Sales Analytics and Big Data Developments Needed Now to Address Practitioner-Identified Emerging Biopharmaceutical Sales Force Strategic and Operational Issues

George A. Chressanthis, Ph.D., Principal Scientist, Axtria and Murali Mantrala, Ph.D., Sam M. Walton Distinguished Professor of Marketing, University of Missouri, Columbia

Abstract: The biopharmaceutical industry is undergoing significant changes. Most importantly, there is a shift toward greater company R&D focus on and launching of specialty medicines that use new scientific drug delivery systems, e.g., large molecules as opposed to traditional small molecule drugs, catering to smaller patient populations. While this shift solves some problems pharma has been facing, it has raised a whole new set of questions of sales and marketing, not yet addressed by academic and practitioner marketing science research. This paper focuses specifically on developments in data analytics needed now for practitioners to solve future sales force strategic and operational issues. As a starting point, the paper presents results of a survey of industry practitioners about emerging sales force science issues conducted in Spring 2015 with the help of the Pharmaceutical Management Science Association. The survey asked respondents for their perspectives on five areas of current and emerging sales force science issues: sales force strategy, sales force operations, sales analytics, big data, and environmental trend changes. The survey revealed there are big differences in the issues that are perceived as emerging and those currently preoccupying practitioners, indicating major changes in the data and analytics methods currently used are necessary to solve future sales force strategy and operational problems. A case study of this problem involves the analytics and data involved to look at the effect of detailing on drug utilization and health/economic outcomes for patients with newly diagnosed metastatic breast, lung, and colorectal cancers. Implications and challenges for the successful conduct of commercial analytics are provided based on the proposed conceptual framework.

Keywords: Biopharmaceuticals; Emerging sales force science issues; Sales force strategy, operations, analytics, big data, and environmental trends; Detailing analysis on drugs for metastatic cancer patients

1. Introduction and Industry Shift to Specialty Medicines

The growing shift to specialty medicines in the US pharma market is well documented.[1] Pricing issues are becoming more common and controversial, with questions raised about the sustainability of increasing sales revenue mainly through pricing.[2-3] One observes a rise of performance-based managed care contracts requiring pharma companies to demonstrate drug value in producing health outcomes and/or health economic benefits.[4] Providers are already adopting guidelines and treatment pathways that are driven by evidence of outcomes and value. These trends are raising new and challenging strategic and operational issues for biopharmaceutical sales forces. This paper focuses on how pharma sales data analytics need to adapt to address these issues.

We emphasize here that companies must rethink their commercial model design, supporting analytics, and data management infrastructure based on new industry dynamics. Future project/product portfolios will be

increasingly populated with expensive large molecule/biologic specialty medicines. There will be greater focus on personalized targeted therapies and significant concerns over patient access/affordability. Accordingly, the commercial model design, nature, and role of the pharma sales force must change.

2. Insights from Previous Published Research and Survey Work

Currently, the academic marketing science literature offers little insight into the kind of biopharma commercial model design now needed. Instead, extant literature focuses more on a tactical non-strategic economic model framework, emphasizing optimization of the promotion mix with the objective of increasing physician prescriptions.[5] Previously published academic works also tend to overlook the perspectives of industry practitioners as seen in this referenced review.[6]

This paper offers some insights into emerging biopharmaceutical sales force science and big data developments based on an exploratory survey of PMSA members working at biopharma firms and consulting organizations.[7] This survey is different from previous ones in the academic literature in that that it focused on biopharmaceutical sales force issues (as opposed to more general industry and broader sales & marketing perspectives), and surveys industry practitioners as opposed to academics. The survey ran from April 29, 2015 to May 22, 2015 and was sent to current members and email addresses from the Pharmaceutical Management Science Association (PMSA). The survey was also sent to members of the Pharmaceutical Marketing Research Group (PMRG). A total of 89 respondents started the survey, with 54 completing the survey.

Respondent attribute information was not broken down into finer details so as not to reveal the identities of individuals or their companies. Three tables were provided to manuscript reviewers showing: 1) profile of survey respondents, 2) respondent-company attributes (both showing broad and representative coverage of the biopharmaceutical industry, and 3) distribution of the areas of expertise across respondents from consulting firms in our sample. To conserve space, these tables are not provided here but are available upon request.

Respondents were asked to list the top 2 current and emerging issues in sales force strategy and operations per area. Table 1 notes clear differences in current and emerging issues:

1. concomitant changes in analytics and big data needed (e.g., medical claims, EMR, patient-level data, digital/social media channels) to support new solutions based on health outcomes.

2. rapidly evolving environmental trends (e.g., growing influence from IDNs, ACOs, increasing consolidation between providers and payers, increasing sales rep access restrictions to physicians).

Pharma commercial analytics are currently seen mainly as a means to support tactical execution of traditional sales and marketing channels to achieve short term financial goals, rather than as a strategic asset as a key source for competitive differentiation to sustain long term industry advantage.[5] Instead, biopharma companies need to pursue a strategic open systems based approach across the entire pharmaceutical value chain throughout the project/drug lifecycle.[5] This means pharma companies will be increasingly called upon to demonstrate value through significant

Table 1: Exploratory Survey Results on the Top 2 Identified Current vs. Emerging Issues for Each Biopharmaceutical Industry Sales Force Science Area[7]

Current Issues	Emerging Issues
1. Sales Force Strategy	
21.4% Targeting quality	26.2% Institutional sales forces, especially for IDNs and ACOs
19.0% Financial outcomes	16.7% Outcomes and value-based messaging
2. Sales Force Operations	
21.2% Incentive compensation	26.2% Flexible sales force deployment
16.7% Call planning	16.7% Incentive compensation
3. Sales Force Analytics	
33.3% Promotion response and ROI analytics (all channels)	16.7% Health outcomes and cost-effectiveness analyses
11.9% Marketing-mix optimization	14.3% Sales analytics that drive sales force strategy and operation outcomes
4. Big Data	
21.4% All Rx-based databases	16.7% All Rx-based databases (physician-level and product-level)
14.3% LRx (patient-level) data	16.7% Activity data from social media and digital channels
	16.7% Electronic medical records (EMR)
5. Environmental Changes	
19.0% Increasing payer influence on physician prescribing	16.7% Increased consolidation between provider and payer
14.3% Increasing sales representative access restrictions	14.3% Increasing sales representative access restrictions
	14.3% Changes in payer influence on physician prescribing

Top 2 identified *current* (0 to 2 years out) vs. *emerging* issues (> 2 years out) for each biopharmaceutical industry sales force science area and by % of total responses.

improvements in health outcomes and reductions in treatment costs. This latter viewpoint is consistent with a newer perspective that research-based biopharma companies must think differently and apply tools beyond traditional boundaries, while engaging in interdisciplinary-type analyses to solve increasingly more complex business problems.[8]

3. Foundations Governing the Future Role and Effects of Sales and Marketing

Models must begin to connect the nature of sales rep-physician interactions on a different set of metrics ultimately tied to improvements in health outcomes, drug and total treatment costs, and cost effectiveness. Three underlying theoretical frameworks provide the foundation

for analyzing the effect of sales rep-physician interactions:

1. Pharma sales & marketing will be designed and executed as "*informative*", not "persuasive".[9]

2. The growth of more complex specialty medicines implies more weight will be placed on the quality of supporting *scientific evidence* by healthcare practitioners and payers involved in drug adoption, formulary coverage, patient access, compliance, and adherence.[10-12]

3. Variations in the diffusion of medical information create patterns of variable medical care use, which in turn, results in variations in health outcomes, expenditures (drug and treatment spending), and cost-effectiveness.[13] This fundamentally alters the commercial analytics approach. The current approach emphasizes assessing physician prescription (Rx) response to sales & marketing. The future approach must demonstrate how such channels impact health/economic outcomes. This means building new analytical capabilities based more on real world evidence (RWE) and health/economic outcomes research (HEOR) models. This is necessary to support decisions on managed care performance-based outcomes contracts on formulary coverage and patient access, and provider adoption of guidelines on treatment pathways.

4. Case Study Example in the Therapy Area of Anti-Cancer Drugs

The evolutionary role of detailing is highlighted when looking at scientifically-driven personally-targeted specialized anti-cancer drugs. Focus is on the sales force science and big data required to relate detailing and other commercial activities to variations in drug utilization and in turn health/economic outcomes for newly diagnosed metastatic patients with breast (BC), colorectal (CRC), and non-small cell lung cancer (NSCLC). There are a number of reasons for choosing these anti-cancer drugs as a case study:

1. The trend of increasing sales rep access restrictions to oncologists has been well documented[14] and was identified in the practitioner survey as an important environmental change. Oncology sales reps are also very experienced and knowledgeable, thus access restrictions to these individuals means potentially missing out on valuable information.

2. Anti-cancer drugs represent the second largest therapy class by US spending and the largest therapy area by the percentage of new drug launches.[1]

3. Keeping current with the latest information developments on anti-cancer drug R&D, clinical trials, and new novel therapies (e.g., personalized medicines, targeted cancer therapies)[15-16] by medical oncologists is challenging given the high involvement of biopharma companies.

4. A medical oncologist who falls behind on the latest anti-cancer drug developments means dire consequences and higher risks to patients given the lethality of these diseases.

5. The pricing of anti-cancer drugs and assessing the value of cancer treatment options are not only significant commercial challenges but also key public pharmaceutical policy concerns.[17-18]

A conceptual framework on how to estimate the relationship between detailing and health/economic outcomes has already been publicly presented and researched for viability.[19-20]

Figure 1: Framework How Geographic Variations in Sales Rep Detailing Affect Drug Utilization, and Health/Economic Outcomes for Newly Diagnosed BC, CRC, and NSCLC Patients[13,19]

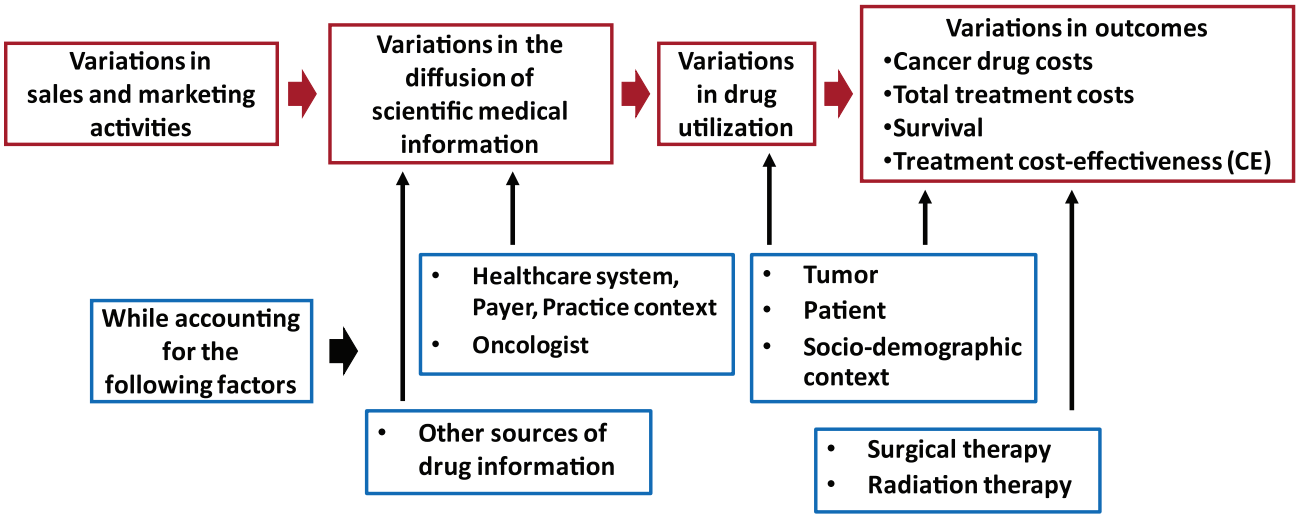


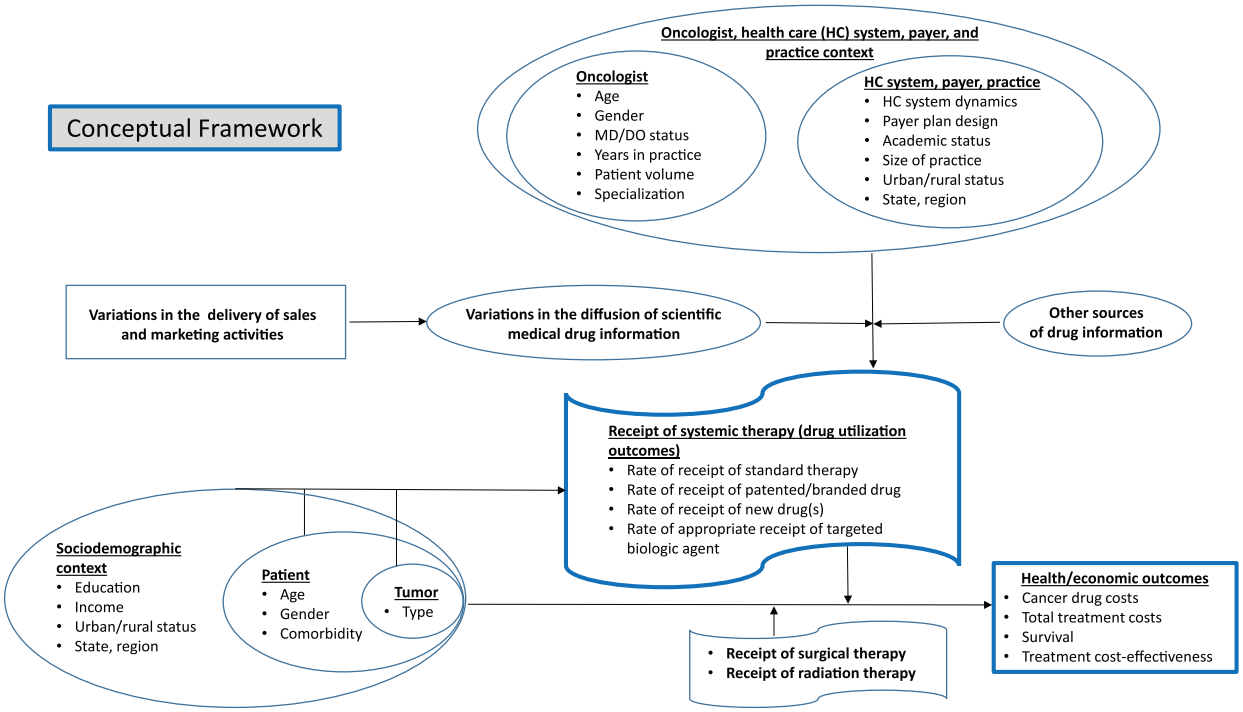
Figure 1 shows how variations in sales and marketing activity are related to outcomes along with factors impacting this chain.

Figure 2 provides a more detailed conceptual framework of key relationships and specific data elements needed to measure each link in this chain for each type of metastatic cancer patient. The data elements and physician identifier codes for data bridging needed to measure statistically key relationships are generally available to biopharmaceutical companies through an array of secondary data sources and contracts. Lastly, data from qualitative market research will be needed to determine the range of drug information sources and their weight of influence when oncologists make drug utilization decisions.

The basic modeling approaches required to test the significance and measure the effect of key relationships shown in Figure 2 is based on prior research work.[20] Important to note are the applications of research methods more common to the analysis of RWE and HEOR models than traditional econometric methods on Rx-physician sales-response designs. The effect of detailing on drug utilization outcomes separately for each tumor type can be estimated, controlling for important factors that may confound this relationship, including those on the oncologist, health care system, payer, and practice, patient and tumor characteristics, location of treatment, time of diagnosis, and non-detailing commercial activities. Generalized Propensity Score (GPS) based weighting with bootstrap standard errors can be used to estimate the marginal effect of detailing on drug utilization, *ceteris paribus*. Full discussions of this estimation technique advantages, adjustments to account for confounding factors, sufficient covariate overlap, and misspecification concerns are well known in practice.[21-24]

The association of detailing to cancer drug costs and total cancer treatment costs per cancer site uses two methods: Kaplan-Meier Sample Average (KMSA) method[25] and an approach described by Miller & Halpern,

Figure 2: Conceptual Framework How Variations in Sales Rep Detailing Affect Drug Utilization and Health/Economic Outcomes for Newly Diagnosed BC, CRC, and NSCLC Patients[19-20]



which is similar to the Cox proportional hazard model.[26] Analyses on total treatment costs and overall survival per average patient per detailing segment category can be combined per cancer site to determine incremental effects of changes in detailing on cost-effectiveness using statistical procedures previously noted.

Estimating the effects of detailing on health/economic outcomes are not without challenges, a non-exhaustive list being:

1. The effect of detailing may be tempered by sales rep access restrictions, which in turn, limits the dissemination of scientific information to physicians. Prior research work can be applied on the modeling and estimation approaches on the determination of industry sales rep access restrictions and their effect on physician prescribing using data defined in the conceptual framework.[27-28]

2. The data needed to perform the preceding described analyses is substantially larger, potentially more expensive to acquire, and less comprehensive than traditionally-applied databases. Patient-level claims data is not as complete as existing Rx-level and even anonymized patient-level databases (APLD). Claims data is not for example IC-grade. Companies would have difficulties acquiring a national footprint of data in order to conduct various strategic and operational sales force processes, especially for diseases with smaller patient populations.

3. Questions may exist on the ability to merge effectively this larger array of databases, even

with available bridging components such as physician identifying codes.

4. Companies need to adjust their thinking of segmentation analysis, which currently is focused on payers and physician attitudes/behaviors to addressing patient attributes and characteristics of their disease state, and healthcare systems.

5. Current analysis of detailing is on the effect from added frequency rather than call quality and the nature of scientific evidence delivered. This means metrics on scientific evidence need to be devised and tested. Prior research work can be a guide here.[10-12]

The above challenges, while daunting, are not insurmountable and should not stop company efforts to connect sales and marketing activities to the ultimate value goal of health/economic outcomes given changes in key environmental trends as identified by survey participants.

5. Implications for Sales Force Strategy, Operations, Data Development, and Analytics

The preceding data and analytics sections chart a different course than current promotion-response econometric-modeling practices for sales force strategy, operations, data development, and analytics. Current commercial analytics is frequency-based where the end point is measuring drug utilization. Sales operations processes are geared to support this strategic approach to facilitate and incentivize detailing frequency with little regard for the effects physician interactions have on patient outcomes, drug costs, treatment costs, and cost effectiveness. Evolving commercial analytics must be structured to see drug utilization as an intermediate outcome, especially since key physician specialties that will be associated with the focus of future new drug development are generally the most sales rep access-restricted.[14] Focus instead must leverage RWE data and the effects from delivering scientific medical information to specialty physicians on drug utilization and health/economic outcomes.[29] This means sales operations processes must structure the success of sales reps in their detailing efforts geared toward facilitating information-based physician interactions and where sales reps are focused on improvements in metrics, such as patient compliance and adherence, as leading indicators of better health/economic outcomes. A list of specific implications for sales force science issues as categorized by the survey headings noted in Table 1 are as follows:

Sales Force Strategy

1. Segmentation schemes must combine data to reflect dynamics at the following 4 levels: physicians/accounts, IDNs, payers (e.g., commercial 3rd party, Medicare, Medicaid), and patients. The goal is to be able to follow the patient through the healthcare system to ensure both patient drug adherence and health benefits are derived from continued drug utilization. This segmentation scheme will drive sales force strategy and operations process outcomes. Rx and drug adherence must be objective measures that drive sales force strategy, the latter metric being a good leading indicator of health/economic outcomes.

2. Sales force size, structure, and allocation will still be physician-based but layered differently based on the above segmentation scheme and where sales force allocation efforts are implemented to cover the patient journey.

Sales Force Operations

3. Territory alignment and call planning design will reflect the 4-level segmentation scheme.

4. Objective setting, incentive compensation, and sales force reporting/performance

management will share focus on Rxs (still needed to track company objectives for financial returns) and MBOs (management by objectives) that affect drug adherence tracked by APLD aggregated at the physician-level. These MBOs are designed to track activities related to the delivery of scientific information and efforts that improve patient adherence, thus helping outcomes on value delivered to physicians, health and economic benefits effects to patients, and to the healthcare system.[30] Examples of sales rep MBOs tied to their interactions with physicians and other healthcare personnel are as follows:

(a) qualitative assessments from physicians and office staff (nurses, office manager, etc.) on whether sales reps are adding value in their interactions.

(b) providing physicians information on and enrollment of patients in disease management programs, co-pay card programs, and coupons.

(c) connecting physicians to medical science liaisons who can provide deeper answers to medical questions.

(d) sending physicians optimal level of samples that can be helpful for physicians to try patients on new therapies when other approaches have failed to reach clinical goals.

(e) alerting physicians to new drug indications, FDA-imposed black-box warnings, and other important drug updates.

(f) measuring the proportion of call plan physicians who listen to a detail through an electronic notebook/non-paper delivery (designed to collect qualitative measurements of sales rep-physician interactions for detailing quality analysis).

(g) tracking the proportion of call plan physicians who attend and the qualitative assessment of local speaker programs organized by the local sales rep.

(h) counting the proportion of call plan physicians who seek added drug information through the company/drug website.

Sales Force Analytics

5. The preceding cancer example illustrates the need to introduce empirical techniques common to HEOR and RWE models and to combine their use with traditional statistical sales force analytics.

6. The need to demonstrate drug value through sales force activity will require the broader use of and implications from detailing quality statistical models.

Big Data

7. Figure 2 illustrates the combination of a wide array of traditional data used in sales force analytics plus newer elements utilized in HEOR/RWE models as found in claims/EMR, socio-economic, and demographic data sources. This will require efficient data management, bridge elements that allow individual data sources to be merged, and routines that allow for easy access for analytics to support these processes and insight generation.

Changes in sales force environmental trends likely mean future sales reps will need to improve their capabilities to deliver more complex scientific evidence. This will also require a team of service reps to address and focus on matters such as patient-access/affordability and payer dynamics since sales reps will have ever-decreasing time interacting with physicians.[14] Attention will have to be given to the development of technology that more

efficiently and effectively delivers scientific information to healthcare professionals while recording such data for further analysis. The introduction of complementary devices (health diagnostic and monitoring technology) will aid in improving patient compliance/adherence and demonstrating value to payers. These preceding changes mean the talents and capabilities required by people involved in commercial analytics to conduct this work will have to be upgraded to account for new modeling designs and expertise in handling different databases. Concomitant changes in the internal organizational structure of companies will be required to facilitate this type of interdisciplinary analysis among groups that currently have little to no engagement with each other (e.g., interactions between HEOR and RWE functions with sales force strategy, operations, and analytics functions). Lastly, challenges will need to be overcome to generate the necessary patient-level data (e.g., claims, EMR, etc.) size that will enable this change in sales force science approach. Patient-level databases are highly fragmented, thus a need to combine databases required to generate sufficient number of observations when analyzing diseases with small patient populations.

6. Concluding Remarks

This paper has tackled the question on the emerging future role of sales analytics and big data developments in a pharma environment increasingly focused on launching specialty medicines. The case study example can be adapted to address an array of other sales and marketing situations, other disease areas, and physician specialties. We believe fundamental commercial analytics changes are destined to happen for pharma companies in the following seven buckets consistent with comments here and trends identified by survey participants:

1. *Commercial Model Design* - the go-to-market approach and model design necessary to achieve all company strategic goals, driven by payer and patient analytics, and dependent on drug technology of the project/product portfolio that can be successfully developed and tactically executed to deliver optimal results while mitigating key risks.

2. *Payer Analytics* - focused on managed markets (e.g., private third party commercial and public drug plans), analyzing effects from changes in plan design, and their relationship to sales, marketing, and patient outcomes.

3. *Patient Analytics* - focused on analyses generated from real world evidence (RWE) and patient-level data on outcomes (e.g., drug compliance and adherence, drug costs, treatment costs, health outcomes, cost-effectiveness) resulting from drug utilization.

4. *Sales Analytics* - focused on processes and outcomes related to ensuring optimal sales force investment efficiency and effectiveness.

5. *Marketing Analytics* - focused on processes and outcomes related to ensuring optimal brand performance throughout the entire lifecycle.

6. *Commercial Analytics Innovation Center* - focused on basic research activities designed to generate new management/marketing science methods for solutions to address future commercial problems faced across the entire project/product lifecycle using experimentation, collaborations with academic researchers, and other activities to encourage innovation.

7. *Cloud Information Management* - focused on speed, agility, and scale in association with managing new data sources, elastic infrastructure, data quality & accuracy, and

actionable insight in support of activities in all of the preceding commercial analytics buckets.

These commercial analytics buckets will rapidly become interdependent activities. Health/economic outcomes from payer and patient analytics will become the principal emphasis and drivers of all future commercial decisions.[29] The construction of the right commercial model design and conduct of all remaining analytics in other areas, like sales analytics, will be done to support payer and patient outcomes. This means solving problems using commercial analytics will require greater alignment among these activities, an open system framework of thinking in solving commercial problems, data environment constructed to support all of these activities, and leadership approach and innovative analytics culture necessary to cultivate and sustain a competition advantage. A potential industry challenge is who will be leading perceived advancements in basic knowledge on key sales force science topics as outlined here? Respondents from the practitioner survey clearly noted biopharmaceutical industry consulting research companies as the leading source.[7] Yet, survey respondents from biopharmaceutical consulting companies also noted expertise focus is not in the areas identified here required for the industry to respond effectively to changing environmental trends.[7] This paper provides a commercial/sales analytics, big data management, and organizational blue print for companies on how to prepare and operate successfully in this evolving sales force pharma landscape.

About the Authors

George Chressanthis *is Principal Scientist at Axtria, a big data and analytics company, starting there in July 2016. His research focuses on pharmaceutical commercial issues and their intersection to drug industry business, public policy, clinical treatment decisions, patient outcomes, and cost of care. He spent 14.5 years from 1995-2009 working in the pharmaceutical industry after a long career in academia, with the majority of his time at AstraZeneca Pharmaceuticals LP US headquarters leading teams in support of sales force strategy, sales operations, and other commercial analytical functions. He held full-time professorships in Healthcare Management and Marketing in the Fox School of Business and a secondary professor appointment in Clinical Sciences in the School of Medicine at Temple University from 2010-2016. He also had a career as an academic economist from 1982-1995, eventually becoming a tenured full professor at Mississippi State University. He received his Ph.D. in Economics from Purdue University.*

Murali Mantrala *is the Sam M. Walton Distinguished Professor of Marketing and Chair, Department of Marketing at the University of Missouri at Columbia. He is a member of INFORMS (the Institute for Operations Research and the Management Sciences) and the American Marketing Association. His research interests include retail pricing and category management, news media pricing, pharmaceuticals marketing, marketing decision models, sales force resource allocation, and compensation strategies. His extensive publication record spans major academic journals across marketing, management and marketing science, operations research, and sales. He received his Ph.D. in Marketing from Northwestern University.*

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