**Senthil Murugan**

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**OBJECTIVE:** To lead, develop and implement commercial impact assessments and investment optimization strategies.

**CAREER HISTORY**

**2008 to Present Merck & Co., Upper Gwynedd, PA**

Director – Data Science - Impact Assessment & Investment Optimization (2018 - Present)

Associate Director – Investment Analytics and Decision Sciences (2016 - 2018)

Associate Director – Global Analytics, Enterprise Integration and Customer Collaboration (2013 - 2016)

Senior Specialist / Project Manager – Commercial Analytics and Decision Sciences (2010 - 2013)

Manager - Global Business Analytics (GBA) (Feb 08 – Jan 10) – Schering-Plough Pharmaceuticals

**1999 to 2008 IQVIA / Cegedim Dendrite, Bedminster, NJ** - Senior Scientist / Consultant

**1997 to 1999** **Tata Consultancy Services, Chennai, India** - Assistant Systems Engineer.

**EXPERIENCE**

More than two decades of experience in pharmaceutical commercial analytics and promotional investment strategy spanning 15 years with Merck. Worked with multiple top and medium sized pharmaceutical manufacturers and in multiple therapeutic areas.

**Director - Data Science - Impact Assessment & Investment Optimization *Merck***

***Management***

* Responsible for management of sales impact measurements and guiding optimal marketing budget allocations
  + - * Includes US marketing teams of Oncology, Vaccines, Chronic Care and Hospital / Specialty business units
      * Inform marketing mix and optimal marketing promotion investment of about $1.1 Billion per year.
      * Lead sales impact analysis of HCP promotions, Consumer promotions and Patient support programs
* Lead, develop and coach a team of about six employees and several consultants
* ***Oncology:*** Measure promotion impacts and guide marketing budgets for Keytruda, a leading PD-1 inhibitor, from its launch to current multiple indications and tumors. Expanded portfolio to Lenvima, Lynparza and Welireg.

***Functional Areas of Responsibility***

* **Health Care Provider (HCP) Personal & Non-Personal Digital Promotions [~$350MM budget]**
  + - * Measure sales impact / ROI and Provide sales maximizing investment guidance for each vendor & channel of promotions both during profit planning and ongoing planning. Includes key brands and launches of all BUs.
      * Channels include details, samples, speaker programs, alerts, third party vendor emails, headquarter emails, eDetails, field emails, point of care, display and paid search
      * Help develop omnichannel strategies that maximizes revenue and customer experience
      * ***Oncology:*** Guide $40+MM investment through HCP Non-Personal Marketing Mix and Channel Investment Allocation (CIA) processes.
* **Health Care Consumer (HCC) Digital & Traditional Media Promotions [~$300MM+ budget]**
  + - * Measure sales impact / ROI and Provide sales maximizing investment guidance for consumer channels both during profit planning and ongoing planning. Includes key brands and launches of all BUs.
      * Channels include TV, Display, Online Video, Streaming Video, Social, Paid Search, Print, Point of Care and Adherence programs
      * Guide and verify sales impact and net conversions from Crossix, point of care and adherence channel vendors
      * ***Oncology:*** Guide $200+MM consumer media investments through Marketing Mix, Adhoc analysis, Pilot design and measurements and Promotion Response curves. Includes high priority TV investments.
* **Patient Support Programs [~$200MM+ spend]**
  + - * Design, Evaluate and Guide promotional investment decisions for Coupons, EVouchers, Samples and Vouchers of Key brands within Chronic Care and Hospital Specialty BUs.
* **Strategic Initiatives**
  + - * Next Best Engagement (NBE) – Core member from inception to implementation of multiple brand NBEs, including Oncology. Guide max digital touchpoints and model development by ZS.
      * DOMINO – Conceptualized, designed, and implemented budget allocation process for Oncology [~$700MM]
      * Health Map – Guide net conversion analysis for consumer promotions using consumer level media exposures
      * Content Hyper Personalization – Predict the value of content personalization to business.
      * Support adhoc analyses. Ex: Accelerate, Business Development, Vaccine Confidence, Tumor pilots etc.
* **Data, Models and Simulations**
  + - * Extensive hands-on experience in working with wide variety of pharmaceutical datasets
      * Understand the utility and use vast varieties of data sources both in Oncology and other BUs.
      * Extensive hands-on experience in varieties of Marketing Mix type statistical models, Test/Control analysis, Pilot designs, Machine Learning methods.
      * Experience with data simulations, patient pathway simulations, discrete-event, system dynamics and agent-based simulations.
      * Hands-on experience with SAS and in recent years with R and Python in multiple environments such as AWS cloud eco-system.

***Collaboration***

* Part of multiple Agile collaboration teams.
* Collaborate extensively with internal teams such as US Market brand teams, Digital Engagement [DET], Media, Strategy Realization, Market Research, NBE, Commercial Legal, Finance, US Operations, IT, Contract Optimization, Customer Engagement Optimization, Targeting etc.
* Manage and/or collaborate with vendors such as Datazymes, Crossix, Initiative, Solved, IQVIA, Symphony, ZS etc. to execute various initiatives.

**Associate Director, Global Go-To Market Analytics – EICC *Merck***

***Lung Cancer Diagnosis & Analytics***

* Predicted relevant patients’ probability and diagnosis leading to lung cancer using machine learning.

***Global Promotional Impact, ROI, Market Mix and Sales Force Sizing Analysis***

* Collaborated with business teams of several countries, IT teams and vendors to solve business issues.
* Supervised consultants. Trained and mentored regional team members (US / Prague / Singapore / Genpact).
* Managed, Executed and Presented various Go To Market initiatives for:
  + - * *SF Sizing*: Russia (12 Franchises), Brazil (3 Franchises), Hong Kong (7 Products).
      * *Details / Meetings / Lectures / TV*: China (2 Products), Japan (Januvia), Canada (Zostavax TV & Reps)
      * *Market Mix*: Helped develop Promotional Budget Optimization web tool for US IADS team.

***Pricing and Supply Chain Analytics***

* Pricing: Developed customer segments and statistical pricing models for brands in Hong Kong and Portugal.
* Merck Manufacturing Division - Simulated and optimized supply chain for HCV & Women’s Health brands.
* Animal Health: Determined optimal packs for global brands. Designed large scale operations research methods.

**Commercial Analytics and Decision Sciences *Merck***

***Consumer and Physician Promotion Response, ROIs, Marketing Mix, Pilots and Budget Allocations***

* Measured ROIs of TV and Print campaigns. Guided strategies for DTC investment of over $200 MM.
* Designed and implemented channel level optimal allocation of over $81MM budget for Januvia
* Identified pilot sizes, test regions, test and control physicians for several pilots. Informed $30MM investments.
* Determined optimal allocation of samples for multiple chronic care brands. Informed $50MM investments

***Vendor Management and Collaboration***

* Managed and collaborated with multiple vendors such as Nielsen, ZS, IMS Health, HCL, Genpact, Mu-Sigma, Evolution Road, Draft FCB and Wolters-Kluwer Health.

***Promotion Responsiveness Clustering and Simulations***

* Developed innovative methods to create physician clusters based on their promotional responsiveness.
* Designed and developed multi-variate data simulation and agent based simulation techniques to guide sales and marketing strategies.

**Global Business Analytics / Decision Sciences *Schering-Plough / Merck***

***Targeting and Call Plans - Customer Centric Selling Model and Fixed Product Lineup***

* Managed the implementation of Differential Resourcing Model for two primary care field forces.
* Managed the development of targets and two cycles of call plans for multiple field forces.

***Sales Force Sizing and Optimal Resource Allocation***

* Helped to determine optimal number of representatives and the products each representative carry for the two differential resourcing primary care field forces. Determined optimal levels of details and vouchers.

***Marketing Mix and ROI Analysis***

* Assessed impacts of details, samples, vouchers, events and DTC advertising on Nasonex scripts.
* Evaluated eDetail's ROI and sales impact for Nasonex. Identified most responsive specialties for targeting.

**Analytics and Consulting *Cegedim Dendrite / IQVIA***

***A. Sales Force Design and Optimal Resource Allocation***

* ***Odyssey Pharmaceuticals:*** Developed two mirrored sales forces for Sanctura with 520 territories
* ***Johnson & Johnson:*** Determined optimal samples for One Touch Ultra to increase sales by 2% to 8%
* ***Pfizer:*** Assessed over-sampling of Lipitor and optimized samples to increase sales by 2%
* ***Bristol-Myers Squibb (BMS):*** Developed innovative analytical methods and determined sales force sizes for various sales forces, brands and physician specialties for all the countries where BMS operates.

***B. Promotional Response and ROI Analysis***

* ***Cell Tech:*** Measured the sales impact of coupon distribution to physicians.
* ***GSK:*** Determined impact of Levitra coupons and vouchers on physicians Rx, patients’ co-pay, refill gaps and rates, adherence, switching behavior etc., using patient level Rx data.
* ***Wyeth:*** Applied recent advances in management science to shape promotion strategies for 90 channels for Effexor XR.
* ***Pfizer, Japan:*** Developed innovative models to predict Physician’s sales from hospital level Norvask Rx.
* ***Abbott and CellTech:*** Developed promotional response and ROI tool to assess sales impact and optimize resource allocations for several channels for multiple products.
* ***Sanofi-Aventis and Pfizer:***  Determined impacts to New Brand Starts and NRX for a wide range of personal and non-personal marketing channels and brands. Identified profitable physician segments.

***C. Market Research and Data Analysis***

***Longitudinal Prescription Data (LPD) Analysis and Reporting. About ten pharmaceutical companies***

* Recommended key takeaways and answered business questions by analyzing the trends and summaries of LPD based metrics for clients such as GlaxoSmithKline, FDA, Bayer, Schering-Plough etc.
* Part of small team that initially defined rules, developed and delivered various LPD metrics that are now in common practice across the industry.

**EDUCATION**

* **Central Connecticut State University, CT, USA**

M.S. – Data Mining – 2012. *Award:* *Graduate Academic Award* 2007 - Top in the graduate program.

* **Indian Institute of Technology (IIT), Madras, India**

M.S. – Machine Dynamics – 1997. *Score: GATE* – 96th percentile in the country.

* **Madurai Kamaraj University, Tamilnadu, India**

B.E. - Mechanical Engineering - 1995. Top 5% of class.

**MODELING AND PLATFORM EXPERIENCE**

**Modeling:** Regression models like linear, non-linear, mixed models, random and fixed effects, time series cross section models, neural networks, semi-parametric, non-parametric and local regressions, generalized additive models, TreeNet, Lasso, GPS.

**Optimization:** Linear, non-linear and multiple integer programming using solver and SAS OR modules, simulated annealing and genetic algorithms using Java.

**Machine Learning:** Deep Learning, Clustering methods like k-means, hierarchical, SVM and custom. Decision trees, discriminant analysis and a wide range of statistical and machine learning models.

**Operating systems:** Windows, UNIX, Linux, IBM 360 Main Frame

# **Languages / Scripts:** SAS, R, Python, SQL, Java and few others.

**Database:** AWS Redshift, Mongo DB, Oracle, Access DB, Teradata, SQL Server 2000, DB2.

**Other Tools:** Excel, PowerPoint, SAS JMP/EM, Arena, AnyLogic, JBuilder, SQL Navigator.

**PUBLICATIONS**

Presented and authored / co-authored multiple innovative articles in PMSA and PBIRG conferences. Topics include:

* Measuring responsiveness of integrated multichannel marketing programs
* Uncovering physicians' adoption patterns of newly launched products
* Effects of Medicare Part-D and identifying high-potential physician targets
* New method to identify targets during the early phases of product launch
* Robust framework for various types of resource optimization problems using evolutionary algorithms