivers that will allow them to improve, sustain, and flourish. The desire of this work will be to uncover those synergistic drivers that are shown to significantly impact the desired outcomes of dealers and manufacturers. The intention of the research conducted was to utilize data at a level of detail that would be reasonable to assess from a quantitative perspective and to marry that with information from the 'art' or qualitative side. Instead of relying on personal experiences or anecdotal stories, the intention is to identify areas that mathematically matter with traditional and newly accessed

objective data to identify which controllable factors drive sales and profit performance (Figure 2). Beyond balanced scorecards (Kaplan & Norton, 1992), the use of only financial data (Parmenter, 2009) and the application of generally accepted Key Performance Indicators (KPIs) (Narver & Slater, 1990) for performance management (Forrester, 1958), we needed to provide a deeper analysis amongst items that had proven value to the desired outcomes of both dealers and manufacturers.

Figure 2. Research intent
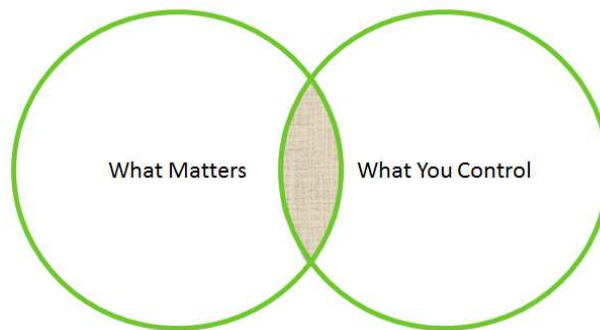
In many cases, this is the first attempt to use these types of data in analysis; nevertheless, there is much greater depth that can be completed. We endeavored to use available data to generate guidance in actionable areas. There is greater opportunity through both quantitative and survey data that can be researched further to bolster this work and will be discussed at the end of this work. In the end, the desire of this research is to address the fact that dealers have little time to thoroughly analyze their data to make decisions.

We first analyze dealership data through the quantitative data available for network-wide dealers of a providing brand. This allows thorough analysis of a dealership's quantitative metrics to identify within data already available, what should be analyzed and how areas of opportunity in achieving desired KPO goals can be quantified. Through the process provided, we intend to make it easier for dealers to focus their attention without constant attention to piles of reports,

performance indicators, and metrics. Additionally, we aim to address factors outside of data already collected. Beyond the contribution of a process to identify opportunities for improvement in sales performance and/or profitability, we conducted research through a method utilizing interviews, aligned it to constructs from literature, and produced a survey to dealership personnel that was very unique in nature, as it addressed cultural, interpersonal, and attitudinal matters. In accumulating the survey data, we were able to show the validity of a process in reducing dimensions through identifying factors amongst the many questions and subject these factors to statistical analysis. Finally, the analysis was applied and shown practical relevance to dealership activities that could be used to identify specific actions a dealership could take in order to improve in an underperforming area.

As part of the quantitative study, we used only data readily available. There are many other sources that could have been sought after but would have required a great deal of additional time and effort. Also, at no point would we feel we had obtained all possible data, as much is not accessible from the dealer's Dealer Management System (DMS). Again, we intended to provide the framework of a process, and as more data becomes accessible or available, it can be incorporated into this model for future research.

Additionally, we utilized a single brand in the United States for our quantitative analysis. It would be possible to conduct the same analysis for other brands or in other geographies. This process could also be applied to other retail industries.

For the mixed methods study, we had access to a limited number of participants for the survey distribution. Having an entire brand or a greater number of dealerships would be ideal. We assessed participants through questions from literature that related to interview results. Most assuredly, other constructs or question sets could be utilized. We, again, intended to provide

insight that could directly relate to dealership operations and improvements that could be made, but our process allows for the inclusion of other data, questions, or survey results.

Finally, as part of this study, we did not combine potential quantitative and qualitative drivers together to identify which, out of the many available, best predicted our dependent variables through statistical means. Also, we maintain the two dependent variables of sales effectiveness and dealership profitability throughout our study. We believe these to be representative of the parties involved, although other potential KPOs, such as customer loyalty, could be included. These would need an assessment, however, to determine their role as a driver, objective, or mediator of observed results.

Dissertation Organization

We will begin the analysis on quantitative data to provide a foundation of analytical results that relate to our two key objectives: new vehicle sales and dealership profitability. By gathering data at the dealership level, we can evaluate any relationships or correlations that potential drivers have against these two key dependent variables. We will utilize and evaluate both KPIs that are industry standards as well as generate new relationships and ratios to test alongside. Having a complete brand of data will be most ideal to identify variances within the brand, given the variety of locations, situations, and expectations for individual dealers. Through accessing thorough and broad data at the dealership level across brands and by adding a correlative assessment, we will be able to introduce a new assessment that has not been possible previously.

To ensure that this analysis is more robust and to obtain data unique to the automotive industry, we will also interview dealership management to better understand their management styles, competencies, organizational climate, emotional intelligence, and other factors to identify which interactions impact operational results. A survey will be generated through the evaluation

of interview results that will provide valuable insights into the specific areas that require the greatest attention to achieve desired outcomes.

The dissertation will also provide case studies to better illustrate how these drivers ought to be managed at dealerships. In viewing historical data, we will provide support for our findings through real-life outcomes that align with our analysis. While the dissertation study will be limited to the automotive industry, the models and insights generated should be relevant for other retail industries as well. Finally, conclusions of this research and recommendation for future efforts based on this work will be discussed and recommended.

CHAPTER 2 DATA ANALYTICS DRIVEN PROCESS FOR AUTOMOTIVE RETAIL OPERATIONS MANAGEMENT

The mechanisms by which a business is approached for evaluation and improvement through analytical methods has been a topic of debate for decades (Ansoff & Slevin, 1968; Forrester, 1958). However, much of the extant literature is relative to manufacturing and (recently) technology-based concerns rather than retail performance (D'antonio et al., 2015). Since the advent of big data analytics and burgeoning interest in making enterprises more data-driven, many industries have embraced data analytics initiatives to drive business decisions (McAfee, Brynjolfsson, & Davenport, 2012). Leading the adoptions is banking and securities, followed by communications, media, entertainment, healthcare, and education (Gaitho, 2015). Surprisingly, despite the growing competition and bankruptcies in the retail sector, retail operations management has been seldom addressed through the lens of structured and holistic analytics (L. Thomas, 2018).

Relative to any historical analysis that has been conducted, there are variances amongst the types of fixed retail outlets. These can range from convenience stores to specialty stores, department stores, or supermarkets (Technofunc, 2013). In this group are automotive retailers, which sell in a model unlike most other retail outlet types as the purchase is of high value, traditional salespeople interact with customers (even today, in spite of the growth in ecommerce), the exact product to be purchased may or may not be at the customer's selection location, and promotion of the products include prices and incentives that are difficult to translate into an exact price for the customer (Maxton & Wormald, 2004). We have selected the automotive industry due to its unique complexities and its need for analysis, as a multi-billion dollar business that links manufacturer to customer through a unique sales channel (Manganaro, 2017).

Dealerships employ a variety of processes, hoping that they have the right mix to achieve their goals. They typically have set beliefs, structures, and procedures that are used to obtain the goals that they set out to achieve (Wilson, 2013). With broader and new economic challenges, dealers today must employ new methods to obtain success as the retail environment's interaction with the Internet and related services provides new challenges and opportunities. Many have learned through the recent economic downturn as dealers that were considered the gold standard of profitability fell into bankruptcy due to a lack of preparation and unwillingness or inability to adjust and utilize readily available data to their advantage (Hardigree, 2008).

Regarding the evaluation of business operations, dashboards and scorecards are widely used by senior management to assess the current status of their operation and for tactical and strategic planning (Taulli, 2006). Performance scorecards are also commonly utilized to provide a timely view of selected measures that are particularly relevant to an area of responsibility (Foulloy, Clivillé, & Berrah, 2014). These can specifically grade a department or unit on what is deemed important to the business; however, they must have content that is valuable by which action items can be generated. Key Performance Indicators (KPIs), often generated for use in dashboards and scorecards, are used loosely to refer to important ratios or simple calculations that have been identified as important to business results. In many cases, however, their development is not well-vetted through scientific analysis. While many of these KPIs have value, most will suggest there are too many for timely and prudent business decisions (Hammer, 2015). Our goal is to provide a vigorous analytic process for analyzing automotive dealership operations that benefits all parties involved (in particular, the manufacturer as well as the dealer).

Additionally, much of the data that exists in the automotive space today is either difficult to obtain in robust quantities at the dealership level (highly protected by the owner/dealer) or the

appropriate granularity cannot be obtained to be actionable to generate business improvements (Manganaro, 2017). Having dealership data from financials, sales transactions, service repair orders, customer traffic/satisfaction, demographics/territory, and others are all valuable in providing a robust portrayal of dealership operations. The sources of this data can include Dealer Management Systems (DMS), manufacturer data, or third party sources (e.g. demographics data sources). As a more complicating factor, most manufacturers and dealers often believe that they each have the correct "formula" for success, but, in reality, many factors can influence their success or failure (Dant, Weaven, & Baker, 2013). There are situations where the data analysis can provide direction but specific evaluations and actions would occur at the individual dealership level. For instance, culture is often a recurring theme that dealers find to be important to their success, but this cannot be easily measured.

This manuscript aims to guide dealers in the direction of those factors and drivers that will allow them to best improve, sustain, and flourish through an objective data analytics process, aiding both dealers and manufacturers. We take the perspective of the OEM (Original Equipment Manufacturer – the producer of the product being sold) in the discussion and analysis conducted for only the OEMs can facilitate full dealer network level data collection. Note also that it is not possible to model a single dealership as we must have broader data to consider the variations in KPIs across the broader network, allowing for benchmarks to be created. While literature suggested that analysis of this type is possible using internal data for a single business, having the additional capability to compare like businesses within a brand and create robust benchmarks is critical for developing effective insights and recommendations (Wetzstein, Leitner, Rosenberg, Dustdar, & Leymann, 2011). The value of having the detailed records for each subject dealership as well as the ability to benchmark many KPIs across the entire network of dealerships for a brand

is something uncommon in automotive analyses due to data access, although it has been attempted in other industries (Horta, Camanho, & Da Costa, 2012).

We will utilize data readily available to assess and equip the dealership management and the highly routine OEM field management personnel for impactful data-driven practices. The intention is to determine variances from both traditional and newly generated metrics to identify which factors drive desired outcomes. Thus, a key contribution of this paper is the development and validation of an objective data analytics driven process for managing automotive retail outlets. This will include analyzing which retail activities (independent variables) have an impact on product sales (manufacturer's primary objective) and dealership profitability (dealer's primary objective). The approach accounts for heterogeneity in dealer performance dynamics across distinct geographic territories and markets (e.g., brand market share, proximity and makeup of competitive outlets). The manuscript also seeks to establish a causal model of dealership operational dynamics (Figure 3). The model, building upon extant literature around the basics of marketing, begins with the attraction of the customer through promotions and incentives that may lead the customer to the dealership or manufacturer website for information on products, inventory, and pricing. Having this information, which is trackable today through dealer/OEM website analytics tools, customers will eventually need to visit a dealership showroom for either additional research or to make a purchase. The main factors that can play a role in whether the customer makes a purchase are the existence of a vehicle the customer would purchase, their current and/or historical experience in the dealership, and the value proposition proposed for the vehicle and any related offerings. This not only includes a price for the purchase or lease of a new vehicle but also financing terms, vehicle accessories, protection plans, service plans, insurance, and other optional

components. Finally, clarity to the process will be provided and effectiveness demonstrated through a dealership case study.

The remainder of this manuscript is organized as follows: Section 2 discusses key literature, Section 3 reviews the methodology employed to utilize dealership data to derive a process for dealership analysis, Section 4 is a description of the results and process by which to derive dealership recommendations, Section 5 applies the results to actual dealership data in the form of a case study, and Section 6 provides some conclusions and directions for future research.

Figure 3. Causal diagram of dealership's interaction with customers to drive sales
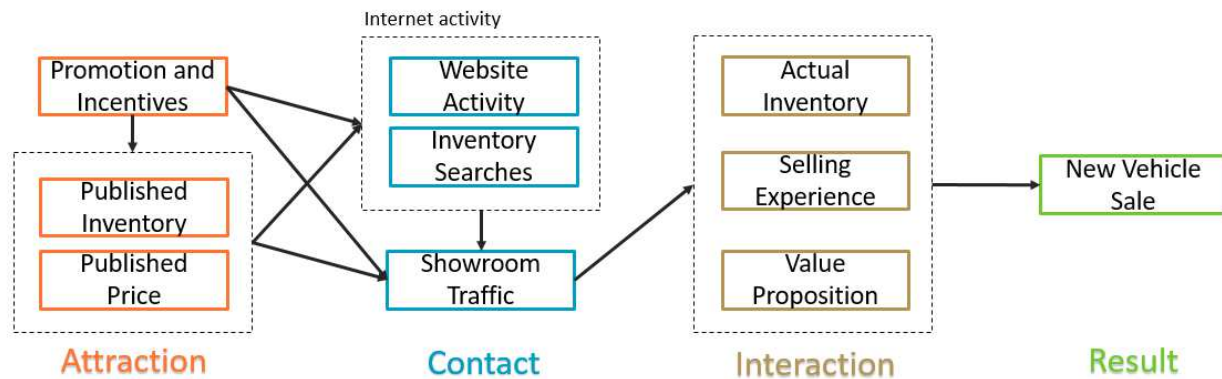
Literature Review

We had expected to encounter a large body of literature on analytics driven retail operations management and the development of KPIs for many types of businesses. We also anticipated a history of methods utilized with limited data before large quantities of data and the capacity to store the data that exists today (R. R. Thomas, Barr, Cron, & Slocum Jr, 1998). Instead, the first articles that assessed the use of KPIs did not address robust KPIs but rather focused on financial measures only and attempted to indicate that these high-level variables could affect high-level financial outcomes (Keegan, Eiler, & Jones, 1989). In an era of "big data," it has become clearly apparent that previous research has been lacking. In addition, there is also very limited literature

for the automotive retail sector. As stated, this may be due to the tendency of dealers and manufacturers to protect data, making analysis difficult without appropriate permissions.

Retail Success and Failure: The Roots

Retail operation data analysis has been utilized relative to the identification of business successes and failures, ranging in application from big businesses to start-ups (Grewal, Krishnan, Levy, & Munger, 2010). Much of the research has depended on the available data across multiple businesses and in different global locations. A seminal work in the evaluation of business success and failure was generated with the intention of predicting corporate bankruptcy (Altman, 1968). Altman introduced the concept of addressing quantitative metrics and ratios in addition to the common metrics of the day through multiple discriminant analysis. The intention was to apply results to an overall corporate profitability perspective to predict bankruptcy risk. While focusing on the internal operations that relate to profitability, the analysis lacks any relationships to sales, utilizing only financial statements. This original work has been applied in many aspects to derivative forms of analysis, including capital structure decisions ((Frank & Goyal, 2009), pricing (Simunic, 1980), and credit risk (Barboza, Kimura, & Altman, 2017); however, the downstream research has mostly focused on only the financial realm, lacking operational components and other sources of information. Overall, literature focused on the specific attributes applied to individual retail operation types with an emphasis on practical application and without strong reliance on data consumption and analysis (Ander & Stern, 2010).

Developing Performance Metrics in Business Processes

In considering which performance metrics to evaluate for our analysis, we first studied factors that drive the performance metrics that are considered the "objectives. Van de Ven theorized a framework to assess organizations through: 1) Defining and relating selected properties

of macro and micro organization design and performance, 2) Identifying and comparing different design patterns within a complex organization, and 3) Exploring how these differentiated patterns are linked as an intra-organizational network (Van de Ven, 1976). Globerson and Maskell (Globerson, 1985; Maskell, 1991) began the discussion of creating a performance management system including a suggestion that performance criteria be selected through expert interviews. At a minimum, industry knowledge can provide guidance on which areas to examine as well as help to define what may be acceptable and desirable to management. In the automotive sector, the OEMs and dealerships primarily focus on new vehicle sales performance and dealership profitability, respectively. While brand loyalty and customer satisfaction are also deemed to be important, they are often secondary in their contribution to sales and profitability. Literature focused on the process to logically derive and manage these drivers (Parmenter, 2010) or in the application of statistical techniques to identify which independent variables contribute to the variability of the objective (Altman, 2000). Additionally, differentiation between the identified Key Performance Drivers (KPDs) and the many KPIs available has also been termed and supported in other works against desired outcomes or Key Performance Objectives (KPOs) (Cox, Issa, & Ahrens, 2003).

Utilizing Performance Metrics

The process for determining what to measure received more attention over the years. Keegan et al. (Keegan et al., 1989) provided three steps on what to measure: 1) Strategic objectives related to management actions, 2) Deriving measures on a performance measurement matrix in five generic areas, and 3) Implementable in day-to-day actions. This process provided a framework by which to take high-level findings and ensure they are applied down at an actionable level. Still, the breadth of items analyzed was limited and a mechanism to ensure action and track outcomes was

lacking. Our work intends to breakdown a more specific process into actionable elements that can be utilized in retail operations management.

Once a general process was formed, discussions of which items to manage ensued, covered in literature through different approaches. Regarding the use of KPIs, Rasmussen, Chen, and Bansal noted several key concepts to help businesses in selecting and defining KPIs (Rasmussen, Bansal, & Chen, 2009): 1) KPIs are metrics but not all metrics are KPIs, 2) KPIs include both financial and non-financial metrics, 3) KPIs help to define organizational goals, and 4) KPIs help to measure process toward goal achievement. The most common approach appears to use categories (Narver & Slater, 1990), and amongst these categories, to determine through various means such as group discussions or interviews, which are most important for the strategy of the organization. Since financial data has been available for a long time, analysis of those types are well documented and available, but the addition of other data-based metrics were considered new (Hitt, Wu, & Zhou, 2002). With the many data feeds that dealers provide and access, the array of information to gather and analyze is vast and should more easily generate insight than other retail industries.

With selected KPIs, a balanced scorecard can be created (Kaplan & Norton, 1996). Previous to Kaplan and Norton's work, there were some suggestions that data could be used to manage businesses in an organized fashion (Lynch & Cross, 1992), but none suggested a technique by which to select, review, improve, measure, and enhance metrics over time. In their 1993 article "Putting the balanced scorecard to work," they suggest an eight-step process that would assist companies in generating a balanced measurement system. Their work started not only a focus on KPIs selection for the balanced scorecard but also the accumulation of scorecard KPIs to provide

a comprehensive view of performance, integrating distinct types of data to comprehensively assess business performance.

Data Analysis Techniques

In analyzing the data and KPIs to determine their relevance to the objectives of the business, we assessed options for analytics methods for modeling performance and generating recommendations. In particular, we explored techniques that can quickly ascertain significant relationships for application to individual outlets, while also investigating techniques previously employed to assess retail business data. Data Envelopment Analysis (DEA) is prevalent in the literature, which seeks to evaluate the relative efficiency of retail outlets and similar agencies (R. R. Thomas et al., 1998). Typically, many others techniques focused only on single stores or a subsection of all retail, but did not focus on the success factors for a particular retailer (Bharadwaji & Menon, 1993). The DEA process does utilize performance metrics and assists in structuring them to identify the key drivers of results; however, in seeking acceptance of results from the analysis, it allows individual outlets to employ nearly arbitrary weights/importance to performance metrics (R. R. Thomas et al., 1998). While this might be adequate for administering other agencies such as school districts and such, it is not as applicable for retail operations management (where the goal is not appeasement or consensus but managing performance). For these reasons, it is mostly employed for outlet termination and sometimes the determination of the most efficient of a group of retail outlets and is more focused on best practices rather than unprejudiced measurement (Vyt & Cliquet, 2017). We instead seek to focus on more objective methods that primarily seek to understand drivers of performance for developing balanced and effective recommendations for retail operations management.

Additionally, economists have utilized models in addressing retail store efficiency, including a transcendental logarithmic (translog) cost function (Kamakura, Lenartowicz, & Ratchfrord, 1996). This considers the efficiency of both customers and sellers in driving the performance of retail stores. Although applicable, this method requires inputs designed from cost functions along a stochastic frontier intended for production process examination. Although a frontier may be suitable, this method is more focused on the estimation of the marginal cost of production (Daglish, Robertson, Tripe, & Weill, 2015).

A statistical regression approach may be utilized to determine differences in performance relative to benchmarks or averages. The goal is to estimate parameters for variables by minimizing the sum of squared errors against the dependent variable, which for our analysis are the KPOs. We chose to primarily employ this method for its familiarity to the business community, ease of interpretation, and its ability to provide a mathematical understanding of relationships and influences to determine areas of focus amongst a group of potential KPDs. It is also utilized in previous retail performance assessment analysis literature (Mukaromah, 2017); however, other more advanced methods can be employed (e.g., machine learning methods) for improved accuracy and KPD selection (for example Random Forests, given their effectiveness in determining the importance of independent variables during modeling).

Literature Gaps

The literature review makes clear two glaringly untapped areas for research. First, effective analytics driven process for the selection of KPIs, the management of KPIs, and the identification of opportunities has not been strongly researched relative to the retail space. This is a primary contribution of this manuscript. Second, the combination of these principles has not been addressed thoroughly for any industry, and certainly not for automotive dealerships. The application of these

steps to automotive retail is relatively unique in the literature, despite the substantial usage of data in automotive industry to manage dealerships and will be a key focus of this research. We were also surprised at the lack of case studies around applying KPI measurements to businesses. We would expect that as data becomes more readily available, there will be many more opportunities to delve into deeper analyses, maximizing business potential.

Automotive Retail Data

As noted earlier, although a variety of data is available, dealers typically rely upon their experience, anecdotes of other's positive results, or a combination of qualitative factors to make business decisions (Frazier & Summers, 1984). This research aims to establish an objective and effective data driven analytics process for retail operations management. In doing so, the process should employ all key relevant and available data from dealerships and manufacturers. Through the incorporation of both commonly utilized and newly available data streams, the proposed process seeks to establish and leverage actionable relationships between inputs, actions, and performance to address operational needs and promote efficiency. Although specifically applied to the automotive sector, the proposed process could be readily used or adapted to other retail sectors as well.

Figure 4. Analytics methodology for retail operations management
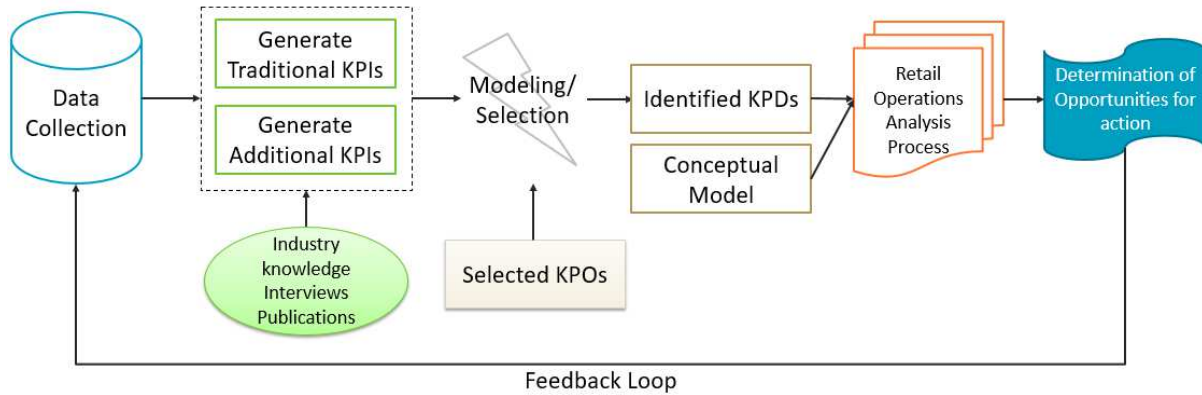
The proposed methodology for retail operations analysis (Figure 4) involves several key steps to analyze dealership performance to generate recommendations for improved management. The process begins with the collection of sales and financial data (Figure 5) and establishing necessary data pipelines in the absence of such data collection systems. The data applied can be of operational nature (e.g., volume and mix of vehicle inventory), tactical (e.g., volume and mix of advertising), or strategic (e.g., number of salespeople or number of bays in the service department) and mostly comes from dealership information systems, the OEM, state agencies (e.g., industry level vehicle registration data), and a growing list of data brokers, who combine datasets to add value and resell them for activities like marketing. This will become even more popular as connected cars are becoming more robust.

Dealership information systems typically collect a variety of transaction level data from their customer's vehicle purchases and service activity. OEMs require dealers to submit performance data, such as new vehicle sales and financials on a regular basis (often on a monthly basis). Sales data includes information about the vehicles sold and the dealerships that sold the vehicles. Financial data includes customer transactions and investments made by the dealer. Vehicle registration activity data in the dealer's territory is also needed to determine the location of the

customer registering the vehicle and sales activity by competing dealers (within the brand and across brands). Through accessing these robust datasets enriched with knowledge of how to combine the different data elements in a sensible way, KPIs can be generated.

Through interviews with OEMs, industry experts, and additional consultation with the North American Dealership Association (NADA), we are able to ascertain what the most commonly utilized KPIs evaluating dealership operational performance and also propose modified KPIs that allow for more effective comparison of data/performance across dealers through data normalization techniques.

Figure 5. Data sources for generating KPIs
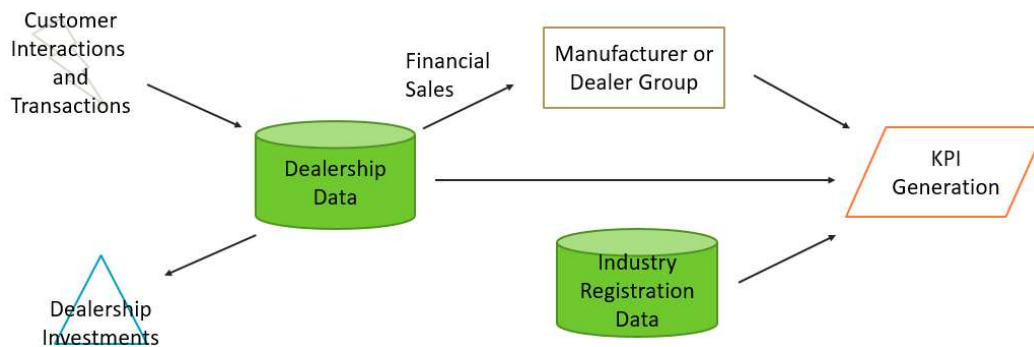
With the many possible KPIs for analysis, we need to determine the Key Performance Drivers (KPDs) that most influence our Key Performance Objectives (KPOs). These features should be selected from a mass of actionable alternatives that should be evaluated for their influence on the KPOs. To determine which KPIs are KPDs, (causal) relationships between KPIs and KPOs need to be assessed, involving relevant and appropriate statistical and/or machine learning techniques. Once KPDs and key relationships are identified and established, the next step is to leverage these relationships to guide the individual retail outlets in determining which areas have opportunity for improvement and which require the greatest attention. Additional analysis,

which is out of scope for this manuscript, could include evaluation of results to improve future recommendations through a feedback loop, utilizing machine learning and artificial intelligence.

Data Strategy

The blueprint for our methodology begins with collecting applicable dealership-level data. The automotive industry has a unique advantage relative to information that is stored on both potential and actual customers, due to the large amount of information required during the vehicle purchasing process. Additionally, within the United States, individuals are required to register their vehicle within their state of residence. This allows for the ability to obtain and provide aggregated data across the industry that can include the geographic unit[2] in which the registrant resides. This data provides great value for not only understanding the histories of sales efforts but also provides the ability to attract specific customers in the future (Gersten, Wirth, & Arndt, 2000).

The data volume available can be stifling. Some manufacturers try to make use of many data elements to manage dealers, but the result is an unmanageable amount of information without a clear place to begin or focus. Information is typically provided to dealers through web-based dashboards and reports that contain the dealership's data as compared to benchmarks. For example, on a typical Ford Motor Company Dealer Performance report,[3] many financial and sales-based metrics are provided, containing nearly 800 calculated values or observed numbers. Clearly, there is no decision support with such a report, rather only descriptive analytics. The typical process, as provided by the manufacturer, to address such reports and consult with their dealers, requires a "field organization" that meets with dealers on a regular basis to discuss vehicle wholesaling and manufacturer programs, while providing some assessment relative to reported metrics. As a result

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[2] Geographic units such as census tracts and zip codes are commonly used by dealers and manufacturers. Individual customer addresses are not provided by these companies.

[3] A sample report could not be shared due to confidentiality.

of our interviews of dealers, some find this practice valuable while others do not. Some dealers feel that the field representatives are there to gather information for the manufacturer, rather than provide assistance, while others do value the insights that can be provided. Substantial knowledge would be required to find essential components for action amongst these many values. To remedy this, expert input and modeling are required to pare down the initial volumes to prescribe a useful group of significant, actionable elements on which to act.

The analysis begins with quantitative data to provide a foundation of analytical results that relate to the two key performance objectives (KPOs): new vehicle sales and dealership profitability. By gathering data at the dealership level, one should evaluate any relationships or correlations that potential drivers have against the two key dependent variables, utilizing and evaluating both KPIs that are industry standards as well as generate new relationships and ratios to test alongside. Data for a complete brand is most ideal, to control for variance in models, brand marketing, brand value, dealership locations, and other differences.

Data Sources for Analysis

Much of the necessary data is typically available through a DMS. DMS is a software platform that dealers use for managing vehicle inventory, deals (cash, finance, wholesale, etc.), customer information, credit reports and printing paperwork. In the past, many dealers found the need to login to separate software systems to run their business. For example, a dealer may need to login to one system to submit deals to lenders, another to manage their customer communication (CRM) and yet another to manage their website and online marketing and possibly more. Today, with the advancement in software integrations and partnerships, a DMS can provide an integrated system for helping dealers manage their entire business from a single platform, resulting in better organization, efficiency and performance. Features and capabilities can vary from system to

system, but some of the core features should include inventory and customer management, deal structuring and contracting, payment processing and extensive reporting capabilities with customization options. More sophisticated systems will include integrated dealership websites and other online marketing tools and mobile app enabling dealers to use their phone to manage their business on the go. Customer management features commonly allow dealers to track current customers and leads, schedule appointments, and pull credit reports. Inventory management generally allows dealerships to manage the vehicles on the lot and track reconditioning and flooring expenses and payments, pull book values and vehicle history reports for used vehicles. Deal management should allow credit applications to be processed and sent to the various lenders they use for financing and automatically populate all forms for contracting purposes. All in all, these are the standard features one can find today in a fully packaged DMS.

Ideally, transaction level data could be provided for a thorough analysis of dealership sales, gross margin, expenditures, and customer activity. Dealerships, as any business, however, do not desire to make this data readily available to others, particularly the manufacturer and other outside firms. Their concern is founded in the fact that manufacturers have provided dealers the opportunity to sell their product, as is agreed to via the manufacturer's sales and service agreement. Dealerships, therefore, are cautious to defend their performance, and prefer to provide less information, unless its provision generates assistance that is clearly more valuable than the risk.

We recommend that the assessment start with robust but high-level data sources, including new vehicle sales and registration records for the brand and competitors and financial data (from regular statements). New vehicle sales data is typically derived from the dealers. Daily or even more rapidly, sales are provided to the manufacturer as a report of what was sold, mainly for tracking purposes as well as warranty registration. This data can include the details of the vehicle,

including the Vehicle Identification Number (VIN), from which many attributes of the vehicle can be determined.[4] In addition to the selling dealer, the Retail Delivery Record (RDR) for the new vehicle sale also includes information about the customer. Most importantly, this may include a location of where the customer resides, provided through an address or ZIP code. This data is routinely collected through the vehicle purchase process[5], and therefore, can easily be appended to the RDR. Although not always exact, given that a customer could potentially utilize a work address or other address, this data is typically relied upon in business and legal settings for decision making.

New vehicle sales data is commonly shared through dealer access or can be purchased through third party data brokers (e.g. Experion or R.L. Polk & Co.). Given the protection that is given to customer information, the detail of who the customer is relative to the new vehicle sale may or may not be available. If the dealer is providing the data, they will have access to whatever information they have collected about that customer, which is typically stored in their CRM (Customer Relationship Management) system. Dealers attempt to track customers over time, but the data is not always perfect, particularly due to the turnover of salespeople and the potential for input errors.

The new vehicle sales and registrations are important to be able to calculate the new vehicles "sales effectiveness" metric for the dealership to understand their sales performance. This metric or ratio compares the dealership's actual sales to what should be expected for an average dealer performing at the standard average. The standard used for these sales effectiveness metrics is generally the state or province average, given that this average is typically stated in the

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[4] Such as model, trim level, engine, body style, etc.
[5] This data is collected for the purposes of financing the vehicle, registering the vehicle, test driving a vehicle, or for other transaction-related need.

manufacturer's sales and service agreement (Crea, 2016); however, multiple benchmarks could be considered in addition to any agreement-based standard to ensure performance expectations are appropriate as any average may be imperfect. For instance, a national average is a good comparison as it includes both good and poor performing dealerships, but it may be too broad to be applicable to a specific dealership. Similarly, a much smaller geographic area may constitute a better comparison due to its local nature; however, if the area is not performing well it would not make a good reference standard in achieving the manufacturer's sales goals.

Financial data is important to provide us many of the variables from which to consider as drivers. This is a robust source that can be obtained monthly for most dealerships, as they are required to deliver this data to the manufacturers on a regular basis to track viability (such as through working capital standards[6]) and performance. This data is highly sensitive but is particularly necessary to understand how well the dealer is performing in meeting their profitability objectives, particularly as compared to other dealers. It also provides a great deal of detail as to the dealership's operations and investments, including the gross profit that is generated for a vehicle sale which can be aligned with the price a customer pays when considering the financial accounts contributing to a customer's deal. Ideally, one would have details of transactions to fully assess individual deals, but this information is not readily available. For example, advertising expenditure, included on the financial statement, does provide insight as to the specific nature of marketing and promotional efforts, and additional details would be ideal on the marketing mix, channel; however, without these, an aggregate advertising expenditure should be used. In many cases, if additional details of data are available, if reliable, they should be used to increase the actionable nature of results.

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[6] There are minimum requirements for working capital that a dealer has relative to the size of the dealership.

The most valuable information to be gleaned from these data sources revolves around the overall dealership performance in profitability. As compared to other dealerships, one can (like new vehicle sales) identify an individual dealership's performance for profitability as compared to their peers. This can point out deficiencies and successes in the operation relative to financial outcomes based on such a comparison. Given that this is result of the operation by which nearly all businesses typically summarize transactions for, at a minimum, operational summary and tax purposes, it is considered highly reliable. For automotive dealerships, this data commonly is examined through an error checking process before submissions are accepted from dealers. This is vital as once financial statements are submitted, they are utilized to create composites, which are averages across groups of dealerships for the data elements (and associated KPIs) that are provided. Composites are used to benchmark performance against other dealerships to identify areas for financial improvement. Typically, no less than three dealerships are included in a composite. It should be noted that missing dealership data for a month may impact analysis completed from composites as the averages (and even medians) would vary without data for the complete set of dealerships being compared. Common composites used to benchmark dealers include like-size dealerships, local dealerships, dealerships of comparable performance, etc.[7]

With the thorough geographic coverage of the new vehicle sales, new vehicle registration, and financial data, one can generate many benchmarks for analysis of KPIs deemed significant. This allows for a comprehensive comparison against applicable groups that would act as a sellable appraisal to any dealer. Many dealers prefer to be compared to peers that function in a similar fashion to themselves. For example, an urban dealership may have a high rent cost factor and

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[7] Like-size may be based on sales dollars or sales units or some location criteria (urban dealerships). Local dealerships may be the market or district of which the dealerships being examined is a member. Performance comparison may be based on profitability, sales performance, or other performance metrics.

struggles to store inventory due to the lack of space and the high cost. It may have to charge higher prices for products and services than a rural dealership with a large amount of space and more economical land thus causing an urban dealer to question results in a comparison against a rural dealer, and vice a versa. Even though we can create new ratios and modeling KPIs based on "expected sales" to handle some of this variance due to location, there is still a need to persuade the dealer of the validity of the results. For this reason, it is always desirable to have thorough data coverage across large geographies to have the ability to generate applicable and meaningful benchmarks or composites for comparison.

Beyond subject dealers, data is required from benchmark groups of dealers and larger areas to allow for generating statistical and machine learning models on the larger group and the creation of an appropriate set of comparable dealerships. In recent years, there is growth in additional third-party data sources (both in breadth and detail) and should inform the analysis once quality is ensured.

Variable Operationalization

Data access is the first step, but this data must be transformed into something relevant at the dealership level to be useful. To assist, several industry experts identified calculations that are commonly understood, actionable, and real-world. A key requirement is to ensure created variables for a subject dealership's attention and action are practical.

Today, various KPIs are shown in many systems and most consultants or experienced experts have a core set of these diagnostics that they feel are the most impactful. The challenge with this is three-fold. First, these KPIs have rarely been vetted in a mathematical sense to ensure their relationship with end goals. This study intends to provide this analysis. Second, there may be other KPIs that are not typically utilized or have not been derived that could also show relationships to

outcomes and could potentially have a stronger correlation or provide value in managing the business. Third, many KPIs are much too general to be actionable. It may be acceptable to show that there are high-level calculations that provide guidance for needing to improve, but one must relate more detailed, refined data to high-level key objectives. This will provide, more immediate, direct action that can be taken.

In creating KPIs, we recommend the use of data normalization techniques (e.g., using the "expected number of sales" for a dealership) for allowing for more effective performance comparison and analysis (such as in comparing a rural dealer to an urban-area dealer). This would help to "communize" dealership performance variables to be comparable without respect to size but with respect to opportunity. In particular, sales expectation is recommended to create additional variables due to its ability to consider actual sales activity through registrations that occurred within a local geography adjusted for segment popularity. This provides a way to balance the field of dealerships to be able to more effectively compare them across the same metrics.

Many different reporting measures from the financial statements must be transformed into new ratios using proper normalization techniques. By doing so, one can test both the typical industry metric against this ratio to determine which was a better correlate to our KPOs. As an example, vehicle inventory days supply[8] is a common metric used in the industry to evaluate the adequacy of inventory that a dealership has. This metric allows for an evaluation of a dealership against a benchmark for continuing their current level of sales only. From a diagnostic perspective, however, a dealership should prepare their operation to achieve a desired level of sales that is likely different than their current sales level. This desired level could be at least relative to the opportunity available in their area based upon a reasonable objective standard. Dealerships performing above

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[8] Inventory days supply is the number of days for a dealership to run out of their inventory at their current sales rate, assuming they were to obtain no additional vehicles.

this level may choose something greater and those performing well below may choose to incrementally improve over time to eventually obtain a larger objective. Nonetheless, manufacturers pay close attention to sales relative to opportunity in a dealership's area when considering rewards and long-term viability in representing the brand, as manufacturers have the ability to terminate the dealership agreement for continued poor performance.

In particular, the variables recommended by experts to which this transformation should be applied included those related to marketing effort, inventory volumes, and sales staff. These, in particular, are highly variant based on the size or throughput of an individual dealership and are considered manageable or controllable investments. For illustrative purpose, an analysis was conducted to validate that these variables did in fact vary with dealership size. For example, Figure 6 reports the scatterplot fit line for sales effectiveness as a function of inventory days supply as well as days supply normalized in relation to expected sales for a network of dealerships. While simplistic analysis with respect days of inventory supply might suggest that the dealers cut back on inventory to improve "sales effectiveness" (and potentially lead to lower sales), utilizing inventory per new vehicle expected unit can lead to more effective recommendations.

Figure 6. Sales effectiveness compared to inventory based on days' supply and inventory per expected new vehicle sales
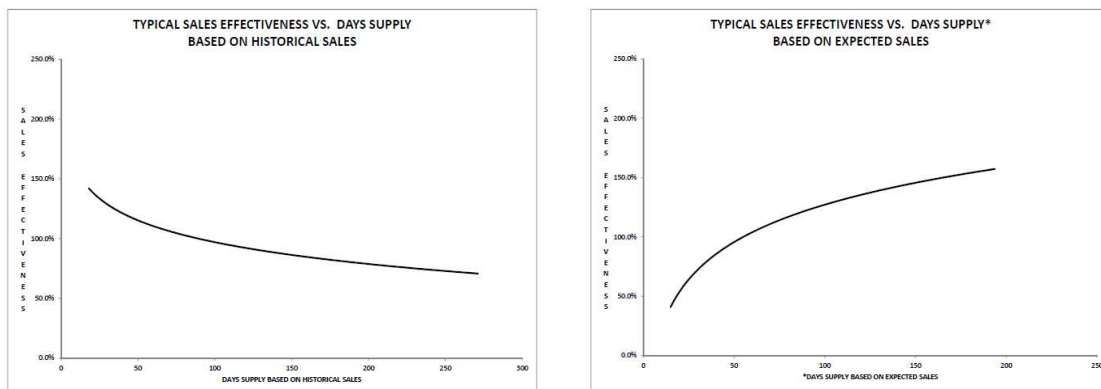
We would presume that additional inventory supply, although having a carrying cost, would lead to higher levels of sales effectiveness, as dealerships would have more selection of product to sell. The figure shows that for days supply based on historical sales, it appears that additional inventory actually causes a decrease in sales effectiveness, which is counter intuitive. Using expected sales as the denominator, we find that the quantitative relationship is as anticipated. We conclude that inventory per expected sales unit is a much better KPI on which to act relative to inventory levels than inventory days' supply, while we also notice the diminishing returns from too high levels of inventory days' supply in relation to expected sales.

Performance Objectives

In carrying out the proposed analysis, the desire is to build appropriate constructs and determine relevance to end goals or Key Performance Outcomes (KPOs). These end goals will contain both a performance measurement (e.g. portion of new vehicle sales opportunity obtained) and a profitability (e.g. return on sales) component. This is intended to relate to both dealers and the automobile manufacturer, as dealers operate the dealership to make a profit and manufacturers utilize dealerships to sell vehicles. One must take into account both of these goals; therefore, the intent in this study is to balance these objectives to determine what impact actions, attributes, and interactions have on these end results that relate to the goals of the manufacturer and dealer, respectively (Eliashberg & Michie, 1984).

In assessing a combined goal of dealership profitability (in the form of return on sales, ROS[9]) and new vehicles sales, we represent the goal of each entity. Return on sales is a long-term

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[9] A ratio widely used to evaluate a company's operational efficiency. ROS is also known as a firm's "operating profit margin". It is calculated using the formula operating profit divided by sales. This measure is helpful to management, providing insight into how much profit is being produced per dollar of sales. As with many ratios, it is best to compare a company's ROS over time to look for trends, and compare it to other companies in the industry. An increasing ROS indicates the company is growing more efficient, while a decreasing ROS could signal looming financial troubles.

profitability metric that relates to the efficiency of the operation in generating profit from sales. Dealers may perform short term activities, such as promotions, special sales, and incentives to spur short-term activity, but one should also pay attention to more comprehensive trends. This not only provides stability in the results but is also more relatable to a dealer in making change. Sales effectiveness must be maintained through selling an adequate volume of vehicles to properly represent the brand in the area the dealership in located. This is of greatest interest to the manufacturer and this metric is widely used by many brands to evaluate the new vehicle sales performance of a dealership relative to the sales opportunity in their local area. We have termed the combination of the two as the "win-win" outcome, including a component for each the manufacturer and dealer. The quadrant of "win-win" success (Figure 7) is the first quadrant of a diagram plotting the dealer's goal (profitability) against the manufacturer's goal (sales or sales performance for new vehicles). In recent years, at least in the U.S., most of the dealer profits for several brands seem to stem from used car sales (and not new vehicle sales), and hence, can potentially create a conflict of objectives for the dealer and the OEM.

Figure 7. Win-Win Approach: Improve dealership profitability while also improving new vehicle sales for OEM
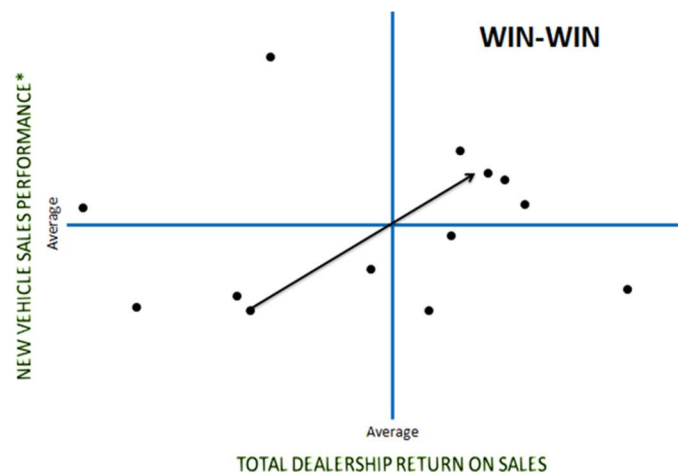
The idea is to aim for above average (or median) performance for each of these critical success factors. As more dealers reach this area, the average for each increases, relating to a new, higher average for both dealership profitability and new vehicle sales performance. This should create, over time, greater brand value and dealership interest to attract customers and high-quality dealership operators in the interest of both the individual dealership and the brand. This applies to all brands in the United States as well as other countries operating in an equivalent way. Due to a dynamic dealership environment due to changes in the dealership model or economy or legislation on how vehicles are sold (e.g. through the manufacturer), this may require future adjustments as the potential "conflict" between the performance objectives is diminished.

Dealership Analytics Methodology

Our challenge in developing an effective methodology is in the detail of information provided to identify which actions generate observable results. If data does not exist, then recommendations cannot be created to drive specific action. The goal is to develop an analysis methodology this is objective in nature to provide factual results that can lead the dealership to the win-win quadrant rather than subjective or anecdotal guidance.

For each model year of a vehicle, manufacturers plan months or years in advance to determine a production volume for which they must align suppliers to obtain the necessary parts to assemble and make available for sale. Given this pre-determined value for the various models of the manufacturer's portfolio, the manufacturer desires to sell certain quantities of vehicles through their dealership network to plan for selling the vehicles they have planned to produce.

Due to the desire to sell the vehicle produced within a model year[10] of vehicle, manufacturers plan with dealers on the number of new vehicles that should be sold within a given calendar year.

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[10] Model years do not typically align with calendar years. Also, models within a model year rarely see any notable change to the vehicle in terms of design and functionality.

The objectives set by the manufacturer may take into consideration a variety of factors, such as local demand, past dealership performance, and/or sales improvement plans (such as due to a change in the dealership facility or personnel). Nonetheless, we recommend a consistent approach to establishing the sales target for a dealership that is objective in nature but intends to adjust for factors out of the control of the dealership. This metric, termed Sales Effectiveness (SE), is used by manufacturers to evaluate dealership performance against geographic averages to determine where opportunities for new vehicle sales improvements may exist. As a common, widely-utilized, and objective measure, we recommend it for evaluating dealership performance relative to the new vehicle sales opportunity available.

Note that it is not possible to model a single dealership as we must have the data to consider the variations of the value of KPIs across the broader network. A single dealership's data would not allow for benchmarks to be created or to have any ability to assess their KPI performance. While literature suggested that analysis of this type is possible using internal data for a single business, having the additional capability to compare like businesses within a brand and create robust benchmarks is critical for developing effective insights and recommendations. The value of having the detailed records for each subject dealership as well as the ability to benchmark many KPIs across the entire network of dealerships for a brand is something uncommon in automotive analyses due to data access, although it has been attempted in other industries.

Figure 8 outlines the recommended analysis process for analyzing and guiding individual dealers based on the research completed and the analytical findings discussed. This analysis utilizes the process of data collection, KPI synthesis, KPD identification, statistical modeling and analysis, and benchmarking in critical areas to determine the top areas for dealerships to focus their efforts for improvement.

Figure 8. Retail operations analysis process
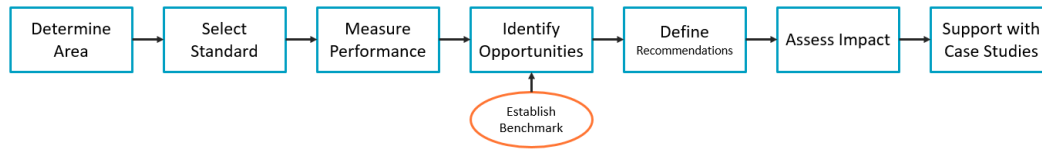
Determine dealership's primary marketing area (PMA)

The analysis process begins by defining a Primary Market Area (PMA) for each outlet or dealership in the network. For most brands in the U.S., a territory is defined by an accumulation of geographic units (commonly census tracts or ZIP codes) and is assigned to each dealer based upon its convenience to customers that live in those geographic units. The concept is to assign the dealer an area over which they have an advantage due to location for sales and service as compared to other dealers of the same brand (intra-brand dealers). Contractually, dealers are notified of the definition of this area and in some states, can protest the definition of the PMA. Ideally, we would review each for its veracity or appropriateness; however, dealers are contractually obligated to function relative to the manufacturer's definition per their sales and service agreement.

To determine how to assign the territories, data regarding travel distance, air distance, travel time, and other metrics are used to identify the closest dealer to the centroid of each geographic unit. Additionally, comparative dealer sales in each geographic unit may be reviewed, particularly in situations where rivers, mountains, state borders, and other geographical or political boundaries exist, impacting customer travel patterns.

Also of importance is the definition of a market area. In situations where customers traverse and cross-shop a larger area, which is usually true in a more densely populated area, to complete their retail transactions, the dealerships within this area may be "connected." That is, there is "cross-sell" or the travelling of customers from one dealership's territory to another to complete their transaction. This occurs in larger markets as customers may be more likely to comparison

shop, pass by a less convenient dealership while on their way to work or other location, or consider the alternative distance to be acceptable or similar to their closest dealership. Still, the reason most customers do not purchase from their most convenient dealership is typically because of one or more factors beyond convenience that relate to the operation of that store (including competitive pricing of products and services), hence the need for this research.

Select a Standard Area or Basis for Sales Performance Assessment

A reasonable and attainable standard must be selected by which the dealership and the area in which the dealership resides can be evaluated. This is essentially a benchmark that will be applied based upon a comparable area performing at a level that is reasonable or attainable. Standards are often compiled from a group of dealers or dealer PMAs, as defined previously. Many manufacturers in the U.S. utilize a state average as the standard, as it is a consistently available geographic basis for any dealership across the nation and includes dealerships at varying levels of sales performance by which a reasonable average can be obtained. This is also part of many dealer's sales and service agreements in that dealers need to meet or exceed state average to be in compliance.

When choosing amongst standards to apply for analysis, dealers and/or manufacturers may desire a more aggressive comparison area than state average. If the state were performing poorly as compared to other states, the state average may not be desirable for the manufacturer to achieve goals of higher market share and/or sales. In these cases, it is possible to consider a broader average (region or nation) or a more localized comparison area (such as a market or areas within a market). Despite whichever is selected, it must be reasonable in nature to withstand any tests in a legal environment in situations where dealership network changes have resulted in litigation. A judge, dealer board, or similar party must find that the applied standard is just when evaluating a

dealership and the network of dealers for the analysis based on objective measurements such as sales effectiveness to apply.

Measure New Vehicle Sales Performance and Establish Benchmark Dealerships

Dealership performance should be calculated through the sales effectiveness metric at the standard average. This should be generated at the vehicle model level to identify more specific opportunities, allowing for more appropriate target marketing. With this information, shortfalls in sales of specific units can be assessed and addressed. In particular, inventory levels can better be examined for appropriateness once specific models are identified to have sales opportunity. Once the knowledge of the dealership's sales performance and profitability as compared to the standard average is obtained, links to shortfall areas lacking as compared to the benchmark can be made.

In summary, Sales Effectiveness is the ratio of a dealer's actual retail sales (regardless of where the vehicles were registered) to an expected level of sales for the dealer ("NISSAN NORTH AMERICA, INC. v. ROYAL NISSAN INC. and All Star Nissan, L.L.C.,"). That expected level sales is derived from (a) the volume of registrations in a geographic area assigned to the dealer and (b) the brand's market share in the benchmark area or standard. A dealer whose actual retail sales equal the expected level of sales would earn a sales effectiveness score of 100. It is inappropriate to compare dealer sales performance using only sales volume because a large market dealer would always appear to perform better than a small-town dealer. The calculation of an expected level of sales based on the dealer's market size allows the comparison of dealers across markets of different size. Sales effectiveness is the ratio of actual sales to expected sales. This ratio has been used to measure dealer sales performance for decades. The fundamental premise for this type of dealer sales performance measurement is that a dealer's sales are proportional to the opportunity available to the dealer in its assigned area. This premise holds for dealers of various brands. As the level of

expected sales for a dealer increases, generally the sales for that dealer also increase. While correlation does not prove causation, the fact that this relationship holds throughout the country confirms the reasonableness of the sales effectiveness methodology.

Unique consumer characteristics in an area could affect expected sales levels for that dealer. These characteristics may result in differences in consumer preferences for specific types of vehicles. How well a brand satisfies those preferences affects the expected sales in a way in which individual dealers have little control. Manufacturers control for this possibility by using what is commonly known in the automobile industry as segmentation analysis. Segmentation analysis involves separating the universe of all vehicles into groups (segments) that are similar to each other in terms of size, price, function, etc.

For calculating sales effectiveness, the expected number of sales is based on the average segment level market share achieved by the brand within the standard area and the number of registrations of all competitive vehicles, including the brand being assessed, by segment within a dealer's PMA. The brand's market share in each segment reflects the strength of its individual product offerings relative to inter-brand competitors.

The application of segmentation analysis adjusts for age, income and other socioeconomic factors that might impact the type of vehicles consumers buy because, to the extent these factors affect transportation needs, their impact is measured by the actual number of vehicles sold and registered within each segment. For example, if household incomes in an area were low, rendering luxury cars less popular, the effect would be reflected in the actual number of luxury cars sold and registered in that area.

With a standard applied to the dealership's area, a performance measurement can be calculated. The most common of these to evaluate individual dealerships is called *Sales*

Effectiveness. The intent of this metric is to determine the ability of the dealership to obtain the opportunity available in its area through its operations. The dealership personnel have control over the practices of the retail operation and, therefore, this metric is something that can be controlled. Sales effectiveness provides an unbiased assessment of the performance of the new vehicle department to compare same-brand and/or competing brands' dealers.

Sales effectiveness is calculated through adjusting the expectation for the dealership or PMA through an assessment of the popularity of vehicle segments in the dealer's area. This provides an allowance for factors that may cause, for instance, convertibles to be more popular in an area (e.g. Florida) or less popular in an area (e.g. Alaska). The standard (benchmark average) is then applied to those segments based upon the performance of the brand in the benchmark area. A simple example of this is provided in Figure 9. Here we assume there are only two segments[11], small and large. If in the nation, the brand had a 10% market share of the small segment and a 20% market share of the large segment, based on the size or popularity of the segments, the weighted average market share would be 16.7%. However, if in the state, the brand's large segment vehicle was much popular in comparison to the nation and the size of that segment is larger for the industry, the expected share for the brand in the state would be 18% at the national averages for the segments. Additionally, if the brand performed exactly at the national averages of 10% share for small vehicles and 20% share for large vehicles, the resulting performance compared to the nation may be a premium at 108% of the nation. However, due to the popularity of industry segments in the state (large to small at 4:1 versus large to small at 2:1 in the nation), the state would be at 100% to expectation at the national average.

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[11] In reality, each brand should determine their own segments. There can be as many as thirty to forty segments depending on the size of the brand or the number of vehicle models and model variants that exist. Models can be broken into different segments if they have significantly different features, at the discretion of the manufacturer.

Figure 9. The segment adjustment process to generate an expected level of sales based on a benchmark segment share applied to local segment popularity

NATION					STATE			
Segment	Brand	Industry	Share		Segment	Industry	Expected Share (Nat'l)	Expected Brand
Small	100,000	1,000,000	10.0%		Small	100,000	10.0%	10,000
Large	400,000	2,000,000	20.0%		Large	400,000	20.0%	80,000
TOTAL	500,000	3,000,000	16.7%		TOTAL	500,000		90,000

Expected penetration based on National Dealer Performance adjusted for State Consumer Preferences = 90,000/500,000 = **18.0%**

A separate metric, *Registration Effectiveness* can be used to describe a brand's performance in a geographic area. This considers the number of registrations to customers within a given area for a selected period relative to the number of registrations expected for the brand in this area based upon the popularity of products. The same calculation as in Figure 9 is utilized for the denominator of this calculation to determine the performance of the brand (not relative to a dealer or group of dealers) within a geographic area. Note that both sales effectiveness and registration effectiveness are typically examined at a month or greater interval, most commonly annually or year-to-date, due to undulations in sales volumes that may occur in shorter timeframes. Nonetheless, progress can and should be tracked at the most specific timeframe to ensure dealers can act accordingly in shorter timeframes, as many decisions are made at the weekly and monthly basis.

Based on an evaluation of sales effectiveness for a dealership and other surrounding dealers, we establish a benchmark group that is relatable to the dealership. Typically, a local group of dealers would be most applicable, as dealers would find them to be the most relevant to their operation. Due to varying competitive conditions, requiring different types and volumes of investment, we must find an applicable group to assess a subject dealership. The group of dealerships being compared must also be at a performance level that is relative to the subject dealer's target. If the comparable group were to perform well above or below the subject dealer, the analysis results and recommendation may be unattainable or not applicable. In a benchmark,

we will want to include at least 3 to 5 dealers must be included to avoid any potential calculation of an individual dealer's data from the group.[12] The performance of the potential groups selected should be taken into consideration relative to the desired level of performance for the dealership being assessed. Dealerships that exceed 100% sales effectiveness or above average profitability may desire a comparison to dealerships with a much greater level of sales and profitability performance.

Identify Areas of Opportunity

With the data collected and an objective measurement of performance, a model to examine variance in performance between dealerships as a function of KPI similarities and differences can be created. In order to determine its identity, we must consider what drives a dealership to succeed or failure in the generation of ample new vehicle sales and sufficient profitability. Beyond decision-making that results solely from experiences, a data-driven approach that builds upon domain knowledge should be utilized to identify these relationships. Through finding statistical correlates in examining network-wide data for the brand, areas for the dealership to focus its attention for improvement should be identified. This step will assist dealers and manufacturers to consume the results through prioritized KPDs that highlight deficiencies, approximate the amount of change necessary, and estimate improvements thorough the implementation of improvements. Both manufacturers and dealers will benefit from implementing the results to increase sales and profitability through the improvement of the win-win metric.

Without loss of generality, we recommend applied regression modeling to assist in identifying which variables are KPDs. While the results are pivotal to impacting dealership operations, a specific modeling method selected is not required. The analysis can be carried out

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[12] Per the U.S. Department of Justice

though a goal programming approach that explicitly models both the high-level performance objectives (profitability and sales effectiveness) or they can be reduced to a single metric through some form of a weighted sum objective (as discussed with the win-win outcome). While goal programming model (Charnes & Cooper, 1977) and multi-objective optimization with least absolute shrinkage and selection operator (Almohri & Chinnam, 2017) could also be applied to generate correlates to desired results, the process is more complex and can be beyond the comprehension of most dealership. The use of a regression model is beneficial through the ease of explanation of visualization as dealers, manufacturers, and others involved with dealership networks and operations, including attorneys and judges, will need to understand how the results were obtained and applied. In an instance where manufacturers are more analytically savvy or are comfortable without a detailed understanding of result generation, a more complicated modeling method may be applied (e.g. random forests, machine learning, etc.). The key is to identify correlates that are statistically significant and consider those KPDs for application to individual dealership operations, paying careful consideration to those correlates to the win-win metric, as the objective of having both dealers and manufacturers in approval of the process and results is pivotal.

In comparison to the selected benchmark, analysis can be done to: a) identify shortfall areas relating to sales and profitability opportunities and b) assist in prioritizing efforts. The models developed may need to be re-calibrated to calculate specific coefficients for the given brand or geography. Additionally, dealerships may be analyzed through clusters of like dealerships in operation rather than generic geographies (Almohri & Chinnam, 2017). Models may be created for all permutations to apply results more aptly based on a comparison to similar dealerships

relative to these attributes. Nonetheless, the statically significant KPDs are to be benchmarked to determine where KPD shortfalls exist to provide operational guidance to the dealer.

With the sales effectiveness metric, we have a way to both find dealers with shortfalls of new vehicle sales performance as compared to average and the volume or level of shortfall for each dealer. This provides us a Key Performance Objective to which we can select and manage drivers. To select these drivers, one option is to model independent variables to identify which are the strongest drivers of sales effectiveness:

$$\text{SE}_{it} = \sum_{k=0}^{n} \alpha_t + \beta_{kt}(V_{kt}) + \varepsilon_{kt}$$

where SE_{it} is the sales effectiveness for dealer i in time t and V_{kt} are a set of k independent variables in time t. Relative to the timeframe for modeling purposes, it is ideal to consider full calendar years, as within a year, seasonal factors and economic undulations may impact results.

In addition to the objective of selling vehicles, we may also consider the profit that is generated through the dealership. Profit, by itself, can simply be considered a monetary quantitative value, which may be an important consideration. To make this value useful for analysis, it must be considered in relative terms. First, we must consider the varying sizes of dealership businesses. U.S. dealerships can vary from just a couple million dollars in sales to more than a billion dollars. The quantitative value of profit must then be balanced against a measure that considers dealership size. A common metric that handles this issue ii Return on Sales (ROS):

$$ROS_{it} = p_{it}/S_{it}$$

where ROS_{it} is the Return on Sales for dealership i in time t, p_{it} is the Net Profit Before Bonus and Tax (NPBBT) in dollars, and S_{it} is the sales in currency units for the dealership.

With this value, one can compare dealerships, again benchmarking them against some average. In this case we use an average of dealerships, like the standard used in determining Sales Effectiveness. The selected benchmark should be the same for both calculations to maintain consistency and simplicity in the analysis. Through this, we obtain a comparative value for ROS as a percent of average (ROS):

$$ROS'_{it} = ROS_{it}/\left(\frac{\sum_{k=1}^{n}(p_{kt}/S_{kt})}{n}\right)$$

Again, this value will be modeled with individual dealerships' performance in independent variables to determine which are the greatest influences in driving return on sales. Through some dealership interviews, it was highlighted that the greatest help could be provided in evaluating appropriate inventory levels, completing detailed marketing attribution[13], and evaluating their salespeople.

Define Recommendations

Mathematical programming models can help with the development of recommendations. Two alternative formulations are offered below:

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[13] The aligning of sales with customers that were targeted through marketing efforts.

Weighted Sum Objective Formulation:	Multi-Objective Formulation:

$$\max_{[x_1,\cdots,x_K]} (w_{ROS} \cdot \widehat{ROS} + w_{SE} \cdot \widehat{SE})$$

$$\max_{[x_1,\cdots,x_K]} (\widehat{ROS})$$

Account for modeling imperfections for ROS and SE:

Subject to: $\widehat{SE} \geq \widetilde{SE}$

$$ROS = f_{ROS}([x_1,\cdots,x_K]) + \varepsilon_{ROS}$$

Account for modeling imperfections for ROS and SE:

$$SE = f_{SE}([x_1,\cdots,x_K]) + \varepsilon_{SE}$$

$$ROS = f_{ROS}([x_1,\cdots,x_K]) + \varepsilon_{ROS}$$

Honor ROS and SE relationships (with slack):

$$SE = f_{SE}([x_1,\cdots,x_K]) + \varepsilon_{SE}$$

$$\widehat{ROS} \in f_{ROS}([x_1,\cdots,x_K]) \pm k.\hat{\sigma}(\varepsilon_{ROS})$$

Honor ROS and SE relationships (with slack):

$$\widehat{SE} \in f_{SE}([x_1,\cdots,x_K]) \pm k.\hat{\sigma}(\varepsilon_{SE})$$

$$\widehat{ROS} \in f_{ROS}([x_1,\cdots,x_K]) \pm k.\hat{\sigma}(\varepsilon_{ROS})$$

Multi-collinearity constraints (with slack):

$$\widehat{SE} \in f_{SE}([x_1,\cdots,x_K]) \pm k.\hat{\sigma}(\varepsilon_{SE})$$

$$x_i \in f_i([x_1,\cdots,x_K]\backslash x_i) \pm k.\hat{\sigma}(\varepsilon_{x_i})$$

Multi-collinearity constraints (with slack):

Reasonable bounds for each KPI x_i and slack:

$$x_i \in f_i([x_1,\cdots,x_K]\backslash x_i) \pm k.\hat{\sigma}(\varepsilon_{x_i})$$

$$x_i^{lower} \leq x_i \leq x_i^{upper}$$

Reasonable bounds for each KPI x_i and slack:

$$k^{lower} \leq k \leq k^{upper}$$

$$x_i^{lower} \leq x_i \leq x_i^{upper}$$

w_{ROS} and w_{SE} are relative objective importance weights.

$$k^{lower} \leq k \leq k^{upper}$$

$[x_1,\cdots,x_K]$: Set of actionable KPIs

$\widetilde{SE}$: Minimum threshold for SE

$[x_1,\cdots,x_K]$: Set of actionable KPIs

A weighted sum objective formulation balances the interests of both the manufacturer and dealer

through including both of their objectives, sales effectiveness and return on sales, respectively. As an alternative, a multi-objective formulation can be applied through utilizing a minimum sales performance level as a constraint in maximizing profitability.

In determining the areas and priority of recommendations, one should not only consider the areas that are below the benchmark area but also the degree to which the KPD is below. By prioritizing these as a percent of benchmark, we can identify the shortfall areas for the dealership that need the greatest attention or investment first, while also considering the degree of significance of each variable. Overall, the prioritization of recommendations would be based on the greatest significance and most underperforming as compared to the benchmark (Sekerinski & Sere, 1996).

Assess Impact of Recommendations

Costs and effort will be required to act upon the opportunity identified in implementing recommendations. How these efforts will be rewarded should be summarized and compared to additional investments (e.g. additional product inventory, increased marketing expenditures, or increased sales staff) necessary for the dealer to know what to expect through making changes. Based upon improving those KPDs that are below the benchmark average, one must assume that the dealership's sales performance and profitability will improve to benchmark average's level relative to the standard. For example, if the benchmark group's performance was 105% sales effective and 95% ROS (relative to average), by making improvements in underperforming areas, we would assume that the dealer could achieve at least these levels as well. The following case study will help to provide clarity as to how the process flows in practice.

Support Recommendations and Impact with Case Studies

To support this process, case studies should be created for dealerships in differing performance scenarios. This will add clarity to the application and value of the process that dealers

can follow to increase sales and profitability. For any such situation where quantitative results will be provided through a process which may seem complicated to the average businessperson, supporting historical examples of where this process was effective can be very persuasive through creating comfort in the validity or results.

Case Study

With a process to follow, we can apply it to actual dealership scenarios to better comprehend how the recommendations are generated and acted upon. Typically, one would start with analyzing which dealerships within the dealer network had the greatest need for attention. By reviewing sales effectiveness and return on sales, we can identify which dealerships are below average. This provides a set by which to examine for best candidates for improvement. The best dealerships to study will be those where the dealer is engaged and willing to make adjustments based on the data analysis. We were able to engage with a large dealer group to have a variety of dealerships with which to engage. If we were to provide such analysis for a manufacturer, selection may be based on specific criteria, such as sales improvement opportunity, profit improvement opportunity, dealer willingness, location, or other attributes.

The following case study utilizes the process outlined to generate specific recommendations. Actual adherence and real-life impact is also discussed. The dealership selected for this analysis was part of a large dealer group[14] and was one of their worst sales performers by percentage as compared to their new vehicle sales expected. This dealership was highly profitable (ROS' = 224% at benchmark average), but lacked in sales performance (SE = 68% at state average). Our objective was to use this dealership as a validation of the analysis conducted.

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[14] Dealer groups are private or public entities that own a set of dealerships, which may be in different areas of a country and may be of different brands. In many cases, the dealerships in the group share resources, processes, ideas, and programs that benefit the group as a whole. Groups may or may not require their dealerships to follow certain procedures, depending on the independence given to the dealership operator.

Through the process, we were able to conduct interviews of the dealer principal and staff to better understand the current situation, to allow for an in-person reaction to recommendations, and to track changes made and the resulting outcomes. This process occurred over about a year period, utilizing the past twelve months of data for assessment of the current state and comparison against benchmarks.

Through many discussions with manufacturer personnel, industry experts, and dealership consultants, over one hundred KPIs were identified as potential options for our model (Giannakis & Louis, 2011). Previous literature had shown that the use of KPIs in business management could be selected based on only common sense or interviews of upper management to ensure buy in (Kaplan & Norton, 1992); however, we desired to show a statistical relationship with these to ensure a scientific basis.

Additionally, our analysis compares dealerships of the same brand. Although data, such as sales, for other brands is necessary for our analysis to understand market activity, dealerships of the same brand must be evaluated to generate acceptable comparisons and recommendations, as brands vary significantly in product, dealerships locations, manufacturer marketing, brand equity, and many other inconsistencies. Most dealerships and brands do not openly provide these datasets, so accessing these provided a great advantage in conducting analysis that had not previously been completed.

Determination of Dealership PMA

To begin our analysis, once a dealership was selected, we evaluated the PMA for our study dealership. Contractually, the PMA was already defined; however, if there were any clear changes that needed to be made, we would have considered their impact to the opportunity for the study

dealership. Still, there were only very small changes that could even be considered that would have had minimal impact on the dealership's metrics.

Select a Standard Area for Analysis

The standard area selected for our dealership was the state average. Our dealership was performing well below the state average for new vehicle sales after adjusting for local segment popularity. Due to their high profitability performance, we knew that there would need to be some investment that may lower ROS in the short term but eventually produce higher new vehicle sales, as new vehicle sales are often driven by expenditures in promotion, inventory, people, facility, and other investments.

Evaluate Dealership Performance and Determine Benchmark Dealerships

The standard selected will be applied in the same manner as the sales effectiveness calculation process described earlier including the use of industry registrations by segment adjusted for the standard selected. It will also be the basis for determining average profitability. The difference is in their derivation and application where the benchmark may be different than the standard. The standard will be based on a desired level of performance and may be stated in the manufacturer's sales and service agreement. The benchmark is a comparable group of dealerships. The benchmark will be used for the evaluation of a dealership's performance relative to individual KPDs.

After segment adjusting to determine an expected number of sales at state average, we find that the subject dealership is at 68% of state average. That means that an improvement of 32% of their expected is required to just match the state average performance. In evaluating other dealerships in the subject dealership's market, we found that the average sales performance was 112% of state average and their profitability was 132% of state average. Relative to these facts,

we find that this local group of dealerships are a good comparison and likely to be accepted by the subject dealer as reasonable benchmarks for their achievement.

Identify Areas of Opportunity

The KPIs evaluated provided an understanding of what relationships existed with, first, sales effectiveness. To complete the analysis, generalized least squares (GLS) was employed to perform linear regression in generating estimates and *p*-values to find statistically significant relationships, similar to other analysis conducted in marketing analytics (Angulo-Ruiz, Donthu, Prior, & Rialp, 2018). In assessing the list of KPIs through GLS, we found that the KPIs derived utilizing expected sales proved to be significant in relation to the sales effectiveness KPO. Advertising per expected new vehicle sale, inventory per expected new vehicle sale, and salespeople quantity in relation to expected sales all proved to be significant with p-values < 0.05. Additionally, used to new ratio was also of value in the analysis of sales effectiveness. Note that expected per salesperson as well as the used to new ratio resulted in a negative relationship and impact to sales effectiveness. With a benchmark at 75.6%, our subject dealer was at only 26.4% for the inventory per expected KPD. Our dealer, in essence, is required to triple their inventory to be at the benchmark. It is understood that this may not occur immediately, due to the nature of obtaining inventory through the allocation system in place by manufacturer's; therefore, it may take some time to increase inventory levels, to the benchmark level. Advertising per expected new vehicle sale was also short at only 73.2% of the benchmark. The used to new ratio for the subject dealership was low at.0.69 as compared to a benchmark of 0.86 used vehicles sold for every new vehicle sold. Expected new vehicle sale per new vehicle salesperson was low at only 64.9% of the benchmark.

To examine profitability in isolation, we utilized a normalized value for return on sales (ROS) as the dependent variable. We would expect financial measures to be associated specifically

with a KPO that is a summary of financial measures. This was generally true in that frozen capital and absorption both were found to be significant; however, expected as a percent of gross profit and expected per salesperson also proved significant. Note that a higher expectation for salespeople to sell and lower grosses would lead to lower overall dealership profitability. Having too high of an expectation for each salesperson to sell, can lead to a shortfall relative to new vehicle sales opportunity a dealer's PMA. Clearly, salespeople are only able to handle a certain quantity of purchasing customers and expecting more than that amount, on average, will not contribute to achieving expected sales volumes. Lower grosses for selling anything in a dealership may increase sales volumes or increase customer retention, but will impact the bottom line immediately.

In evaluating each of these variables against the benchmark, we have identified areas where clear shortfalls exist. The next step attempts to evaluate how these results can function toward making change in the dealership operation.

Define Recommendations

The process for defining recommendations includes an assessment of the shortfalls to provide a recommendation for improvement. Regarding inventory, despite having only one-third the benchmark inventory, the dealership was over 50% sales effective. Clearly, they are efficient with the inventory they have, but this is still not enough. An argument can be made that the required inventory for this dealership should be less than what is required to meet the benchmark level. Additionally, the dealerships at the benchmark level are performing above the state average. In the subject dealership's case, we may choose to allow for: (1) the dealer to work towards increasing sales performance over time from its low 68% or (2) expect less than the benchmark level by incorporating the efficiency that they have experienced in obtaining new vehicle sales from lower inventory levels. Additionally, inventory cannot be obtained immediately. It takes time through a

turn-and-earn[15] process for the dealership to increase inventory levels by selling more of what they have. To increase inventory, the dealership will have to determine how to move the vehicles they have through sale or trade with other dealers to increase allocation. Once allocation increases, they can select to purchase more vehicles for sale at their location.

For advertising, it is important that the dealership determine their expenditure based not only on the benchmark but also the availability of vehicles and personnel to address additional customers. Advertising will increase Internet, phone, and walk-in traffic, but must be supported by other dealership investments. Given that new vehicle personnel costs are also low, it is sensible that an investment in additional people may be sensible before increasing advertising. Conversely, the dealership could choose a slow approach to advertising increases while inventory allocation increases and new salespeople are sought after and hired.

Used vehicle sales relative to new vehicle sales also need to increase. We have stated that a significant increase in new vehicle sales is already required and is of interest to the manufacturer. Some of the other KPDs identified will have an impact on both new and used vehicle sales, as additional advertising can drive traffic for both new and used vehicles and additional personnel will provide support for selling to customers that visit the dealership.

With this information, we can further examine, through case studies, the true validity of these correlations in the context of dealership operations. We have also noted that some relationships are non-linear (Almohri & Chinnam, 2017). Our focus will be to provide recommendations to stores operating within a reasonable bounds, as extremely higher or lower values may not follow a linear path, hence invalidating any results or recommendations for those values. Therefore, we

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[15] Most manufacturers use a process that allocates vehicles that can be purchased by a dealership based upon their existing days supply. Manufacturers list dealers by model in order of days supply and the lowest obtains one vehicle, then the list is reset. This process is continued until all available vehicles are allocated.

can only interpolate within range of variables space. Future research could look more closely at the non-linear nature at the high and low ends of the variable spaces.

Essentially, the dealer will need to accept their deficiencies and create a time-based plan for improvement. Our analysis will indicate where the dealership should be based solely on quantitative data. Despite many considerations of how order of investment and incremental change must be considered, this analysis focuses on the essential goal of improving the performance of KPDs to benchmark levels to provide the best chance for success.

Assess Impact of Recommendations

In the case that the dealership would accept and invest in their dealership to a level equal of that as the benchmark group (by percentage), the following additional expenditures would be required:

- Advertising $148,000 per month

- Inventory floorplan expense would increase $6500 per month by increasing accepted allocation

- Four additional salespeople would cost the dealership approximately $428,000 per year

Through these activities, additional new vehicle sales to achieve the benchmark group's level of sales effectiveness would generate approximately $8.3M annually. This would greatly outweigh the expense required to obtain these performance improvements.

Reaction and Outcomes

When presented with this concept, process, and recommendations, the dealer was initially defensive about their operation and need to change or improve. Still, after careful consideration, changes were made. Inventory levels were increased and advertising investment was increased as well. Some changes to individuals within the sales department occurred, but staffing levels remained the same. This allowed them to obtain a sales effectiveness of 86% within just six

months. Profit margin and return on sales did decrease due to the investment, and overall profit dollars did also increase. Used vehicle sales also increased as part of their marketing efforts.

The process described through the example given shows that dealerships can utilize these results to improve the effectiveness of their operation. It will require acceptance on their behalf and their exact mechanism to improvement may not exactly follow the recommendations, as there are many details to manage in the dealership operation. Nonetheless, this process can be applied to dealerships for any brand in any country across the globe. The same methodology also has merit in potential application to other retail businesses but would need to be tuned to address the nuances of any retail sector. Although our focus has been on the OEMs due to data accessibility, similar efforts can also be pursued in collaboration with dealer associations (potentially across automotive brands), the proposed methodology should be highly effective for such studies as well.

CHAPTER 3 THE ANALYSIS OF AUTOMOTIVE DEALERSHIP OPERATIONS

THROUGH A MIXED METHODS APPROACH

Retail operations management, in particular automotive retail, has not received much attention in the academic literature (Manganaro, 2017). In the context of automotive dealership management, the business setting tends to vary across countries and markets. For example, in the U.S., the new vehicle market is regulated and the original equipment manufacturers (OEMs) are not allowed to run the retail operations on their own but must rely on independent dealerships (Najjar and Pardasani, 2017), which presents some challenges. Dealerships generally manage sales of new product, used product, financing, and support services (e.g., vehicle maintenance) for both vehicles under warranty and past warranty with the goal of improving profits. The profit makeup for dealerships can vary greatly over time from new vehicle sales to other departments and back and forth, creating some challenges for OEMs that have a primary interest in promoting new vehicle sales and customer satisfaction/loyalty. For this reason, OEMs rely on sales and service agreements to align the interests of the dealers. These agreements often dictate a minimum level of new vehicle sales to maintain dealership ownership (see GM Sales and Service Agreement in Appendix A). In managing these metrics, dealers base their actions on either experience or industry-accepted metrics to identify areas needing attention.

Retail operations management techniques can be broadly categorized into qualitative and quantitative methods (Jick, 1979; Kelle, 2006; Bernard, 2017). The quantitative methods revolve around the use of KPIs common to the industry, typically provided to dealers and OEM representatives in a multitude of reports (Niebecker, Eager, and Moulton, 2010). Quarterly, monthly, weekly, or even daily reports can be overwhelming to a dealer, whose primary job is to manage staff and customers. Qualitative methods tend to be unapplied in the automotive space

(Woodward, 2014). Interviews and survey results are not documented in literature to provide insight on dealership best practices. Although research has been conducted in other retail areas, addressing the activities and concerns in automotive retail is uncommon.

In conducting research on retail outlets, it is recommended that both quantitative and qualitative methods are pertinent in determining a complete assessment (Hair Jr, Wolfinbarger, Money, Samouel, & Page, 2015). It is emphasized that there is substantial importance in utilizing a key asset, data, to evaluate methods, processes, and people in your organization (Laursen & Thorlund, 2016). With substantial data available in the automotive realm, quantitative analysis in possible, however access to dealership-level or network-wide data is challenging (Woodward, 2014). Still, opportunity exists in the qualitative realm, where management perceptions, actions, and techniques all play a role in the dealership outcomes and bridge the gap between quantitative analysis (with a potential lack of detail) and results.

In the realm of objective quantitative data, dealerships produce a wide variety of data surrounding their operational, tactical, and strategic decisions that can inform effective business planning and management. Often the goal is to identify from these data key performance indicators and actionable patterns/drivers that can improve short- and long-term profitability of the dealership while also meeting the terms of the OEM agreement (Finlay, 2018). Analyzing many reports may include obtaining and benchmarking their operation against other dealers, which many manufacturers do provide. It is clear as to why a dealership may not use all of the accessible data, as there is simply too much to review, the lack of time to assess, or a knowledge gap of drawing conclusions from what is available. Research suggests data should be used to track progress and determine a process to follow (Laursen & Thorlund, 2016). However, if the time or understanding of what is being presented is unavailable, then data analysis is typically a top item avoided, as

many dealership emergencies, including the handling of customers or employees, managing internal process, selecting the appropriate inventory, or many others distract from a deep analysis into their operations. Instead, many dealers sometimes hire consultants or delegate to managers or other leaders to assist with these tasks. Still, very few have the acumen and desire to consistently follow what the data is suggesting.

While these quantitative approaches have an important role to play, they do not get to the important intangible factors such as management style/leadership and cultural norms/beliefs within the organization. This research takes a mixed methods approach to develop a deeper understanding for the dynamics at play within dealership operations to facilitate more effective performance management. Through our efforts, we found that factors and individual questions related to those factors can provide dealership management direction on how to improve sales performance and profitability. These can provide specific actions or changes that can occur at the retail level and have a direct impact on results. Additionally, activities related to the support of sales performance and profitability can be at odds in some cases, such as risk propensity which has a negative impact on sales performance while having a positive impact on profitability. Conversely, internal culture may have a negative impact on profitability but a positive impact on sales performance. Having awareness of these factors can help a dealership balance their investment of time and money into making improvements to impact their KPOs.

Through our research, we have identified a series of topical areas that have been thoroughly researched that apply to dealership operations, which is discussed in Section 2.[16] These were the result of initial literature research and cursory exploratory interviews with dealership staff, OEM management, and automotive experts, as seen in Section 3. From these, we were able to continue

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[16] These include personality traits of management, organization behaviors within the dealership operation, customer orientation of staff, power and decision making methods, dealership management processes, and dealership business development practices.

with interviews of dealership management, addressing more specific and consistent topics to identify variances across retail outlets. The complete process methodology is discussed in Section 4. With these results, we generated a survey that was distributed to dealership management throughout the United States to obtain results that could be aligned with our objective KPO measurements, which is our key contribution and is discussed in Section 5. A case study has been provided to exemplify the process a dealer would use to identify opportunities and make adjustments to their operation in Section 6.

Research Approach and Hypotheses

Through our research, we contributed to the analysis of retail operations through, first, the development of a hypothesis around what qualitative factors may influence dealership operational results. Understanding that many perceptions and attitudes in retail settings would play a role in the outcomes realized (Astakhova, 2016; Kravens, Olivier, Oishi, 2015), we desired to identify which were the most important in the automotive retail space. Our hypothesis was constructed through first gaining an understanding of which factors *could* be important for our target retailers. Research was targeted at evaluating past interviews and surveys conducted to understand greater detail about retail operations in a variety of industries. Based on our literature research we identified several areas that may have been pertinent and utilized the interview process to refine these into a useable set of relevant constructs and related questions for our survey. We hypothesized that at least some content from these literary sources would be valuable in analyzing automotive dealerships and would later allow data analysis to derive our relationship assessment.

Our second contribution lies with the utilization of the interview process to qualify our research in preparation to generate a survey to distribute to retailers. Literature provides many instances of conducting interviews with various interviews that result in a survey distributed to

collect data for analysis in mixed methods approaches (Bulsara, 2015; Burns, Bush, Sinha, 2014; Yardley and Bishop, 2015). We chose to first conduct more open-ended exploratory interviews to provide an outline of what was reasonable to research in more detail. These interviews were constructed to ask about industry-norm topics in general and allow the respondent to generate their own comments and thoughts about their impression of retail operational drivers) (Cooper, Schindler, & Sun, 2003). Comments made from interviewees about the importance of dealership culture, interactions of employees, handling of the business, and involvements with customers then led to a second set of more structed interviews. Once these interviews were completed, a 135-question survey was constructed relative to those areas where variance was observed between respondents. This allowed us to generate data about dealership operations not formerly created or available.

Figure 10. Our hypothesis of the relationship of constructs in dealership operation to obtain the desired results
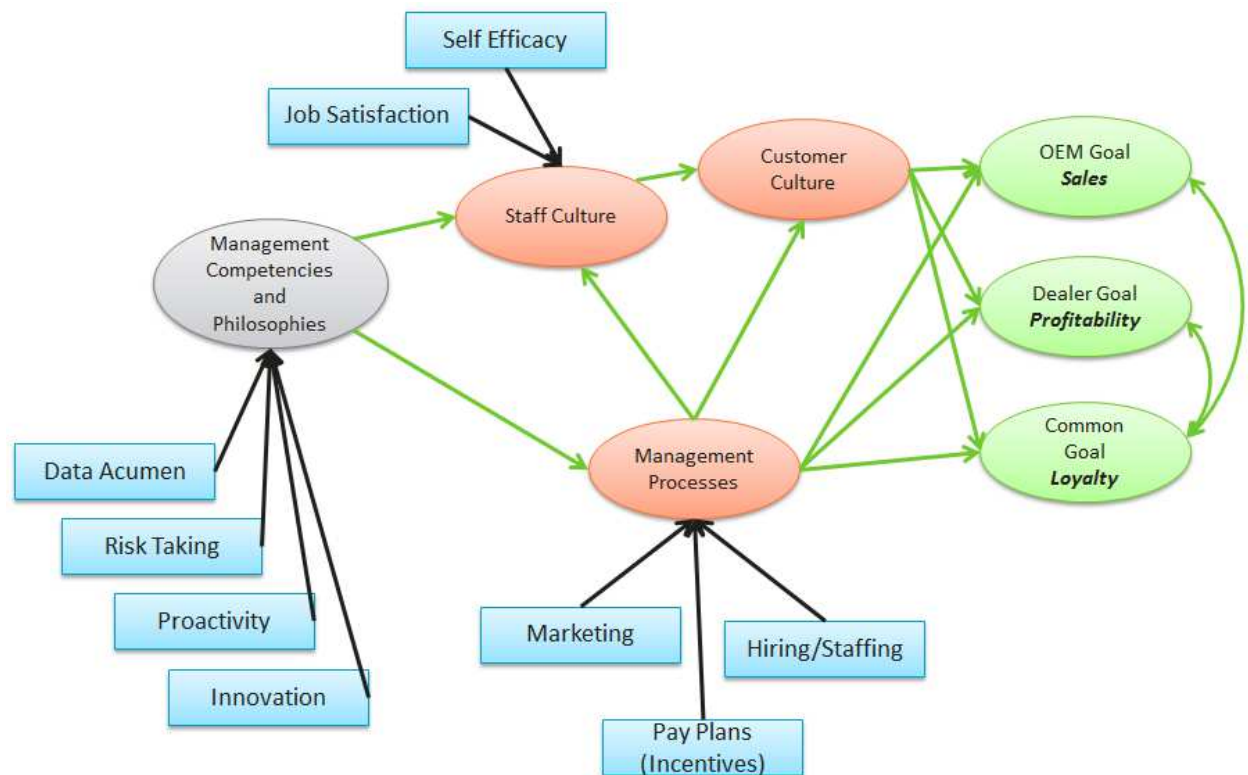
The next contribution revolved around the generation of factors from the survey question responses to make associations between dealership performance outcomes and variations in the qualitative data. To obtain data, we utilized a survey that was sent to dealership management to evaluate their processes, perspectives, and attitudes. This survey was generated from a variety of interviews to first identify areas of variance amongst dealerships that was then coupled with existing surveys in literature on topics where variation was observed. Survey responses were clustered through commonality in Principal Components Analysis to reduce the dimensions of the analysis (Fodor, 2002). Through this process, we identified eight factors covering 71 of the survey questions from the group of interviewed dealership general managers. The hypothesis of their relationship is exemplified in Figure 10.

Finally, we utilized data analysis techniques common to surveys, including Partial Least Squares regression, to draw inferences between the observed drivers and dealership outcomes. This is our final contribution. These drivers were assessed both from the perspective of the dealership goal, profitability, and the manufacturer's goal of selling more new vehicles. Differences and similarities were also examined relative to which outcomes were driven by which survey responses or constructs and to what degree. The results allowed us to identify factor areas in which dealers could improve to impact their KPOs as we applied our analysis in combination with quantitative results to provide recommendations to real-world dealerships that are performing below a desired level.

Through our research, we have provided insight into what drives both the goals of the manufacturer and dealer at a very detailed level by generating new data. Our process in developing a survey, deploy and gather data within a variety of dealerships, and then analyze dealership operations on a qualitative level, we have provided new insights as to the impact of operational

decisions on observed outcomes. Note, as well, that the results could relate outside of automotive businesses to other retail operations as well.

Literature Review

General research in the retail space regarding operations is robust (Aloysius, Hoehle, Goodarzi, & Venkatesh, 2016). And as the environment changes, more research is required, particularly with changes in buyer's shopping habits and the use of traditional brick-and-mortar stores versus web-based touchpoints (Kalyanam, McAteer, Marek, Hodges, & Lin, 2015). Historical research in assessing retail operations management through surveys has been conducted on various industries, albeit not robustly in automotive (McCullough, Ser Heng, & See Khem, 1986; Sappington, 2005). Within the automotive industry, research topics, which tend to be dated, focus on the customer through assessing general retail satisfaction (Hildebrandt, 1987), pricing (Zettelmeyer, Morton, & Silva-Risso, 2006), discrimination (Goldberg, 1996), and other assessments. When considering management and their implemented practices, there was a definite lack of material, although its importance as it relates to general business evaluation has been noted (Sekaran & Bougie, 2016).

In our scenario, with both a dealership concerned with generating profit and a manufacturer focused on selling new vehicles, some conflict can exist in how to proceed due to this misalignment of goals. Key areas such as facility appearance, vehicle allocation, facility size, and brand loyalty can all be at odds between the two parties, where one has a set of demands and the other invests (Csere, 2012). The balance of power between the manufacturer and dealer has been well documented in the analysis of agency theory (Eisenhardt, 1988). The struggle is usually in the sharing of equity or in the providing of appropriate compensation. In the automotive scenario, the revenue dealers obtain from selling vehicles can be quite complicated, as the value and availability

of factory-to-dealer incentives can change often and substantially drive dealership behavior (LaReau, 2017). With these complications, it is clear that we must consider both entities objectives to examine similarities and differences in the impact of actions.

Our process allowed us to utilize results to generate questions for a broader survey that contained empirical dealership results (from quantitative data), operational characteristics, dealership processes, and management or staff psychology. Business process management is a changing environment where more data, both quantitative and qualitative can be used to identify and assess business processes (Hammer, 2015; Rosemann & vom Brocke, 2015). We have the ability to use quantitative data as a result and determine what in qualitative survey results has a relationship to these results amongst a group of dealerships. Although balanced scorecards and other methods are utilized by businesses to incorporate a variety of business objectives into a comprehensive result (Kaplan & Norton, 2001), we will be utilizing one metric to represent the manufacturer in the form of sales units, while examining profit quantity and potential for the dealer. Further research can examine the detailed quantitative drivers of each, as our focus is on the impact of qualitative measurements on these objectives.

Retail operators desire to maximize profits through the dollars they are willing to invest. The key to being successful lies in creating sales efficiency as increases in productivity converge with marketing efforts (Kadic-Maglajlic, Palic, & Cicic, 2011). Being able to sell the product efficiently must balance the effort of promotion. In the automotive realm, from the dealer's perspective, the brick-and-mortar location (place) as well as the design of the product is somewhat pre-determined (although dealers do have some control over the quantity and mix of inventory)[17]. Dealers do have some control over price and definitely can control how they promote themselves,

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[17] Dealers have the ability to select the option packages for the vehicles they order; however, most run on a turn-and-earn process, where dealers are allocated more vehicles to select based upon their sales rate of that model.

whether it be through direct marketing, customer treatment, facility quality, or other factors within the dealership.

A key to being successful within the dealership is managing their employees to create these efficiencies (Klein, 2012). Of all employees, salespeople and service writers are the most vital since they interact directly with the customer (Sharma, 1997). Salespeople and service writers are however in their position to make money, just as any other employee. They will look to maximize their income relative to how they are paid or what incentives are provided (Yilmaz & Hunt, 2001). No matter how they are paid, however, retail sales is a people business and the customer must be their best friend in order to obtain success (Kennedy, Ferrell, & LeClair, 2001).

Salesperson performance is a well-studied factor, even as it particularly relates to dealerships (Coulson, 1993). In his dissertation, Coulson looked at the manager for cues on the performance of their salespeople. He concluded that better managers created better salespeople in that they were able to teach soft skills more easily. Expert sales managers were more consistent in their judgments, and when performance cues were not present, tended to use fewer irrelevant cues, placing more faith in organizational cues than did a less experienced manager.

Factors of job satisfaction, communication style, ethics, and even gender can all weigh on the ability of a salesperson to perform adequately (Babakus, Cravens, Johnston, & Moncrief, 1996; Brown & Peterson, 1993; Darley, Luethge, & Thatte, 2008; Dion & Notarantonio, 1992; Honeycutt, Siguaw, & Hunt, 1995). It is the proper balance of these that is generated through hiring and investment that will achieve the desired result of sales efficiency and customer allegiance (Rickert, 2010). These factors will be assessed against what dealers and manufacturer personnel believe today and what the data suggests regarding the existence of any relationships.

In addition, it has already been noted by experience that the characteristics of the company's leader trickle down into the staff without little effort. Cultures of fear, excitement, laziness, or calamity are typically derived from the partner, owner, manager, or whoever owns the power and leadership within the organization (Quinn, Anderson, & Finkelstein, 1998). Those in leadership positions, therefore, most create a culture to succeed. This input was utilized in all interviews conducted to identify any relationships that lead to specific outcomes.

Noting the above research, we evaluated dealerships and their management to identify the actions and perceptions that lead to differing results. We selected constructs through interviews and those areas researched to generate a survey that could be completed by any automotive dealership. The findings will provide the ability to create case studies to apply to other dealership situations to be able to find opportunities to impact new vehicle sales and profitability.

Methodology

Although survey-based analyses in retail operations exists in literature, the application to dealership operations, particularly as relates to the goals of new vehicles sales performance and profitability, observed through interviews is a new area for research. Most importantly, we have generated new data for analysis based on constructs and questions from previous literature, as was applied to businesses in other industries. The results from our work provide a template for dealers to better understand the impact of their existing practices and allow them to make decisions about the future of their organization.

Our methods for contributing to research in these ways begins with an approach to determine which data is appropriate to collect. Beyond the available quantitative data, our methods employed in this research draw upon qualitative inputs to provide a more holistic view of what actually occurs within dealerships. In order to complete this, in-depth and contextualized inputs, although more

time-consuming, were obtained directly from dealers through qualitative survey data derived from interviews (Johnson & Onwuegbuzie, 2004). By utilizing key performance indicators (KPIs) based upon the quantitative data while including real-life industry knowledge will provide a best-of-both-worlds approach to gaining knowledge about dealership operations. This combination of data collected through surveys and existing quantitative values intends to enlighten regarding what factors are truly relevant to focus management efforts.

Dealership Operations Objectives

The analysis focused on dealerships in the U.S. to determine correlations to the desired outcomes in all preliminary and complete interviews. A variety of automotive brands were involved to ensure variation is obtained. In all cases, the objectives of the analysis are the same: to identify correlations of qualitative dealership aspects against our KPOs. Sales effectiveness, the KPO desired by the manufacturer, examines the performance of a dealership as it relates to new vehicle sales. The denominator of the calculation is based on the historical registered new vehicle sales in an area where that dealer has an advantage of proximity to customers relative to other dealerships of that brand. If other dealerships of the same brand are too distant, many manufacturers limit the reach of the dealer's Primary Market Area (PMA) to say twenty or thirty miles. This particularly applies to brands where dealers are less common in rural areas. Expected sales (the denominator) also consider the popularity of segments in that dealer's area. Clearly, convertibles would be less popular in Alaska as compared to Florida. Due to this, we adjust for these differences by breaking down all vehicles into these segments of competitive vehicles, which are defined by each manufacturer.

To balance the manufacturer's objective of selling new vehicles, dealerships are in business to drive profit. If not invested in a dealership, the owner could choose to invest in another business,

equities, real estate, or any other option. They have chosen a dealership to invest as it can be a vehicle to create substantial profits if the operation is run successfully. Therefore, dealership profitability is one the greatest importance to the dealer and for the viability of the business. Through tough economic times, dealerships must weather lower vehicle sales volumes and be operating in such a way that short term loses will not undermine their long-term prognosis.

Based on these two objectives, our desire was to identify what dealership activities and situations were related and to what extent. The desire was to find dealerships that were above average in both or a 'win-win' scenario existed between the dealership and manufacturer, with dealerships aiming to be above average in both new vehicle sales and total dealership profitability. Our initial thoughts were that some variables would drive improvement in both, while others would be antagonistic. For any given dealership, however, our aim was to triage the current state and identify where areas of improvement could be realized.

To generate these metrics, data from each dealership studied would be needed in the form of financials, sales, and registrations. Financial data is provided by dealers to manufacturers each month to report on the viability and performance of the dealership to ensure viability. Retail new vehicle sales are also provided to the manufacturer from the dealer as each vehicle is sold and is reported on a daily basis. Warranty registration occurs at this point, so it is required that these be sent expeditiously, in case the customers were to need warranty repairs shortly after the sale. Registrations are gathered by each state as part of the vehicle registration process with the Department of Motor Vehicles. These are needed to tie the Vehicle Identification Number (VIN) to the customer's location to assess how a dealership or brand is performing in a specific geography (such as ZIP code or census tract). With these datasets, which we made available by a

manufacturer, we can calculate our objectives in the appropriate periods to align with our survey results.

Interviews

We began our research with a plan to generate valuable survey questions relative to dealership operations results. Different stages of industry input and knowledge were needed to identify what areas should be addressed to find variance in responses, which were broken into three phases: (1) Dealership, OEM and consultant semi-structured interviews, (2) topical dealership management interviews, and (3) dealership management surveys.

In preparation for the discussions with dealerships, we first had dialogue with dealership consultants to review what they examine to help critique and identify areas of opportunity in dealerships. In these conferences, we asked about unique activities within dealerships, both procedurally and conceptually, as well as obtaining their opinions on what generates success. We covered the activities in each department that were important, trends or changes in how dealerships operate, as well as what customers expect. Topics included loyalty, trade-in processes, interactions with OEM field representatives, hiring practices, Internet leads, and many other areas. These discussions began very open-ended but provided the opportunity to identify more detailed areas where pointed questions could be later asked to dealers. The results from these informed us as to the areas to focus the initial interviews with dealers.

The phase one interviews, with seventeen dealerships representing two vehicle brands in locations dispersed throughout the United States, were meant to help refine questions for the rest of panel in order to focus on topics where we may find variance and could further delve into the details or drivers of these topics. The dealership locations varied greatly throughout the interview and survey process, as a diverse set of both urban and rural locations were desired. Also, their

locations were in various regions of the United States to eliminate any location biases that may exist. To ensure analysis was possible, the dealerships selected also varied in their performance levels, both for sales performance and profitability, allowing for correlations of survey results to made to KPOs.

These discussions started with many directed questions based upon the discussions with consultants, but we allowed the conversation to flow, as we knew that additional areas that are important to dealers could be identified. The plan was to slowly add, modify, and delete specific questions as we progressed through the seventeen to eventually have a solid, consistent panel of questions to discuss with the following group.

Note that through all of these discussions, the final interview content was refined if similar answers were provided consistently for any question. In some situations, we still asked these questions if there were a basis for other responses; however, if they were not needed, they would be removed to allow for any new questions to be added. Again, the phase one interviews were conducted in a very open-ended approach and the phase two interviews were a result of these preliminary interviews. This process, including the use of quantitative metrics as objectives, is well-documented in other manuscripts (Bryman, 2017; Kessler et al., 2016).

With a manageable set of interview questions, detailed phase two interviews were conducted with eighteen dealers across two different brands, with most (fifteen) from a single brand. The dealership partner, owner, or general manager was the targeted interviewee. The intent of these interviews was to define variances in outcomes relative to interview results. Once we recognized that there was ample variance in enough topical areas, we felt comfortable proceeding on to survey development.

The phase two interviews were constructed to address overall dealership activities as well as each dealership department (new, used, service, and parts). We began with areas where dealerships could articulate differences in how they operated the business but attempted to keep the questions fairly general so that the discussion could lead to the uncovering of other areas of interest. It was intended to be more of a conversation that was led by questions but not constrained to just those topics.

In all, thirty-five in-person dealership interviews were conducted across the U.S. These results were then assessed through organizing results and evaluating which topics saw variance amongst dealership interviews. These topics were researched to identify existing literature-based surveys that had already been formed. In some cases, as mentioned, direct questions about dealership operations were utilized in the survey that were pertinent to the challenges of dealership operations or were generic in nature relative to the history and activities of the dealership and the survey responder. All interviews were conducted within the dealership of the target individual. In a session that would last about one to two hours, all questions were asked. Many times, follow-ups to seek more detail were explored. Most participants were open and willing to provide the current practices in their dealership as well as their feelings about how to handle people and situations within the operation.

A small set of interviews with OEM headquarters and field personnel were also completed to determine what they believe are their key objectives and how they normally obtain these objectives. These individuals were sought after only to provide insight from experiences in interacting with dealers.

Survey Creation

As we reviewed the results of the interviews, we examined which topical areas could be approached in literature research to provide a set of well-evaluated questions for analysis that provided results in other business settings. Through all of our research, we did not find much analysis related to automotive either for general dealership studies or for qualitative business acumen evaluation; therefore, we relied on surveys that were developed on themes identified from the interview experiences.

To evaluate the interview results, we evaluated the responses from each interview and each question to identify variance in the verbatims that we recorded. From this assessment, we were able to determine which areas had the greatest potential for driving differing outcomes in profitability and sales performance. These were then translated into topical areas for literature research. The overall intention was to ensure that we covered these areas based on previous research while also asking questions pertaining directly to automotive dealerships.

To address the automotive-specific, operational areas, we focused on a couple bucketed areas where we found variance occurring in the discussions we had with dealers. These were in marketing, selection, value proposition, selling approach, variable operations, fixed operations, and overall performance. The first four areas (marketing, selection, value proposition, and selling approach) were areas that had been identified consistently in literature as general retail business drivers, albeit through independent works. Performance measurement relative to marketing was specifically analyzed for an automotive brand (Beukes & van Wyk, 2016) while dealership digital marketing was also recently analyzed in the industry (Zettelmeyer & Merkley, 2017). Selection or inventory has been a topic of analysis in general retail (Gordon & Regalado, 2018) and automotive for some time (Hansch, Naik, & Viswanathan, 1998). The value proposition or price

charged to a retail customer has substantial research around its importance on both unit sales and outlet financial performance (Ozturk, Venkataraman, & Chintagunta, 2016), including dealerships (Chen, Gallego, & Kou, 2016). Finally, the selling approach through a sales staff is also of vital significance, according to many manuscripts. In dealerships, personality traits (Andersson, Carlson, & Monié, 2015) and customer orientation (Konrad, 2018) were shown to have a relationship to sales. There are retail studies as well on how salespeople change their attitudes and actions based upon the incentives provided (Owan, Tsuru, & Uehara, 2015). Overall, there was substantial support to ask operational questions based on the categories and topics of previous literature as it applied to, at least, retail operations, if not specifically to dealerships.

In further analyzing interview results, we did find that there were operational activities that we needed to inquire about in the survey. The questions utilized in the operations section were organized into three groups: performance, dealership processes, and culture. Since these were topics very specific to how automotive dealerships are run, we decided to generate questions on them directly. Relative to performance, while we did have the quantitative results of the dealerships surveyed, we did want to obtain management's perspective on their own results, particularly as compared to other dealerships. For processes, as there are specific activities in dealerships as compared to other retail operations, we provided questions on both fixed operations (service and parts) as well as variable operations (new and used vehicle sales). Culture was the top response as to differentiating factor in their dealership per the interview. Given the broad nature of this term, we endeavored to obtain more color around its meaning and where variances might exist. We also knew that culture could apply both to the internal dealership as well as interactions with external sources, or customers, so questions on both were included.

Finally, there were topics about the attitudes, perceptions, and feelings of management that we also desired to examine. Although direct answers to pre-defined questions did not always precipitate the direct need for these analyses, through our structured interview approach, varied sentiments and approaches did appear. We approached literature as a source of questions in these psychological areas. In enveloping the concepts of organizational behaviors (Jaworski & Kohli, 1993), power and decision making (Hurley & Hult, 1998; Jaworski & Kohli, 1993; Narver, Slater, & MacLachlan, 2004), retail management (Jaworski & Kohli, 1993; Narver et al., 2004), and retail business development (Hurley & Hult, 1998), we utilized several survey questions applied to management in other industries. The questions were vetted for applicability to the dealership case and used when potentially informative, focusing on changes to dealership operations practices as a potential result of the analysis. The topics selected aligned with both interview responses and observed sentiment as we proceeded through the many interviews.

Once the survey was created and vetted amongst industry experts and dealership management to ensure applicability, it was distributed to a group of 42 dealership general managers and owners. They were to complete the survey within a two-week period, ensuring prompt responses to align with similar quantitative data results. The dealership management that did complete the survey were from a variety of geographies across the United States and from different brands. The survey utilized a 5-point Likert scale for all dealership evaluation questions, which was based on the existing surveys found in literature. Additionally, it allowed for a consistent analysis process and for ease of data analysis.

To understand these relationships in the survey data, analysis was required once the surveys were completed. The process utilized for analysis included Principal Component Analysis (PCA) followed by Partial Least Squares (PLS) of the resulting factors to determine their relationship to

the KPOs (Gefen & Straub, 2005; Wold, Esbensen, & Geladi, 1987). First, the factors must load together to generate explainable and significant groups through PCA that can be analyzed in predicting our dependent variables through PLS. With these results, we can best understand the most relatable constructs to dealership profitability and new vehicle sales performance, providing direction to dealerships in best running their operation.

Results

Principal Components

Once the surveys were completed to a sufficient volume[18], we accumulated financial statements and sales performance metrics (KPOs) for the dealerships involved. These acted as the dependent variables in the analysis of factors. Given the large number of questions in the survey, we needed to find the underlying themes or dimensions. The survey results were analyzed in software to create factors, through combining questions into robust groupings that included more than two survey questions and together constituted a theme. PCA was used to identify the underlying dimensions in the data. We reviewed various potential solutions including six to fifteen factors as potential results and considered outcomes utilizing different extraction and rotation methods, including Promax, Direct Oblimin, and Varimax. All questions in the factor loadings were required to have a value greater than 0.6 to be included in that factor. Using sensitivity analysis to find an optimal solution, the solution with the most interpretability included eight factors that met the desired requirements.

The final factor model included 71 of the initial 135 questions. The content of the factors based on these questions includes:

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[18] Many iterations of the analysis were completed, some before the completion of all the surveys utilized to ensure meaningful results could be obtained.

- Factor #1 - Internal culture (Team Spirit, Teamwork, Culture with colleagues, Management – Employee Relationships, Organizational Commitment, Power Sharing)

- Factor #2 - Dealership operational processes (Department Connectedness, Innovation, Risk propensity, Responsiveness, Communications, Programs)

- Factor #3 - Decision making (Management activity/involvedness, Decision-making processes)

- Factor #4 - Internal communication (Dealership communication norms, Dealership structure, Cultural commitment to dealership/management, Employee involvement)

- Factor #5 - Customer orientation (Customer involvement, Beliefs on interacting with customers, Market evaluation)

- Factor #6 - Dealership management (The use of data to make decisions, Management's handling of employees relative to making deals with customers)

- Factor #7 - Risk propensity or innovation (Activity in requesting and identifying innovative opportunities, Procedural vision, Involving staff in the operation of the dealership)

- Factor #8 - Sales and marketing focus (Aligning marketing with objectives, Processes to make a sale)

A summary of the final factors and their statistics is displayed in Table 1.

Table 1. The results of the PCA analysis, showing the resulting factors, the number of questions included in each factor, the loading range values for the questions, and factor reliability

PCA results* and Factors

Factor Name	Number of Items (Number Negative)	Loading Range (Absolute Value)	Scale reliability
1) Internal Culture	16	0.625 to 0.826	0.72
2) Dealership Operational Processes	12 (6)	0.601 to 0.880	0.78
3) Decision Making	7 (3)	0.607 to 0.857	0.73
4) Internal Communication	9 (2)	0.601 to 0.709	0.62
5) Customer Orientation	6 (1)	0.600 to 0.772	0.64
6) Dealership Management	6 (3)	0.622 to 0.829	0.71
7) Risk Propensity or Innovation	10 (3)	0.603 to 0.887	0.74
8) Sales and Marketing Focus	5 (2)	0.624 to 0.783	0.68

*Percent variance explained by factors in model was 76.3%

In relation to our original hypothesis, we find that most of the internal factors regarding culture and processes are relevant in the final model. However, the drivers of these were sometimes different than expected. Additionally, we did not test for loyalty in this study or the interaction effects of constructs, which allows for expansion of this analysis in future research.

Partial Least Squares Model and Factor Evaluation

Utilizing partial least squares regression, we can determine the factors that have a relationship to the dependent variables. We utilized this method due to the number of responses we obtained as compared to the number of survey questions. Partial Least Squares (PLS) regression is a method for constructing predictive models when: a) factors are many and collinear and b) the emphasis is on predicting the responses and not necessarily on trying to understand the relationship between the variables (Tobias, 1995). This indirect modeling process diagram is seen

in Figure 11. The advantages of PLS regression include dealing with multi-collinearity, taking

into account the data structure, providing visual results that help interpretation, and modeling

several response variables at the same time, taking into account their structure.

Figure 11. A diagram showing the relationship of factors and responses, per Partial Least
Squares regression approach through indirect modeling (Tobias, 1995)
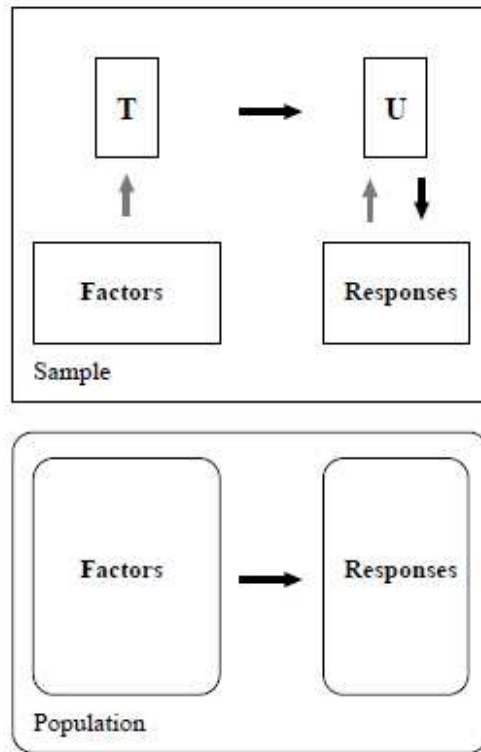
Figure 12. Variable importance calculated for each factor
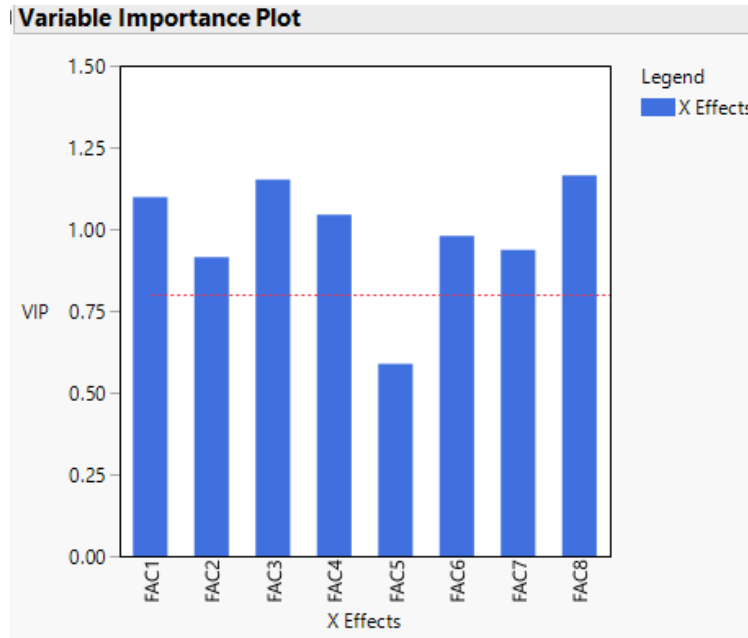
Factor importance plots (Figures 12 and 13) show that most all of the factors are above the 0.8 threshold to imply importance in the model. Factor 5 is the only factor below the threshold, which is true as it applies to both dependent variables. We will discuss factor 5 in the analysis but is must be remembered that it provides less value in explaining the KPOs as compared to the others.

Figure 13. A graph of each factor showing their Variable Importance Factor and coefficient
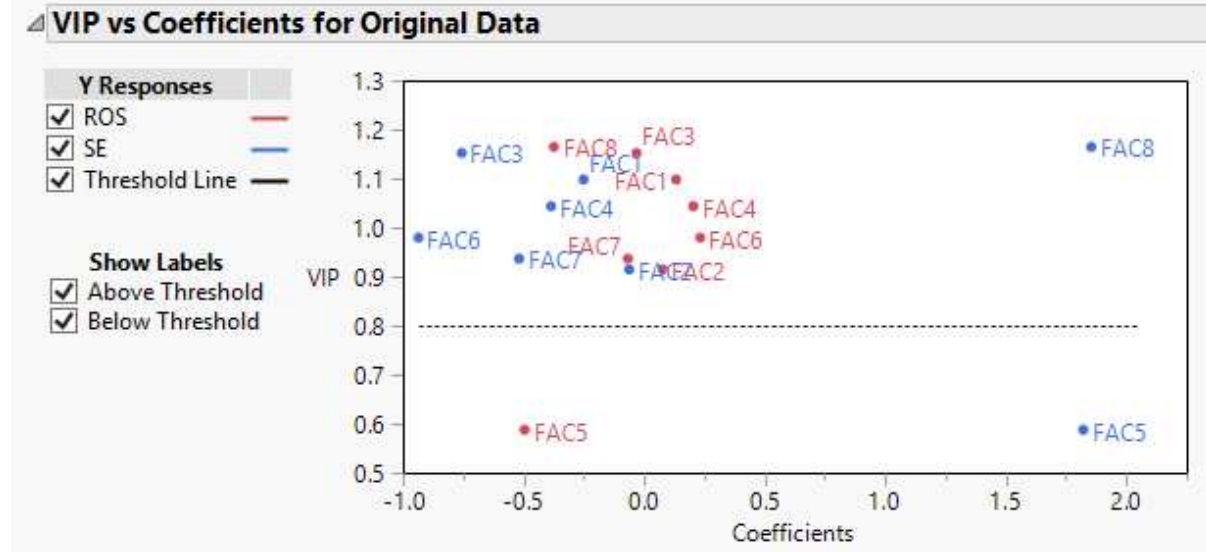
A summary of the direct relationships of each of our constructs to our dependent variables is assessed through the following hypothesis:

- Hypothesis 1a – Internal Culture is positively related to new vehicle sales

- Hypothesis 1b – Internal Culture is positively related to profitability

- Hypothesis 2a – Dealership Operational Processes is positively related to new vehicle sales

- Hypothesis 2b – Dealership Operational Processes is positively related to profitability

- Hypothesis 3a – Decision Making is positively related to new vehicle sales

- Hypothesis 3b – Decision Making is positively related to profitability

- Hypothesis 4a – Internal Communication is positively related to new vehicle sales

- Hypothesis 4b – Internal Communication is positively related to profitability

- Hypothesis 5a – Customer Orientation is positively related to new vehicle sales

- Hypothesis 5b – Customer Orientation is positively related to profitability

- Hypothesis 6a – Dealership Management is positively related to new vehicle sales

- Hypothesis 6b – Dealership Management is positively related to profitability

- Hypothesis 7a – Risk Propensity or Innovation is positively related to new vehicle sales

- Hypothesis 7b – Risk Propensity or Innovation is positively related to profitability

- Hypothesis 8a – Sales and Marketing Focus is positively related to new vehicle sales

- Hypothesis 8b – Sales and Marketing Focus is positively related to profitability

Details as to their relationships with dependent variables, Sales Effectiveness and Return on Sales, are provided in Table 2.

Table 2. Relationships of each identified factor from the results of PCA and the key outcomes

Relationships of the Identified Factors with Dependent Variables (KPOs)

Relationship[‡]	Coefficient	Regression Weight (r^2)	p-Value[†]	Hypothesis Supported/ Not Supported
Internal culture → SE	-0.2512	0.40	0.009**	H1a supported
Internal culture → ROS	0.1328	0.33	0.023*	H1b supported
Dealership operational processes → SE	-0.0621	0.02	0.384	H2a not supported
Dealership operational processes → ROS	0.0762	0.23	0.055	H2b not supported
Decision making → SE	-0.7565	0.62	0.000***	H3a supported
Decision making → ROS	-0.0319	0.39	0.000***	H3b supported
Internal communication → SE	-0.3857	0.58	0.000***	H4a supported
Internal communication → ROS	-0.2040	0.21	0.022*	H4b supported
Customer orientation → SE	1.8209	0.09	0.440	H5a not supported
Customer orientation → ROS	-0.4957	0.18	0.151	H5b not supported
Delaership management → SE	-0.9356	0.29	0.032*	H6a supported
Dealership management → ROS	0.2327	0.28	0.049*	H6b supported
Risk propensity or innovation → SE	-0.5190	0.30	0.062	H7a supported
Risk propensity or innovation → ROS	-0.0671	0.05	0.210	H7b not supported
Sales and marketing focus → SE	1.8541	0.59	0.000***	H8a supported
Sales and marketing focus → ROS	-0.3742	0.28	0.01**	H8b supported

[†]P-values were caluclated using a Partial Least Squares (PLS) regression. Values of $p \leq 0.05$ are denoted by "*", those where $p \leq 0.01$ by "**", and those where $p \leq 0.001$ by "***"

[‡]"SE" refers to Sales Effectiveness and "ROS" refers to Return on Sales, which are our dependent variables

In examining these relationships to eventually draw conclusions, we must assess the weight of the factor relationships as well as their importance or statistical relevance. Factors with the largest impact, where there was a high importance for the factor, a strong coefficient, and a significant statistical relationship include:

- Factor 8's positive impact on sales performance,

- Factor 1's positive impact on profitability,

- Factor 6's negative impact on profitability,

- Factor 3's negative impact on sales performance, and

- Factor 7's negative impact on sales performance

Each of these had a factor weighting greater than 0.5. Note that Factor 5 also had substantial weighting as related to each of sales effectiveness and profitability, but the importance of Factor 5 was relatively low as compared to other factors. We may still want to consider this factor, as it was initially relevant in our model, but note its lower importance as related to our results.

Each of the factors generated can be analyzed against the coefficients in size and sign to determine the relationships of activity or ability in an area to our dependent variables (Figure 14). For factor 1, managers that feel the dealership has good team spirit and that the employees are committed to the dealership help the bottom line of the dealership but do not necessarily increase sales. Factor 2 implies that when dealerships are less inclined to be innovative and risk-taking and are less connected, the result tends toward average profitability but has a negative impact on sales performance. The coefficients are low for these, so overall this factor has limited impact. Factor 5 has a lower importance than most other factors, although it does have a large positive impact on sales performance, suggesting that a customer focus leads to more sales but at a cost to profitability.

Figure 14. Coefficients for each factor found through PCA generated through PLS regression
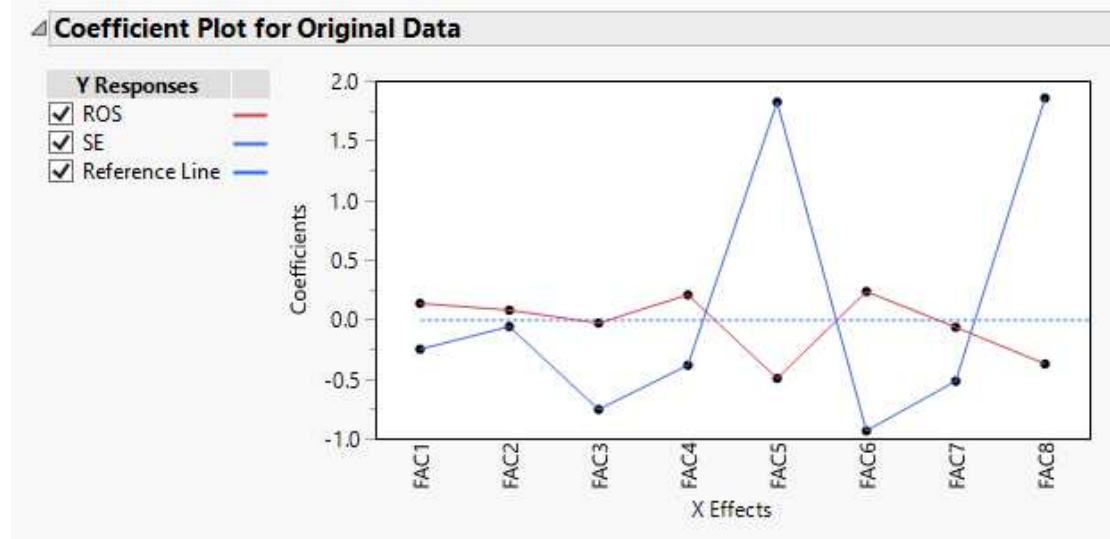
Factors 3 and 6 suggest that dealers that are better at using data are better at generating a superior ROS but not sales level. Factor 4 relates better internal communications to better sales performance; however, factor 7 implies greater innovation is related to lower sales performance. When dealers know their OEM-based sales targets and market in areas outside their PMA, factor 8 indicates they have a better opportunity to be sales effective than to have higher profitability levels. This is the greatest factor for influence on the results, according to the analysis.

Conclusions

Through an assessment of the factors and their relevance to our dependent variables, we found that for dealerships which follow what we consider ideal practices, sales performance is better but profitability is negatively impacted. This suggests that there may be a compromise between how a dealer balances the two objectives, relative to their current situation. Dealerships that may be feeling pressure from a manufacturer for underperforming in sales performance but have good profitability may choose to follow the factor analysis that relates to greater sales effectiveness while giving some profitability. Of course, an assessment of which factors provide

the greatest opportunity to increase sales effectiveness should be considered to have the most efficient impact.

We also found that dealerships use their skills for the purposes of managing their business and profitability, which may include areas outside of new vehicle sales. Although new vehicle sales are necessary in order to maintain a good relationship with the manufacturer and drive service business, dealers will focus on those practices that promote profitability first with the hope that new vehicle sales will follow. This may change as factory-to-dealer incentives increase to better incentivize new vehicle sales levels as well as adherence to other manufacturer objectives.

Table 3. Correlation matrix between identified factors

Correlation matrix for factors								
KPO/KPD	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Factor 1	1.000							
Factor 2	-0.082	1.000						
Factor 3	0.204	0.585	1.000					
Factor 4	-0.037	0.086	0.093	1.000				
Factor 5	0.272	-0.036	0.028	0.100	1.000			
Factor 6	0.574	-0.111	0.160	0.065	0.136	1.000		
Factor 7	0.055	-0.196	-0.529	0.624	-0.250	-0.276	1.000	
Factor 8	-0.210	0.192	0.411	0.433	-0.646	0.322	0.294	1.000

The analysis also shows that managers which know how to use available data should be expected to generate greater profitability levels by management. The factor associated with data acumen and use had a strong correlation to profitability. This could suggest to dealerships with high sales effectiveness but low profitability that either management should improve their data focus or capabilities or hire someone that has them.

Also, innovative groups may attempt tactics and processes that are more risky and may harm sales. Their desire for innovation may support the dealership as a whole, but do not positively support new vehicle sales. Perhaps there is a time-related element that also could be examined relative to the discovery and implementation of innovative practices.

Finally, if dealerships take the time needed with customers and employees and follow the typical guidelines for success, new vehicle sales targets can more easily be achieved, but profitability may suffer. Time is expensive. By not providing an adequate investment of time to one customer may negatively impact another. Still, this is the best way to make the deal and dealerships must balance the investment in time with the quality of the purchase experience.

Based on the analysis conducted and the conclusions based on the factors and associated performance results, dealerships have an opportunity to manage their outcomes through adjustments in the areas discovered. A case study follows on how this analysis could be applied to individual dealerships.

Case study

The following case study utilizes the results of this analysis and applies it to a sample dealership. Recommendations are created in areas that could help the dealership achieve 'win-win' behavior.

Study Dealership Selection

The case study dealership selected was located in the northern part of the United States and represented a premium brand. From a sales effectiveness standpoint, the dealership was performing below average at 78% of average; however, the dealership was above average in profitability at a 4.2% return on sales (as compared to an average of 3.6 % for the brand). The dealership was not located in an auto shopping area, but was on a busy highway with substantial visibility. Through an actual visit to the dealership, the sales staff was pleasant and management engaged. Of course, without an actual employment experience, we only have a customer viewpoint from which to speak. Management was willing to take part in both an interview and survey.

Dealership Survey Results

Since the interview was utilized as part of the phase 2 of our analysis, this portion was less vital to analyze this dealership. We would expect that future dealerships could utilize our survey to inform themselves on areas of opportunity relative to the impact of constructs mentioned. For future application, to decrease survey length, dealerships could be asked to complete the 71 survey questions that were involved in the constructs, rather than the original 135 utilized in the broad survey. In our case, the case study dealership completed the entire survey, given the timing relative to our research process.

This dealership desires to increase sales performance which will aid them in the eyes of their manufacturer as well as assist them in obtaining larger factory-to-dealer bonuses. Since they are above average in profitability, there is an opportunity to allow for some reduction in the short term for the benefit of increasing profitability, which may generate a tag-along effect of greater profit dollars.

In examining the survey responses for this dealership, we found response averages for questions in factors 2, 3, 4, and 6 to be higher, with an average of about 4.2. Responses for factors 1, 5, and 8 were lower, with an average of about 3.0. Factor 7 values were closer to the middle at 3.5. This aligns with what we would generally expect from a dealership with higher than average profitability but a lower new vehicle sales performance.

To assess an individual dealership, we also needed to consider not only the coefficients from the constructs, but also the PLS coefficients by factor for the analyzed dealership. We could then analyze responses for individual questions relative to their own coefficients within their factor and compare that to the dealership's survey response. Particular survey responses that support a strong positive impact on profitably for the dealership analyzed include the following:

- Internal culture - Dealership team spirit pervading all ranks of the dealership and power sharing

- Interdepartmental connectedness is high

- Enhanced centralization of decision making

- Speed of decision making

- Career management

- Free pickup and delivery services

Similarly, there are questions that were answered which indicate potential causes of the dealership's weak new vehicle sales performance:

- Lacking a family-like dealership atmosphere

- Inaccessibility of individuals across departments

- High risk propensity

- Use of a 20 group

- Deficient discussion and debate to make decisions

- Not checking competitors pricing regularly

- Minimal data usage to make decisions

- Caution on innovativeness and accepting new ideas

- Inability to easily trade for vehicles

By examining these responses, we can identify potential areas for change within the dealership operation to encourage increases in new vehicle sales performance. In some cases, there may be a negative impact to profitability for this dealership if changes are enacted to affect new vehicle sales performance; however, increases in sales performance will have a stronger long-term effect for proper brand representation and viability.

Application of Results to Dealership Operations

From this analysis, an individual dealership should focus on those areas that have the greatest opposing survey responses in areas where the dealership desires to improve. For our sample dealership, key recommendations for change can be provided from this analysis. In this case, we found that this dealership must invest or change in those areas where their survey responses aligned with a shortfall or opportunity, as were outlined above.

To obtain 'win-win' status, there is a need for this dealership to increase new vehicle sales performance without substantial negatively impacting their profitability, which is above average. It appears that better internal atmosphere and communication is needed to address the current lack that exists, per the survey results. Improving these areas should not have a negative impact on profitability. Also, they lack innovativeness which may be leading to their not using data regularly for decision making. Operationally, a focus on assessing the market regularly for competitive activity and prices while finding routes by which to trade vehicles, could result in improved profitability over time.

This analysis can be conducted for any dealership through analyzing their survey results that are relevant in the constructs identified. In addition to any quantitative data analysis that could occur to assist in specific operational changes or activities, this analysis provides a guide to improvement in areas where data is not typically available. Dealers could distribute this survey across departmental management to obtain a better understanding of exactly where any issues may exist with actionable information. The exact mechanism must be determined at the dealership level for the existing situation, but overall, with these results, dealers are armed with specific information to provide others in their organization to impact KPOs and obtain 'win-win' status.

Discussion and Conclusion

As a result of this analysis, dealers can better understand which areas can be adjusted to improve operations in new vehicle sales and/or profitability. The challenge in many of these factors is that they affect both, often in opposing ways. Dealers must decide where they have the greatest opportunity for improvements via those factors that are significantly in a direction that does not assist in achieving their goals. Special attention should be given to importance of variables and their volume of impact in affecting KPOs.

From the manufacturer's perspective, this analysis sheds light on the discrepancies in operational characteristics in obtaining sales goals versus profitability. It's enlightening that, of the factors analyzed, there were none that impacted both new vehicle sales and profitability in the same direction and to the same volume. Manufacturer's must realize that it's challenging to act in opposing directions at the same time and that balance is needed to obtain dealership and manufacturer targets.

In following our process through the phases necessary to gather data, we recognized challenges in each step. The attacked the interview process quickly, which was rewarded by having a timely basis for creating a survey relative to the metrics that drove their selection. In creating the survey, there were many options. Due to a large breadth of research on retail management from a qualitative psychological perspective, there were many constructs and survey questions from which to choose. Although we believe that we exemplified our interview results well through the survey, additional research could be conducted on other factors.

Regarding the accumulation of survey responses, we found that aiming for a single brand, which seemed as if it would streamline the process at first, instead was very difficult to fulfill. Most manufacturers were uncomfortable surveying their entire dealership network. Instead, we

needed to acquire individual dealerships that were willing to participate. On the positive side, this allowed for a mix of brands in our survey responses; however, focusing on one brand may have allowed for a more directed result. Also, dealerships are busy places; therefore, obtaining responses can be challenging. Ideally, we would have distributed the survey to a much larger group and obtained a larger volume of responses. The challenge in obtaining a good response rate amongst dealers is to have some opportunity to directly enlighten them as to the research, rather than expecting survey completion for an unknown researcher.

An additional complication in the automotive industry is the high turnover. A consistent person (the surveyed) to provide a viewpoint that has been applied and enacted within the dealership over a period of time that aligns with consumable quantitative information is required but may not be available at all dealership locations.

In the research itself, we focused on the direct effects to dependent variables. Future research could also include interaction effects between these variables, as our initial hypothesis expects to exist. Also, surveys of other personnel within the dealership could inform many of the constructs and increase model robustness.

Finally, a larger endeavor that may result in more detailed findings would be the mixing of more quantitative data from the dealership's operation to have a more robust picture. Quantitative data typically will provide higher level, directional analysis on which areas can be affected to have general positive impacts. This can come from some of the areas that were surveyed, including marketing channels and mix, inventory details, salesperson performance and history, as well as many other factors based on available data. With this information, general practices can be adjusted to align with requirements to obtain desired performance levels. By combining these findings with those of surveys, a holistic view throughout both the hard and soft sides of the

operation can be examined to paint a more robust picture of the dealership's current state and what actions can be taken to improve in areas with opportunity.

CHAPTER 4 CONCLUSIONS OF THE DISSERTATION RESEARCH

Our research question asks what the true Key Performance Indicators are in addressing the interests of both automotive dealerships and manufacturers. Through this study of several dealerships across the United States, we have generated the following conclusions.

Implications for Dealerships

Parts of the process may not be profound to dealers, but the identification of individual KPDs to manage do provide the ability to focus attention and investments. The KPDs may also be a dissimilar metric, in some cases, to those typically utilized. Still, by finding shortfalls in key areas, dealers will know in which areas to focus their time and money to improve the operation. In order to achieve desired levels of KPOs, appropriate investments must be in place. In turn, these investments must be monitored and supported by dealership staff in order to ensure efficiency and expected benefits. Increasing expenditures only will not solve issues independently. Metrics of efficiency in how these metrics are handled are also important. It should be noted that there is a quality factors to many of the metrics discussed in addition to the qualitative analysis generated. Additional research could be completed through either obtaining more detailed data or through obtaining qualitative data through other means to provide more detailed actionable steps for dealers.

As a result of the mixed methods analysis, dealers can better understand which areas can be adjusted to improve operations in new vehicle sales and/or profitability. The challenge in many of these factors is that they affect both, often in opposing ways. Dealers must decide where they have the greatest opportunity for improvements via those factors that are significantly in a direction that does not assist in achieving their goals. Special attention should be given to importance of variables and their volume of impact in affecting KPOs.

Implications for Manufacturers

Manufacturers can benefit from this analysis through their interactions with dealerships. Field personnel, which visit dealerships regularly, can better understand what makes dealerships successful. As they consult with the dealers or recommend actions, they can feel additional comfort in that their suggestions are based on scientific analysis rather than casual observation. With an understanding of what drives results, manufacturers can also structure stair-step objective and bonus payments based on not only the high-level KPO outcomes, but also the detailed drivers that feed these KPOs. It may be easier to suggest that a dealer accept more inventory if that is an underperforming area causing a lower KPO performance.

While literature suggested that analysis of this type is possible using internal data for a single business, having the additional capability to compare like businesses within a brand and create robust benchmarks is critical for developing effective insights and recommendations. The value of having the detailed records for each subject dealership as well as the ability to benchmark many KPIs across the entire network of dealerships for a brand is something uncommon in automotive analyses due to data access, although it has been attempted in other industries.

From the manufacturer's perspective, the analysis sheds light on the discrepancies in operational characteristics in obtaining sales goals versus profitability. It's enlightening that, of the factors analyzed, there were none that impacted both new vehicle sales and profitability in the same direction and to the same volume. Manufacturer's must realize that it's challenging to act in opposing directions at the same time and that balance is needed to obtain dealership and manufacturer targets.

Limitations and Directions for Future Research

Through the experience of this research, new ideas were generated while data concerns were also created. Although we are confident in the analysis provided, there are many opportunities to expand this research with additional data set or data details. Additionally, there are several areas we could expand research to cover more of the automotive retail business.

A challenge throughout this process was in gathering valuable data to assess both dealers and manufacturers are highly protective of their data due to its sensitive nature. Collecting additional or more detailed data will, therefore, be challenging to obtain. Despite being able to point to certain areas that need attention, much more robust dealer data (potentially not gathered today) may be necessary for a more complete understanding and to include additional actionable areas. Following current trends, with more data being collected, this should become an easier task in the future; however, any inspiration to dealers or manufacturers to obtain this data sooner based upon value would be ideal.

Data that is provided also must be vetted thoroughly. Typically, the data endures a variety of checks before being shared in the form of composites or averages, but some financial accounts are only considered memo accounts in that they are not checked regularly for veracity. Additionally, other data sets may be incomplete due to conflicting objectives. For instance, a salesperson may choose not to enter a potential customer into the dealership's CRM system to increase their close rate (calculated by the number of sales made relative to the volume of customers they attempted to sell to). If a salesperson compensation goal is to achieve a defined close rate, they may choose not to add in new potential sales targets to increase this value.

Analysis could further be conducted on other brands in other geographies. It is known that certain variables, such as inventory, may have a different meaning in other regions of the globe.

In Germany, for instance, inventory distribution centers are utilized from which dealers can draw vehicles rather than dealers containing their complete inventory on or near their dealership lot. Other factors may show more or less significance based on complicating local factors.

For inventory analysis, we can access general volumes of inventory found in the assets section of the financial statement. Inventory details (by model, trim, with dates, etc.) would have been ideal for the analysis of Brand A, but were unavailable. Amongst the data we could obtain, we did have several valuable components that could be used in our evaluation of dealership operations. The inventory details (note that general inventory levels are included in the assets of the financial statement) are desired because they would provide another level of granular detail that would aid in the addition of pertinent variables as well as the action-ability of the analysis. Still, without them, we were still able to provide a high-level assessment of the dealership's inventory status.

Inventory present at dealerships and/or is posted on the dealership's website provides insight as to the current available selection to a customer. This will both drive traffic to the dealership as well as assist in closing a sale. Details by model, as available, can be aligned with model-level sales performance metrics for increased detail in opportunity identification. A financial statement will at least provide the overall inventory of a dealership in the assets section; however, greater detail of deliveries by the manufacturer to the dealer and the sales data would be of greater value, including vehicle detail information. Web scraping could be an additional route to obtain inventory data from dealership websites if the data is not otherwise available. Although aggregated, recommendations regarding overall inventory levels could still be provided.

One assumption of this analysis was the linear nature of the variables. In reality, they may show signs of curvilinear or asymptotical natures. This should be further examined, as it will impact the value and significance of certain recommendations.

To further this analysis to provide a complete view of the dealership, other dealership departments should be more thoroughly investigated against their own KPOs. From a organizational structure perspective, dealership departmental managers have objectives that relate to their portion of the business. It should, therefore, be analyzed to ensure that individual departments objectives provide benefit for the overall dealership rather than for the department in isolation. For example, activities in the service department may impact future repeat business in vehicle sales (Youngs, 2015). Activities could be structured to maximize service business at a cost to future vehicle sales. This may or not be desirable for the greater benefit of the holistic business.

KPO volume and breadth could be broadened to include concepts such as customer satisfaction and loyalty, which are both clearly desirable factors, but may be challenging to evaluate. Customer satisfaction surveys are distributed commonly for both sales and service; however, the provision of awards based on score can result in dealership personnel influencing results. Therefore, the existing survey methodology and results must be vetted before accepting results as impactful or descriptive of customer sentiment.

An additional step to this analysis would be to understand how to collect and utilize the measured impact of actions that are or are not taken. Dealers will choose to accept, partially accept, or reject data-based recommendations for a variety of reasons. Still, a relationship between action and output must be gathered in order to:

- Understand what recommendations were accurate or not accurate
- Identify what actions to recommend or avoid in similar situations

- Create a continuous loop of learning between action and future recommendation for subject dealers

We suspect which variance in what is actually chosen and enacted by dealerships. Knowledge of their detailed action step would be ideal to generate further analysis at more detailed levels.

Beyond individual dealer analyses to define driving factors, this analysis could best generate a learning loop that would consistently feed in new data over time as it arrives to be smarter, current, and automated. This study intends to examine dealers at a point in time; however, the market is ever changing and would require consistent analysis to identify timely actionable steps.

Once the findings have been validated through various brands, regions, etc., other elements including machine learning and time series analysis would be necessary to support the feedback loop cycle identified in Figure 4. It will be expensive and time consuming to reproduce this analysis process, so any means to automate would be very helpful. This will include the analysis of time-based data to assess the delay of impact from actions and to include new market situations (economic considerations, competitive actions, incentives, etc.). A robust process is possible but will require work well beyond the scope of this research.

In following our process through the phases necessary to gather qualitative data, we recognized challenges in each step. We completed the interview process over a short period of time, which was rewarded by having a timely basis for creating a survey relative to the metrics that drove their selection. In creating the survey, there were many options. Due to a large breadth of research on retail management from a qualitative psychological perspective, there were many constructs and survey questions from which to choose. Although we believe that we exemplified our interview results well through the survey, additional research could be conducted on other factors.

Additionally, factors could be categorized or ranked for importance. This could help dealerships understand which may provide the greatest impact relative to any underperformance in their KPOs. Relative to their KPOs, separate models may also be created to reflect the opposing impacts of the factors. If a dealership was below average for a particular KPO, focus on what drives these specific results could be modeled to inform the dealer of potential actions; however, it must not be assumed that other KPOs would remain constant during these changes, as we have seen that affecting one factor can positively impact one KPO while negatively impacting another.

Regarding the accumulation of survey responses, we found that aiming for a single brand, which seemed as if it would streamline the process at first, instead was very difficult to fulfill. Most manufacturers were uncomfortable surveying their entire dealership network. Instead, we needed to acquire individual dealerships that were willing to participate. On the positive side, this allowed for a mix of brands in our survey responses; however, focusing on one brand may have allowed for a more directed result. Also, dealerships are busy places; therefore, obtaining responses can be challenging. The challenge in obtaining a good response rate amongst dealers is to have some opportunity to directly enlighten them as to the research, rather than expecting survey completion for an unknown researcher. Ideally, we would have distributed the survey to a much larger group and obtained a larger volume of responses, considering multiple brands, attempting to cover complete brands, or surveying others in the dealership. If other personnel, such as salespeople, department leaders, service writers, technicians, or parts counter personnel were surveyed, other factors may also be incorporated into that research as factors affecting dealership or even departmental outcomes may be different relative to their roles. Still, an opportunity exists to research different activities and perceptions in the dealership from different angles and perspectives to more thoroughly address the complete dealership.

An additional complication in the automotive industry is the high turnover. A consistent person (the surveyed) to provide a viewpoint that has been applied and enacted within the dealership over a period of time that aligns with consumable quantitative information is required but may not be available at all dealership locations.

In the research itself, we focused on the direct effects to dependent variables. Future research could also include interaction effects between these variables, as our initial hypothesis expects to exist. Also, surveys of other personnel within the dealership could inform many of the constructs and increase model robustness.

Finally, a larger endeavor that may result in more detailed findings would be the mixing of more quantitative data from the dealership's operation to have a more robust picture. Quantitative data typically will provide higher level, directional analysis on which areas can be affected to have general positive impacts. This can come from some of the areas that were surveyed, including marketing channels and mix, inventory details, salesperson performance and history, as well as many other factors based on available data. With this information, general practices can be adjusted to align with requirements to obtain desired performance levels. By combining these findings with those of surveys, a holistic view throughout both the hard and soft sides of the operation can be examined to paint a more robust picture of the dealership's current state and what actions can be taken to improve in areas with opportunity.

APPENDIX A DEALERSHIP SALES AND SERVICE AGREEMENT

ARTICLE 9. REVIEW OF DEALER'S SALES PERFORMANCE

General Motors willingness to enter into this Agreement is based in part on Dealer's commitment to effectively sell and promote the purchase, lease and use of Products in Dealer's Area of Primary Responsibility. The success of General Motors and Dealer depends to a substantial degree on Dealer taking advantage of available sales opportunities.

Given this Dealer commitment, General Motors will provide Dealer with a written report at least annually pursuant to the procedures then in effect evaluating Dealer's sales performance. The report will compare Dealer's retail sales to retail sales opportunities by segment in Dealer's Area of Primary Responsibility or Area of Geographical Sales and Service Advantage, whichever is applicable. General Motors will provide a written explanation of the sales review process to Dealer. Satisfactory performance of Dealer's sales obligations under Article 5.1 requires Dealer to achieve a Retail Sales Index equal or greater than 100. If Dealer's Retail Sales Index is less than 100, Dealer's sales performance will be rated as provided in the General Motors Sales Evaluation process. General Motors expects Dealer to pursue available sales opportunities exceeding this standard. Additionally, General Motors expectations of its sales and registration performance for a Line-Make in a particular area may exceed this standard for individual dealer compliance.

In addition to the Retail Sales Index, General Motors will consider any other relevant factors in deciding whether to proceed under the provisions of Article 13.2 to address any failure by Dealer to adequately perform its sales responsibilities. General Motors will only pursue its rights under Article 13.2 to address any failure by Dealer to adequately perform its sales responsibilities if General Motors determines that Dealer has materially breached its sales performance obligations under this Dealer Agreement.

General Motors may modify the sales evaluation process from time to time and will consult

with the appropriate dealer council before adopting such modifications.

Source: SEC filings
(https://www.sec.gov/Archives/edgar/data/1019849/000095012400006964/k57699ex10-2_7.txt)

APPENDIX B INTERVIEW PROTOCOL

Interviews were conducted with dealership and manufacturer personnel across different brands and geographies. There provided the basis for constructs to research to generate the survey. Initially, structured interviews were conducted to determine which areas needed to be addressed in more detail. Once several of these were completed, a more structured interviewing process was followed, but additional comments are insights from those being surveyed were still allowed and recorded. The results of the interviews lead to researching areas where surveys responses were varied to identify literature-based survey questions. The interview questions are listed below.

GENERAL

1. What is the history of ownership? Are General Managers able to acquire % ownership? Up to what %?

2. How is marketing handled? What mediums are used and how much? Advertising? Direct contact/mail?

3. Who are your biggest competitors?

4. Does the amount of calculated 'opportunity' in your area matter? Do you believe your area of responsibility is correct? Is sales effectiveness important?

5. How do you use 'analytics'?

6. What KPIs do you think matter the most?

7. What is your favorite report/data to review or use to manage operations?

8. Do you participate in a 20 group?

9. What is the experience of management? How often do you meet with managers?

10. How good are the soft skills of your salespeople? Service writers? How is this managed?

11. What plans are there for change in management/ownership/facility actions?

12. Have there been any situations out of the dealership's control that may have affected performance?

13. What are your thoughts on your field rep?

14. What is the most important thing for employee loyalty?

15. In your opinion, was has the greatest impact on customer loyalty? What are the factors that cause this to succeed or fail?

16. How is the culture of the dealership managed? What activities influence it?

17. Did the Great Recession have any permanent impact on how you do business?

18. Is sales effectiveness important?

19. What areas do you need assistance in learning more about to improve your operation?

VARIABLE OPERATIONS

General

1. Is your focus on gross or throughput/market share?

2. What is good and bad about the current culture? What is done to manage/improve?

3. How strong is your sales to service handoff process?

4. What is your strategy to get customers into the dealership? Marketing efforts?

5. Is it important for your PMA to be brand effective?

Customer Interaction and Salespeople

6. How do you manage the customer sales experience? What processes do you have in place to ensure it is good?

7. What are your sales processes and how rigidly are they employed? What are the benefits/penalties for not following the system? Is the system followed in both New and Used Depts.?

8. What is the goal for selling vehicles (per salesperson)? Do the same people sell new and used vehicles?

9. Do you give prices over the phone?

10. How is your F&I department setup? Are there separate F&I people? Does your F&I system work?

11. Who speaks to the customer (and what is the process)?

Personnel

12. How are salespeople selected for hire? Buy or grow? Hire from outside or by recommendation of existing employees of the dealership?

13. What pay plans are used for salespeople? Do the salespeople receive incentives, part of the pack?

14. What are the most important factors for salespeople to be successful?

15. How do you retain good salespeople?

Used Vehicles

16. What is the dealership philosophy on Used Vehicles? Self-sufficient retail profit center or trade-in collector to support new vehicle sales?

17. How is the used vehicle operation run? Is the used vehicle operation used to support new vehicle sales or run as a separate and standalone operation?

Inventory Management

18. Do you have a separate person to manage inventories?

19. What process is used to select vehicles? Are there any vehicles you focus on?

20. What are your thoughts on the allocation process? Do you get the vehicles you want/need?

Internet Sales/Marketing

21. Do you have a separate lead department?

22. Do you provide prices over the phone?

23. What websites do you focus on to drive traffic?

FIXED OPERATIONS

1. What are the service department's hours?

2. What is the pay plan for service writers? Variable/fixed? Bonus? CSI?

3. How are technicians selected for a job? Do you use a team approach with service writers and techs?

4. How do you communicate information to the customer on the work/costs? What if the service writer is not available?

5. Does someone oversee appointments made for service? How? Is there a BDC?

6. Do you send service reminders when an appointment is made?

7. How are parts managed?

8. Do you use any processes to increase speed to provide parts to techs?

9. What is your fill rate?

10. Is there a limit/optimal number on how much a service writer can write? A tech service?

11. Walk us through what a customer experiences when they visit you for service…

12. How is the car delivered? Washed? What is the checkout process?

13. Can the customer schedule appointments through an on-line system? What are the advantages of making an appt?

APPENDIX C SOURCES OF CONSTRUCTS

From literature concepts in business functions that applied:

- Marketing (5)

- Selection (4) – Hansch (1998)

- Value Proposition (6)

- Selling Approach (4) – Andersson (2015)

From initial interviews (directly):

- Performance (4) – Wiklund & Shepherd (2003); had the quantiatitve variables but wanted to obtain the dealership's perspective also

- Variable Operations (11)

- Fixed Operations (9)

- External Culture (5)

- Internal Culture (3)

From literature (identified as topics from interviews) intending to evaluate:

1) Organizational Behaviors

- Organizational responsiveness (3) – Kohli (1993)

- Team spirit (7) – Kohli (1993)

- Organizational commitment (7) – Kohli (1993)

- Interdepartmental conflict (6) – Kohli (1993)

- Interdepartmental connectedness (6) – Kohli (1993)

2) Power and Decision Making

- Organizational structure (7) – Narver (2004)

- Centralization (3) – Kohli (1993)

- Participative decision making (10) – Hurley Hult (1998)

- Power sharing (3) – Hurley Hult (1998)

3) Dealership Management

- Risk propensity (5) – Sitkin (1995)

- Responsive market orientation (6) – Narver (2004)

- Competitive industry (6) – Kohli (1993)

4) Dealership Development

- Innovativeness (5) – Hurley Hult (1998); Nordqvist (2009)

- Learning (4) – Hurley Hult (1998)

APPENDIX D SURVEY

Scale and scale designations:

- 1 = strongly disagree

- 2 = disagree

- 3 = neither agree or disagree

- 4 = agree

- 5 = strongly agree

- Not sure

Welcome potential survey participant,

My name is Mark Colosimo and I am a PhD Candidate in the Industrial and Systems Engineering Department at Wayne State University. You are being asked to participate in this survey because you are a professional in the automotive industry and have experience in management at a dealership. This survey is part of my dissertation research, and I hope that the results will provide you high level insights on the significant factors at play in dealership operations. Your responses will be kept strictly confidential and there will be no connection made to you in the results or future publications. Additionally, the survey should not require any more than 15 minutes and is not expected to contain any risk or inconvenience for you. Furthermore, your participation is strictly voluntary and you may choose to withdraw from the survey at any time. As a participant in the survey, you will have access to aggregated information gathered, including a summarized copy of the results. I believe the results will provide high level insights into the significant factors at play in dealership operations. This information should give you a glimpse into the operations of multiple dealerships, both same and competitive makes. If you should have any questions or comments, please do not hesitate to contact me: Mark Colosimo,

PhD Candidate Industrial and Systems Engineering Wayne State University MColosimo@wayne.edu   Or my faculty advisor: Ratna Babu Chinnam Professor, Graduate Chair, Founding Director of the Global Executive PhD Track (313) 577-4846 (phone) Ratna.Chinnam@wayne.edu   Finally, by clicking the "Next" button below and starting the survey, you are verifying that you have read the explanation of the study, and that you agree to participate.   Thank you for your participation!

The following section includes questions about your dealership and your general experience.

Which of the following best describes your dealership location?

❍ Urban

❍ Suburban

❍ Rural

For how many years have you been employed at your current dealership?

For how many years have you worked at an automotive dealership?

How many years has it been since the franchise you work in was first appointed?

Which of the following best describes your role in the dealership?

❍ Owner/operator

❍ General Manager

❍ Sales or Service Manager

❍ Other Manager

❍ Other

The following section includes questions about traditional dealership activities. For all questions, please provide responses based upon the most recent experiences within the dealership.

Marketing

- Our marketing effort is effective in driving customers to our dealership

- I know my manufacturer sales objective

- The dealership generates sufficient traffic, Internet or showroom, to hit my manufacturer's sales objective

- We utilize a Business Development Center (BDC) to generate traffic through outbound calls

- We focus our marketing efforts in our Primary Market Area

Selection

- Our inventory selection is based on our customer's requests or desires

- We spend substantial time selecting specific vehicles to order

- We are easily able to trade for a needed vehicle from another dealership

- Our inventory levels are competitive as compared to nearby same-brand dealerships

Value Proposition

- Our new vehicle prices, after applying all incentives, are very competitive

- We keep tabs on all competitor pricing regularly to ensure that we stay competitive

- We heavily focus on F&I as a way to generate profit on the deal

- Hitting manufacturer sales objectives are pivotal to the new vehicle department's profitability

- Our internal processes are structured to maximize gross

- Our pay plans and personal incentives are aligned with sales goals and customer satisfaction

Selling Approach

- We have enough salespeople relative to our customer traffic

- We have a defined process/system to assign all Internet leads, ups, and incoming phone calls

- Our salespeople are qualified, knowledgeable, and experienced to handle customer questions and requests

- Our salespeople are skilled at closing deals

The following section includes questions about your opinions on operations.

Variable Operations

- I believe in utilizing data and data-based reports to make decisions about operating my dealership

- I believe my dealership is running optimally

- I believe my dealership is above average in profitability as compared to other same brand dealers

- I believe profits are more important than sales

- The top focus of my efforts is to obtain my manufacturer-provided sales target

- Sales effectiveness or our sales performance metric is an accurate measure of my new vehicle sales performance

- My sales expectation from the manufacturer is accurate

- My biggest competitors are other same-brand dealerships

- My sales field representative from the brand provides useful information to help me run my dealership

- I find value in 20 groups

- I would recommend working at this dealership to my friends and colleagues

Performance

- I believe my NET PROFIT has grown faster than other same-brand dealerships over the past three years

- I believe my dealership's FRANCHISE VALUE has grown faster than other same-brand dealerships over the past three years

- I believe my CASH FLOW situation has been much better than other same-brand dealerships over the past three years

- I believe my NEW VEHICLE SALES improvements are much better than other same-brand dealerships over the past three years

Fixed Operations

- We use a consistent sales-to-service hand-off process

- We utilize a Business Development Center (BDC) to manage service appointments

- Our sales-to-service hand-off process includes the scheduling of the first appointment

- Our service advisors complete a structured walk-around process in the service drive

- We contact the customer to let them know work has begun on their vehicle

- The dealership utilizes text messaging for communications to customers

- We employ a structured, effective service loyalty program

- We provide free pickup and delivery of vehicles for service

- There is a known impact to techs that do not service vehicles right the first time

External Culture

- We conduct customer events to provide low stress or informative activities within the dealership

- We encourage our sales team and service writers to up-sell customers

- We consistently and often interact with customers

- We are willing to do whatever it takes to ensure that customers are satisfied, even if it means losing money on a deal or service event

- Customers value our service more than anything else in the dealership

Internal Culture

- I consistently and often interact with dealership personnel

- Dealership employees know that I personally care about them

- The dealership provides many opportunities for employees to interact in a relaxed atmosphere

The following section includes questions about your dealership's organizational behaviors

Organizational Responsiveness

- It takes us a short time to decide how to respond to same or other brand competitor's price changes

- We are fast to respond to changes in our customer's product and service needs

- If a major same or other brand competitor launched a campaign, we respond immediately

Team Spirit

- People in this dealership are genuinely concerned about the needs and problems of each other

- A team spirit pervades all ranks of the dealership

- Working for this dealership is like being part of a big family

- People in this dealership feel emotionally attached to each other

- People in this dealership feel like they are "in it together"

- The dealership lacks a team spirit

- People in this dealership view themselves as independent individuals who have to tolerate others around them

Organizational Commitment

- Employees feel as though their future is intimately linked to that of this dealership

- Employees would be happy to make personal sacrifices if it were important for the dealership's well being

- The bonds between this dealership and its employees are weak

- In general, employees are proud to work for this dealership

- Employees often go above and beyond the call of duty to ensure this dealership's well being

- Our people have little or no commitment to this dealership

- It is clear that employees are fond of this dealership

Interdepartmental Conflict

- Most departments in this dealership get along with each other

- When members of several departments get together, tensions frequently run high

- People in one department generally dislike interacting with those from other departments

- Employees from different departments feel that the goals of their respective departments are in harmony with each other

- Protecting one's departmental turf is considered a way of life in this dealership

- There is little or no interdepartmental conflict in this dealership

Interdepartmental Connectedness

- In this dealership, it is easy to talk with virtually anyone you need to, regardless of rank or position

- There is ample opportunity for informal "hall talk" among individuals from different departments of this dealership

- In this dealership, employees from different departments feel comfortable calling each other when the need arises

- Managers here discourage employees from discussing work-related matters with those who are not their immediate supervisors or subordinates

- People around here are quite accessible to those in other departments

- Communications from one department to another are expected to be routed through "proper channels"

The following section includes questions about decision making in your dealership.

Organizational Structure

- When employees have a problem, they are supposed to go to the same person for an answer

- There is little action taken until a supervisor approves the decision

- Employees are discouraged from independent decision-making

- Going through proper communication channels is stressed constantly

- Employees have to ask their boss before they do almost anything

- Any decision that employees make has to have their boss' approval

- In this organization, everyone has a specific job to do

Centralization

- There can be little action taken here until a supervisor approves a decision

- A person who wants to make his own decision would be quickly discouraged here

- Even small matters have to be referred to someone higher up for a final answer

Participative Decision Making

- Decision making is delegated to the lowest possible level of authority

- Individuals involved in implementing decisions have a say in making the decisions

- Decisions are made on the basis of research, data, and technical criteria, as opposed to political concerns

- Decisions are based on open discussion and debate of facts

- Once a decision is made, management communicates the results and rationale to employees

- We depend on data to support our decision making (the work practices and environment of the entire company)

- We have the data we need to make decisions

- The amount of data I have is overwhelming

- I use a limited amount of the data available to me to make decisions

- I am comfortable using the data I use to make informed decisions

Power Sharing

- People are willing to share their power - there is an atmosphere of working together

- We talk about teamwork and sharing, but people quietly hold on to their power and authority

- Authority is highly centralized; only a handful at the top have it

The following section includes questions about the management of your dealership.

Risk Propensity

- Top management in this dealership believe that higher financial risks are worth taking for higher rewards

- Top management in this dealership often take big financial risks

- Top management here encourage the development of innovative marketing strategies, knowing well that some will fail

- Top managers in this dealership like to "play it safe"

- Top managers around here like to implement plans only if they are very certain that they will work

Responsive Market Orientation

- Our strategy for competitive advantage is based on our understanding of customers' needs

- Our dealership's business objectives are driven by customer satisfaction

- We constantly monitor our level of commitment and orientation to serving customer's needs

- We are more customer focused than our competitors

- We freely communicate information about our successful and unsuccessful customer experiences across all business functions

- Data on customer satisfaction are disseminated at all levels in this dealership on a regular basis

Competitive Industry

- Competition in our market is cutthroat

- There are many "promotion wars" in our market

- Anything that one competitor can offer, others can match readily

- Price competition is a hallmark of our industry

- One hears of a new competitive move almost every day

- Our competitors are relatively weak

This section includes questions about improvements and development in your dealership.

Innovativeness

- Innovation, based on research results, is readily accepted by management

- Management actively seeks innovative ideas

- Innovation is readily accepted

- Employees are penalized for trying new ideas that don't work

- Innovation is perceived as too risky and is resisted

Learning

- This dealership provides opportunities for individual development other than formal training (e.g. work assignments and job rotation)

- This dealership encourages managers to attend formal development activities such as training, professional seminars, symposia, etc.

- There are people at this dealership who provide guidance and counsel regarding one's career

- Career management is a shared responsibility of both employee and the manager

This last question is intended to understand your overall feelings about your dealership in one word. What one word best describes your dealership?

APPENDIX E CONSTRUCTS AND FACTOR LOADINGS

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	23.306	18.066	18.066	18.281	14.172	14.172
2	15.060	11.674	29.741	14.542	11.273	25.445
3	12.539	9.720	39.461	11.683	9.057	34.501
4	10.871	8.427	47.888	11.395	8.833	43.335
5	10.002	7.754	55.642	11.086	8.594	51.928
6	9.332	7.234	62.876	10.673	8.274	60.202
7	8.880	6.884	69.760	10.500	8.139	68.341
8	8.496	6.586	76.346	10.326	8.004	76.346

INTERNAL CULTURE - 1	Q16_6 Team Spirit - The dealership lacks a team spirit	-.826
	Q22_2 Power Sharing - We talk about teamwork and sharing, but people quietly hold on to their power and authority	-.804
	Q11_9 Fixed Operations - There is a known impact to techs that do not service vehicles right the first time	.767
	Q16_1 Team Spirit - People in this dealership are genuinely concerned about the needs and problems of each other	.763
	Q16_2 Team Spirit - A team spirit pervades all ranks of the dealership	.759
	Q13_2 Internal Culture - Dealership employees know that I personally care about them	.745
	Q5_6 Value Proposition - Our pay plans and personal incentives are aligned with sales goals and customer satisfaction	.725
	Q17_7 Organizational Commitment - It is clear that employees are fond of this dealership	.720
	Q16_3 Team Spirit - Working for this dealership is like being part of a big family	.718
	Q16_5 Team Spirit - People in this dealership feel like they are "in it together"	.716
	Q22_3 Power Sharing - Authority is highly centralized; only a handful at the top have it	-.707
	Q17_4 Organizational Commitment - In general, employees are proud to work for this dealership	.672
	Q18_2 Interdepartmental Conflict - When members of several departments get together, tensions frequently run high	-.633
	Q22_1 Power Sharing - People are willing to share their power - there is an atmosphere of working together	.628
	Q21_2 Participative Decision Making - Individuals involved in implementing decisions have a say in making the decisions	.627
	Q17_6 Organizational Commitment - Our people have little or no commitment to this dealership	-.625

DEALERSHIP OPERATIONAL PROCESSES - 2	Q19_1 Interdepartmental Connectedness - In this dealership, it is easy to talk with virtually anyone you need to, regardless of rank or position	-.880
	Q23_5 Risk Propensity - Top managers around here like to implement plans only if they are very certain that they will work	.777
	Q27_4 Innovativeness - Employees are penalized for trying new ideas that don't work	.758
	Q23_4 Risk Propensity - Top managers in this dealership like to "play it safe"	.736
	Q18_4 Interdepartmental Conflict - Employees from different departments feel that the goals of their respective departments are in harmony with each other	-.735
	Q19_3 Interdepartmental Connectedness - In this dealership, employees from different departments feel comfortable calling each other when the need arises	-.728
	Q19_2 Interdepartmental Connectedness - There is ample opportunity for informal "hall talk" among individuals from different departments of this dealership	-.724
	Q15_1 Organizational Responsiveness - It takes us a short time to decide how to respond to same or other brand competitor's price changes	-.681
	Q11_6 Fixed Operations - The dealership utilizes text messaging for communications to customers	.677
	Q19_5 Interdepartmental Connectedness - People around here are quite accessible to those in other departments	-.670
	Q8_3 Variable Operations - I believe my dealership is above average in profitability as compared to other same brand dealers	.618
	Q11_7 Fixed Operations - We employ a structured, effective service loyalty program	.601

Factor	Item	1	2	3	4
DECISION MAKING - 3	Q8_10 Variable Operations - I find value in 20 groups				-.857
	Q9_3 Performance - I believe my CASH FLOW situation has been much better than other same-brand dealerships over the past three years				.821
	Q21_5 Participative Decision Making - Once a decision is made, management communicates the results and rationale to employees				.694
	Q24_6 Responsive Market Orientation - Data on customer satisfaction are disseminated at all levels in this dealership on a regular basis				.632
	Q21_8 Participative Decision Making - The amount of data I have is overwhelming				-.616
	Q28_6 Organizational Structure - Any decision that employees make has to have their boss' approval				-.611
	Q2_2 Selection - We spend substantial time selecting specific vehicles to order				.607
INTERNAL COMMUNICATION - 4	Q28_5 Organizational Structure - Employees have to ask their boss before they do almost anything				.709
	Q20_3 Centralization - Even small matters have to be referred to someone higher up for a final answer				.697
	Q24_3 Responsive Market Orientation - We constantly monitor our level of commitment and orientation to serving customer's needs				-.685
	Q11_2 Fixed Operations - We utilize a Business Development Center (BDC) to manage service appointments				.669
	Q28_3 Organizational Structure - Employees are discouraged from independent decision-making				.665
	Q17_3 Organizational Commitment - The bonds between this dealership and its employees are weak	-.625			.644
	Q20_2 Centralization - A person who wants to make his own decision would be quickly discouraged here				.637
	Q20_1 Centralization - There can be little action taken here until a supervisor approves a decision				.610
	Q21_4 Participative Decision Making - Decisions are based on open discussion and debate of facts				-.601

CUSTOMER ORIENTATION - 5	Q11_1 Fixed Operations - We use a consistent sales-to-service hand-off process							.772
	Q28_2 Organizational Structure - There is little action taken until a supervisor approves the decision							.761
	Q12_4 External Culture - We are willing to do whatever it takes to ensure that customers are satisfied, even if it means losing money on a deal or service event							.687
	Q12_5 External Culture - Customers value our service more than anything else in the dealership						.652	.653
	Q8_1 Variable Operations - I believe in utilizing data and data-based reports to make decisions about operating my dealership							.626
	Q5_2 Value Proposition - We keep tabs on all competitor pricing regularly to ensure that we stay competitive							-.600

DEALERSHIP MANAGEMENT - 6	Q25_3 Competitive Industry - Anything that one competitor can offer, others can match readily							.829
	Q8_7 Variable Operations - My sales expectation from the manufacturer is accurate							.766
	Q21_7 Participative Decision Making - We have the data we need to make decisions							.757
	Q21_9 Participative Decision Making - I use a limited amount of the data available to me to make decisions							-.728
	Q26_4 Learning - Career management is a shared responsibility of both employee and the manager							-.636
	Q6_4 Selling Approach - Our salespeople are skilled at closing deals							-.622

RISK PROPENSITY or INNOVATION - 7	Q27_1 Innovativeness - Innovation, based on research results, is readily accepted by management							.887
	Q27_3 Innovativeness - Innovation is readily accepted							.874
	Q27_2 Innovativeness - Management actively seeks innovative ideas							.800
	Q8_2 Variable Operations - I believe my dealership is running optimally							.776
	Q27_5 Innovativeness - Innovation is perceived as too risky and is resisted							-.745
	Q11_4 Fixed Operations - Our service advisors complete a structured walk-around process in the service drive							-.659
	Q11_8 Fixed Operations - We provide free pickup and delivery of vehicles for service							.655
	Q11_3 Fixed Operations - Our sales-to-service hand-off process includes the scheduling of the first appointment							.635
	Q8_9 Variable Operations - My sales field representative from the brand provides useful information to help me run my dealership							-.623
	Q28_1 Organizational Structure - When employees have a problem, they are supposed to go to the same person for an answer							.603

SALES AND MARKETING FOCUS - 8	Q2_3 Selection - We are easily able to trade for a needed vehicle from another dealership								.783
	Q19_4 Interdepartmental Connectedness - Managers here discourage employees from discussing work-related matters with those who are not their immediate supervisors or subordinates								-.688
	Q1_2 Marketing - I know my manufacturer sales objective								.672
	Q1_5 Marketing - We focus our marketing efforts in our Primary Market Area								-.628
	Q5_5 Value Proposition - Our internal processes are structured to maximize gross								.624

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ABSTRACT

A DATA-DRIVEN AND QUALITATIVE ANALYSIS OF AUTOMOTIVE RETAIL OPERATIONS MANAGMENT

by

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Major: Industrial Engineering

Degree: Doctor of Philosophy

The importance of effective retail operations management has never been more significant. Our research aims to expand the understanding for efficiency and dynamics of franchise outlets within retail networks with a focus on sales performance and profitability. The focus and contribution is the development of an actionable data analytics driven process by which automotive dealerships (retail outlets) can be analyzed to identify areas of opportunity for improvement. In general, automotive dealerships aim to sell product to make a profit, the manufacturer of the product/brand desires to sell vehicles to make a profit, and the customer desires to find a suitable transportation option that provides most utility. While substantial volumes of quantitative data exists about the details of operations and automotive dealership transactions, similar Key Performance Indicators (KPIs) are typically generated and reviewed in making decisions about operational change. We will focus on the actions (inputs) that relate to outcomes (outputs) at the dealership level, including factors relating to all three stakeholders and their interactions, which are anticipated to be relevant. Input variables and factors relating to the business outcomes of the stakeholders involved will be the desired target for finding synergies.

To address these concerns, we first developed an analytical process for providing recommendations to improve dealership efficiency and performance through quantitative data and demonstrated the effectiveness of the proposed process using a real-world dealership case study. With a desire to go beyond available datasets, there is a need to dig deeper into operations through aligning quantitative Key Performance Outcomes (KPOs) with qualitative survey analysis of dealership operators. This provides a detailed view of analysis not previously available, which should encourage dealerships to make change. Through the utilization of an interview process, with a focus on variance between dealerships, in creating a survey distributed to dealership management, an assessment of principal factors has been created. The assessment of these factors will help dealerships and manufacturers understand which activities, perceptions, and atmospheres have the greatest positive impact on new vehicle sales and profitability.

AUTOBIOGRAPHICAL STATEMENT

Mark Colosimo has lived in the Detroit metropolitan area his whole life. He graduated from Sterling Christian High School in 1993 and went on to obtain his Bachelor's degree in Chemical Engineering (BSE ChE) from the University of Michigan by 1997. He returned to school in 2000 and completed two master's degrees, in business administration (MBA) and industrial engineering (MSE), also from the University of Michigan. Through the educational process, he joined Urban Science Applications, Inc. in 2001, a sales and marketing consulting company with automotive clients spanning across the globe. He began his career completing market studies for General Motors then moved on to the Analytical Services team, where he testified as an expert witness in dealership network litigation and supported and managed litigation activity. He eventually moved into practice development and management, where solutions to client's mission critical problems were hypothesized, researched, and generated.

Mark now serves as the Global Director of Data and Analytics for the company, desiring to use the available data to provide value to clients through scientific, analytical problem-solving processes based on real-world experience. He lives in Northville, Michigan with his wife, Nancy, and two children, Nathan and Ciara.