

Importance of Analytical Tools in Volatile Business Environment

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Abstract— Businesses in 21st century have several objectives. Attaining consistent growth and securing business sustainability are main priorities. Business performances varied from time to time owing to uncertainties triggered by pandemic, war, geopolitical tension and economic downturn. Stakeholders of businesses are interested to know how business is doing justice to their connection and contribution. Managers are under constant pressure when volatilities are rampant and disruptions are relentlessly challenging the status quo. Analytical tool and methods in operation research had proved to be useful to address critical business-oriented problems. Quantitative techniques had never been confined to operation or production related issues, the theories and practical applications has spread out to different functional areas such as marketing, finance, human resource management, time management, inventory management, contingency measure and so on. Efficacy of mathematical tools are undeniably instrumental in today's data driven approach to stay competitive, showing innovativeness in productivity and distribution and having better customer relationship management. Operation research contains several analytical tools whose significance would work well in fast paced competitive business environment. Linear programming can hold the various dimensions of business challenges. Transportation and assignment problems are capable to shed lights on streamlining and strengthening delegation of work and logistics driven distribution issues. Time series data analysis and regression model are useful in predicting future expectations for business. Game theory is undoubtedly useful in strategy building and selecting the right course of action. Stochastic processes such as Markov chain and Monte Carlo simulation can guide in decision making in uncertain business circumstances. Pestle analysis, SWOT analysis, Ansoff matrix, fishbone diagram, box plot, Gantt chart, Johnson's rule for scheduling, CPM/ PERT have their unique applications in solving complex business problems. Progress of data science had been real boon in demystifying modern business problems and capable to formulate workable solution. Artificial intelligence unremittingly tracks real time data and well equipped to analyse the same for wider spectrum of insights. Therefore, analytical tools will be supportive strength and guiding light during uneven irregular volatile period.

Keywords— Analytical decision making, Business sustainability, Data driven approach, Quantitative techniques, Solution centric process.

I. INTRODUCTION

Data is perceived as the new oil of 21st century. Citizens of the world are living in information age and also in one knowledge economy or the other. Billions of data in structured and unstructured form are generated on daily basis. Main concern is tracking, processing of data and analysing them correctly to reach a decision which would guide the business in right direction. So, mastery over data science and data analytics are prerequisite for business progress. Today's data science has

emerged out of mathematical principles and statistical method. Performance of an organisation comes clear with study of data. A glance at annual report makes us clear about the significance of data in understanding company's fundamentals and financial position. In data analytics, analysis is classified into descriptive, diagnostic, predictive and prescriptive analysis. They have their respective utilities and usefulness. Management is practice driven process. Sound judgement, analytical skill and problem-solving skill are needed to cut through the clutter and make a decision about future course of action. Just knowledge about basic mathematical exercise such as calculation of percentage, average, ratio is not sufficient. It is necessary to detect signal and noise in data. Along with composite mean, there is need to figure out skewness, probability factor and correlation between bivariate and multivariate data. Manual calculations are necessary but world has gone much ahead and adopted software driven process for data classification, presentation and analysis. Coding has been very interesting activity among youngsters and tech geeks because it is stepping stone for logical thinking, problem solving, comprehending programming language. Mastery over data analytical tools such as R, SAS, Tableau, QlikView, Advanced Excel, Python has been necessary for people at management consultancy firm or at market research organisation. All companies are striving hard to gain competitive edge and walking through the maze of voluminous data. Mystery of market dynamics and eccentricity of consumer behaviour is better understood with data analysis and statistical experiment. Unless organisation is mindful about giving leverage to data driven approach and analytical exercise, survival and sustainability would be a far cry. Market trend is changing as consumers are getting more aspirational and looking for more thrilling experience. Real time data analysis is more of necessity than a fanciful idea to keep pace with changing market trend and momentum.

II. LITERATURE REVIEW

Since the dawn management evolution, numerous scientific approaches were offered to run the business successfully. Frederick Winslow Taylor referred about scientific management in his book in 1911. Italian economist Vilfredo Pareto discussed about optimum allocation of the resources in his book *Manuale d'economia politica* (1906). Pareto chart is a valuable diagrammatic presentation where he clarified that approximately 80% of the outcomes happen due to 20% of the conditions, for many events. Michael Porter's Five Forces in a 1979 article 'How competitive forces shape strategy' expressed key elements in strategic decision-making

exercise. Balanced Scorecard by Robert Kaplan and David Norton published as an article Putting the Balanced Scorecard to Work in Harvard Business Review provided clear path of strategic planning and management system. Technology is getting faster and smarter by the day. World has witnessed some miracles of automation, machine learning, artificial intelligence and robotics. David De Cremer and Garry Kasparov (2021) have discussed about the role of AI to reinforce human intelligence rather than replacing it. It is getting tougher for human beings to keep pace with changing technology and building up competency on new upgraded version of technology to stay relevant in the market. Repetitive works are becoming machine driven and better managed. Even stock market analysis, economic performance assessment, climatic condition forecast is getting done by sophisticated analytical tools. Marco Iansiti and Karim R. Lakhani (2017) referred about blockchain technology which can revolutionize financial transaction. They were evocative about speciality of blockchain which makes the transaction safely and efficiently eliminating role of intermediary. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams (2019) mentioned about data driven approaches and statistical analysis through SPSS and Minitab to cultivate better decision making prowess. Testing of hypothesis is an important exercise to validate any proposition with parametric and non-parametric tests. Levin Richard, Siddiqui Masood and Rubin David (2017) highlighted in details about preliminary to high end statistical analysis to assist managerial logical reasoning and decision making through statistical experiments.

III. OBJECTIVES OF THE STUDY

The chief objectives of the research paper are delineated below.

- i. To highlight the significance of analytical tool in perceiving economic outlook, market condition and business dynamics better.
- ii. To showcase the strength of data driven approach and use of quantitative technique in providing vital guidelines to organisation in strategic action plan.

IV. METHODOLOGY

The research was purely exploratory and analysis driven. There had been comprehensive study of secondary information related to theories, concepts, numerical exercise and analytical process. In this research study, qualitative aspect of analytical tool has been assessed. Analytical tools are of different types, numerical and strategic in nature. Numerical analysis such as regression analysis and time series data analysis are helpful in tracking trend and predicting future value. Operation research is loaded with numerous mathematical approaches which can provide realistic solution to business centric problems. Different theories from management foundation, strategic management and operation research had been ferreted out and assessed to check their vitality, application and utility. No crafting of hypothesis and testing of hypothesis had been done. This paper focussed on drawing attention to age old strategic and analytical tool and provided view on their applicability, vitality and relevance.

Information on theories, mathematical models and statistical approaches were taken from well-known text books. Collection of information, analysis of accumulated concepts and ideas, interpretation of their applications and usefulness had been done systematically. There was epistemological endeavour to shed light on analytical mechanism which became cliché or worn out with passage of time. There had been effort to view and discover the real worth of analytical mechanism and processes to contribute positively in business operation.

V. ANALYTICAL TOOL FOR DECISION MAKING EXERCISE

Analytical tools are numerous in management science. Management science is heavily indebted to mathematical exercise, statistical process and quantitative techniques for decision making task. There is simple to complex numerical exercise to comprehend business performance. Some are stochastic in nature and rest are deterministic. Quantitative school of management has a historic background as it emerged in 1940s at the time of World War II. Allied forces took the help of scientists, mathematicians and physicists to chalk out strategies to beat out formidable opponents. The collaborative endeavour and coordination of best scientific minds from US, UK set the foundation stone for quantitative school of management to decode message of ever expanding and intimidating axis force. What started as useful tool for military operation, proved to be beneficial for business operation and management decision making. At the end of the day, all the business organisations in competitive market environment searches for appropriate course of action to increase market share, enhance consumer base and prove supremacy in the market. Market in open economic structure is no less than a battleground where conflict with other market players is obvious. Quantitative Technique and Operation Research are loaded with gamut of applicable analytical tools. Statistics throws light and clarifies about different types of data. There is need to understand difference between discrete and continuous data along with geographic, demographic, time series cross sectional data. Market research, complete enumeration and sample survey gives a good vibe about people leaving in the society, their demographic profile, consumer outlook and preference, market expectation, way of life along with others. It will be wrong to treat all equally. Consumers vary in personality, lifestyle, education, income and in taste and preference. So producers realize it better that customization is the key as one cap doesn't fit all. Central tendency tries to find out the middle most value through calculation of mean, median and mode. The calculation varies from simple series, simple frequency and group frequency distribution. Dispersion can be measured in absolute and relative measure. Mean deviation, quartile deviation, standard deviation gives us glimpse of spread in the data and how far data are strayed from the central value. Relative measure coefficient of mean deviation, coefficient of quartile deviation and coefficient of variance helps researcher to comprehend instability or inconsistency in dataset. In signal versus noise in data, dispersion analysis clarifies noise or variability in collected data. Detection of outlier is also an interesting task

which helps to figure out extreme values recorded in data set. Standard values or z score assists in identifying outliers. Correlation helps to find out degree of association or simply relationship between two variables. In bivariate data analysis correlation coefficient and scatter diagram give us insight about positive, negative and zero correlation. Regression analysis is done to estimate or predict unknown value of one variable when value of another variable is aware of. Regression model is used to predict sales value as a result of direct marketing campaign. Skewness measure gives us idea about data distribution pattern whereas Kurtosis gives us peakedness of the distribution. If data points in the data set are not symmetric, there could be positive or negative skewness. Application of probability guides us to determine likelihood of an event. As business world is complex and unpredictable, probable value of an upcoming event can be calculated through classical, empirical and subjective method. Subjective method is popular among managers who are reluctant to get into hassles of numerical complications. Information, belief, intuition, prior experience is the guiding force in calculating probability value. Bayesian probability is a unique tool to compute posterior probabilities. Probability distribution function is split up into discrete and continuous form and acts as very special method to figure out probability of upcoming event or probability of outcome in a typical business circumstance. Time series analysis provides concrete idea about emerging trend or evolving pattern whereas cross-sectional data shows the difference across geographies for a factor in a particular timeframe. Regular, cyclical, seasonal and erratic factors in business environments can be captured and analysed through graphical presentation and numerical calculations of time series analysis. Index number is an important application which provides the idea of changes occurred in economic variable over the period of time. Consumer price index assists to determine real buying power of money and also detects cost of living. Market demand changes with changes in consumer price index. Good knowledge about index numbers helps to determine market strength or effective demand in the market before launch of a product. Simple and easy to follow

VI. ADVANCEMENT AND SOPHISTICATION IN ANALYTICAL TOOL

Analytical tool has advanced with passage of time and become more time tested to solve critical business problems. Quality management and maintenance remained a major concern since beginning of 20th century. Securing higher market share and creating good will were dependent on them. Statistical Quality Control (SQC) was initiated in 1930s as an application driven statistical tool relied heavily on sampling method and control chart. Total Quality Control (TQC) was popularized by Armand V. Feigenbaum with an article in Harvard Business Review in 1950s which encompassed accounting, design, finance, human resources, marketing, purchasing, sales in addition to production. Statistical Process Control (SPC) was introduced in 1960s where process centric feedback got some priority along with monitoring of control chart in industrial process. Total Quality Management (TQM)

arrived in 1980s to ensure persistent organization improvement across all fields of operation. Management thinkers Joseph M. Juran and Edwards Deming had the opportunity to study Japanese way of managing quality and present the concept in thought provoking way. Six Sigma came as revolutionary approach in late 1980s which was pioneered by US based Motorola. Statistics and data analysis are used in the Six Sigma process to identify and organize errors or flaws. This approach aims to decrease manufacturing faults to no more than 3.4 defects per million units or events while increasing cycle times. Balance Scorecard was introduced in 1992 by Dr. Robert Kaplan and Dr David Norton as a sophisticated strategic management performance tool to organize and enhance different internal company processes and the results they produce externally. Kaoru Ishikawa, a pioneer of the Ishikawa Diagram (fishbone diagram), made a significant contribution to the Japanese concept of quality management in 1960s. It is a good idea to look at what Quality Management is for, in order to comprehend the significance or justification of the Ishikawa Diagram. Vilfredo Pareto had immense contribution in scientific approach of business operation and strategic action plan. 80-20 rule, pareto optimality and pareto charts are useful analytical tools still relevant in today's time. Operation research in operation management offers numerous solution centric approaches consistently. Linear programming problem grasps the problem in linear form and solve in graphical or simplex mechanism. Other approaches such as transportation, assignment, sequencing, replacement, queueing theory, decision analysis, inventory management are full of pragmatic applications to solve critical business challenges. Critical path method and program evaluation and review technique are appropriate to accomplish a project impeccably. 21st century has advanced in computer science and information technology. Human intelligence is challenged by artificial intelligence. Big Data and Data Analytics are busy in analysing huge volume of data tirelessly and giving valuable insights to take a decision. Software tools like Minitab, SPSS, SAS, Microsoft Excel, Tableau, R and Python are significant in data analysis and presentation. Interpretation lies with prowess of data scientist and statistician to clarify the outcome that guides in decision making or strategy building exercise. Although new technologies are viewed as labour replacing, but human brain is superior to all. Gadgets and devices run on microchips and they are no match for human intelligence.

VII. CONCLUSION

Businesses are complex and riddled with numerous challenges. It is a tough job to stay competitive and attain business sustainability in the long run. Growth and diversification are crucial for all small, mid and large-scale enterprises. In open market environment, start-up can confront old and established organization head on and put them in existential crisis. As disruptions in economy and business environment are rampant and appearing out-of-the-blue, staying prepared for unforeseen scenario and keeping contingency measures fortified works well. Pandemic and supply chain disruption taught a serious lesson in hard way. So

many companies have started to focus on local sourcing and multiple sourcing. Organisations have started hiring people who are not only good at hard skill, domain knowledge but also have ability of critical thinking, strong learning aptitude, problem solving and decision making. Game theory is one of mathematical tools which guides in decision making in uncertainty. Economic Order Quantity assist in cost minimization in inventory management. Organisations are trying to be more agile, adaptable and resilient. Managing crisis in an rganization is no less than fighting a battle in the warfront. Mathematical concepts and processes can provide necessary ammunition for survival, sustainability and success of an rganization. Round the clock artificial intelligence, analysis of big data, visualization and interpretation of data has immense influence in strategy building, decision making and implementation of course of work. Mathematical approaches mentioned in operation management such as sequencing, transportation, assignment, inventory control is effective enough to find a workable solution. Businesses in modern time can't be run by assumption and wishful thinking. They need data support and analytical expertise to understand which way wind is blowing and when to set sail to tide over tough situations.

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