Preface

Organizational productivity is determined by a range of factors. Some of these factors can be evaluated quantitatively, while other factors may require a more qualitative, analytical approach. It is critical to understand key drivers that impact productivity when assessing organizational productivity, as well as how to effectively assess those key drivers’ contributions to overall productivity. Productivity enhances organizational performance by becoming more efficient in specific areas. Organizational performance refers to how well an organization is doing to reach its vision, mission, and goals. Measuring performance is a vital part of assessing organizational resources and activities. Performance measurement involves collection of data to assess whether correct business processes are being performed and whether desired organizational outcomes are being achieved. Measuring performance can help an organization analyze where and what changes need to be made in order to improve performance. Performance measurement can analyze an individual, a work group, a program or an organization’s efforts; the focus can concern maintenance, improvement, and development goals; measures can be quantitative or qualitative.

Businesses are collecting massive amounts of data every day. These data can be used to increase organization productivity and performance. One method of achieving this is by using predictive analytics. Analytics, in general, is the use of skills, technologies, and practices to explore and investigate past performance, gain insight, and drive business decision making; analytics help decision makers determine risk, weigh outcomes, and quantify costs and benefits associated with decisions (Boundless Management, 2015). Predictive analytics is defined as the set of tools, such as predictive modeling, that can be used to predict trends and behavior patterns in data; it can be used to inform and evaluate alternatives during decision making and explain outcomes. Predictive modeling techniques include linear and logistic regression, clustering, association rules, structural equation modeling, decision trees, neural networks, and support vector machines. There are many ways in which organizations can leverage predictive modeling and analytics to improve productivity and performance. It includes collecting appropriate data, measuring productivity and performance on an ongoing basis, learning from the productivity and performance measures and then closing the loop by implementing new ideas.

The quality of information in any organizational productivity or performance decision situation can range from scientifically-derived hard data to subjective interpretations, from certainty about decision outcomes to uncertain outcomes represented by probabilities and fuzzy numbers. This diversity in type and quality of information about a decision problem requires methods and techniques that can assist in information processing and ultimately may lead to better decisions. Multi-criteria decision analysis is a method for decision structuring that permits the use of both quantitative and qualitative data sources with high uncertainty or subjectivity; it improves ad hoc decision criteria and policy alternatives that
may be chosen by the decision maker. In the multi-criteria decision making context, the selection of a “good choice” from a number of available choices is facilitated by evaluating each choice on a set of criteria. The criteria and their outcomes must be measurable for every decision alternative. Multi-criteria decision making techniques include Analytic Hierarchy Process, Delphi Method, Fuzzy Set Theory, VIKOR, and ELECTRE. Approaches that combine available quantitative data with the more subjective knowledge of experts are desirable; these approaches can provide the decision maker with the ability to look into the future, and to make the best possible decision past on past and present information and future predictions (International Society on Multiple Criteria Decision Making). This book is a collection of 16 chapters on predictive modeling and multi-criteria analytical approaches to organizational productivity and performance measurements.

In their chapter entitled “Predictive Analytics for Infrastructure Performance,” McNeil, Trimbath, Atique, and Burke present a methodology to generate prospective values for the Transportation Performance Index (TPI) by applying elements of the improvement plans from US metropolitan organizations (MPOs). It starts with a summary of the development and use of the Transportation Performance Index, which is generated from publicly available data. The Index was designed to bring a rigorous, quantitative, and repeatable methodology to the assessment of infrastructure performance. Transportation performance indicators that serve as the building blocks for the TPI are presented and the technical specifications used to calculate the TPI are given.

In order to demonstrate the role of the TPI in capturing changes in infrastructure performance and influencing transportation policy, a prospective analysis, looking at the impact of investment based on the long range transportation plans (LRTP) of the Metropolitan Planning Organizations (MPOs), is conducted. The analysis provides a better understanding of the impact of specific investments or policies on the TPI and insight into the portfolio of projects that are required to continue to improve the performance of transportation as measured by the TPI. The predictive scenario analysis process applied to a sample of Metropolitan Statistical Areas (MSAs) was outlined in detail and illustrated for the Baltimore- Towson MSA.

The overall results show that over a 24 year period, the plans developed by MPOs can slow the decline in infrastructure over a baseline scenario; the results also serve to further validate the Index that captures important performance functions of transportation infrastructure. The benefit of this chapter is the understanding of the use of a predictive analysis methodology to capture trends and validate a methodology for capturing performance functions.

In his chapter entitled “Structural Equation Modeling Algorithm and its Application in Business Analytics,” Sorooshian presents a roadmap for business advisors and scholars using Structural Equation Modeling (SEM) for decision making, complex modeling, and data analysis programming. It starts with an extensive overview of SEM, highlighting three different approaches or modeling strategies: confirmatory modeling strategy, competing model strategy, and model development strategy and two SEM estimation methods: covariance-based SEM (CB-SEM), which is a confirmatory approach, and variance-based partial least squares (PLS-SEM), which is a prediction-oriented approach. The chapter presents a practical flowchart covering all three modeling strategies of CB-SEM, especially model development strategy; in the model development strategy, a model is proposed and empirically tested while gaining insight into its re-specifications. A SEM application flowchart is presented, together with details and justifications of each stage and sub-stage of the SEM process.
The SEM application flowchart presents a modification of five stages (model specification, model identification, model estimation, model testing and evaluation, and model modification or re-specification) common to the conventional SEM process. The modification provided by the chapter adds a data collection stage as a prerequisite for the model identification stage, and a report writing stage to finalize the SEM analysis and practices. This improvement to the SEM process allows for use of analytic devices to analyze causal complex models. The benefit of this chapter is that it provides a roadmap for business advisors in their efforts to use SEM for decision support in which the addition of more complex business analytics can be considered.

In their chapter entitled “An Integrated Fuzzy VIKOR Method for Performance Management in Healthcare,” Shekarian, Abdul-Rashid, and Olugu provide a ranking solution for medical laboratories using fuzzy theory. It starts with a literature review, highlighting the application of the MCDM method and fuzzy set theory in health care systems. A brief explanation of fuzzy set theory basic concepts is then presented, followed by an overview of VIKOR method details. Fuzzy set theory is an appropriate tool to quantitatively represent and manipulate imprecision in decision making problems; the multi-criteria decision making method, VIKOR, aids the decision maker in ranking a number of alternatives by examining their performance scores in the presence of a set of conflicting criteria.

The proposed method for medical laboratory ranking, which combines fuzzy set theory and VIKOR, is explained as a six-step process. A case study, which aims to choose the best medical laboratory among three candidate laboratories based on the ISO 15189: 2003 medical laboratory requirements for quality and competence, is then illustrated to showcase the effectiveness and efficiency of the proposed model. This case study proposes to be a valuable and effective contribution in enhancing both qualitative and quantitative criteria in the field of medical laboratory services. The benefit of this chapter is that it provides a ranking solution for medical laboratories that ensures redefinition of competition towards offering better clinical laboratory services; this, in turn, will boost the quality of health care services, in general.

In their chapter entitled “An Analytical Algorithm for Delphi Method for Consensus Building and Organizational Productivity,” Zahidy, Azizan, and Sorooshian present a practical algorithm for the application of the Delphi method. It starts with a literature review of the Delphi Method, highlighting its origin and use in many complex areas where a consensus is to be reached. The Delphi Method is described as utilizing an iterative feedback technique with a group of experts; several rounds of intensive questionnaires are used to generate a series of qualitative and quantitative data for analysis. The ultimate goal of the Delphi technique is to obtain as many high quality responses and opinions as possible on a given issue from a panel of experts to enhance decision making.

The chapter outlines a general structure of the Delphi process that can be applied in research and decision making. It then presents details of the various Delphi process procedures, suggesting modifications on some of those procedures based on continued literature review and the authors’ practiced experiences in conducting a Delphi study. The extensive literature review threaded throughout the chapter identifies a lack of consistency and standard procedures for the Delphi method’s application. The benefit of this chapter is its guidelines for better understanding of the philosophy behind the Delphi study, for appropriate application of the modified Delphi process, and for design of Delphi process procedures, namely, the questionnaire, pilot study, instrument reliability and validity, expert panelist selection, panel size, iteration size and consensus size.

In the chapter entitled “New Product Development and Manufacturability Techniques and Analytics,” Smith presents a case study that evaluates new product development (NPD) techniques integrated
into a product development process by a service and manufacturer supplier to meet its NPD goals and achieve better supplier and customer relationships. It begins with an overview of the role of technology and analytical approaches in manufacturing, highlighting websites and scanning equipment, which not only provide a direct contact between the organization and its customers, but also present an opportunity for innovation in both the manufacturability and delivery/sell of products. New product development is then discussed in more detail. Effective new product development strategy is essential for the success of a service or manufacturing company but management techniques used to achieve successful product development results can vary from one company to another. It is for this reason that the author sets out to investigate the most effective set of tools and/or processes to efficiently transition from one product to another.

The author uses a qualitative business case study methodology to evaluate NPD techniques at Forest City Technologies, Incorporated (FCT), an international company involved in production within the R7D environment. The case study sets out to show how FCT integrates specific components into its product development process to meet its NPD goals and achieve better supplier and customer relationships, using insight gathered via interviews conducted with the company’s product development and materials purchasing management. The benefit of this chapter is a thorough understanding of one company’s NPD process and the strategies, techniques and component integration within its NPD process that lead to the positive outcomes attained by the company due to its success in achieving its new product goals.

In their chapter entitled “Transformation of CRM and Supply Chain Management Techniques in a New Venture,” Ditizio and Smith present a case study of a new startup dealing with customer relationship management (CRM) embedded systems requirements and analytics and issues of supply chain management (SCM) performance dealing with issues of integration and collaboration for a new business venture. It starts with an overview of customer relationship management (CRM), highlighting its evolution, implementation, and benefits. CRM as a strategy aims to maintain long-term relationships with customers. An efficient CRM system is comprised of several modules with the analytic and operational CRM modules providing fundamental functions. The analytic module evaluates customer data and patterns of transaction for the improvement of customer relationships. Benefits are achieved through technology-enhanced CRM systems; patterns in consumer behavior can be detected, items can be tracked, customer experience can be enhanced; cross-selling and up-selling can be facilitated; sales forecasting can be improved, and customer loyalty can be strengthened. Technology-based CRM can help a company gain a competitive edge. It is for these reasons that the authors set out to examine the implementation of CRM systems and analytics as well as SCM considerations in the new startup of the Hard Rock Rocksino at Northfield (HRRNP).

The authors use a qualitative business case study approach to guide their exploration of HRRNP using a variety of data sources, namely, literature research, interviews with upper management, and personal observations. The case study starts out by demonstrating the success of management’s commitment to full integration of the supply chain and operations management techniques. It then highlights the importance of CRM-related operations and analytics for attracting and creating value for the customer. The benefit of this chapter is a thorough understanding of one company’s SCM and CRM strategic initiatives, and its ability to deal with challenges associated with the transformation/refinement of SCM and CRM systems in a continuous improvement and lean management approach.

In their chapter entitled “A Hybrid AHP-ELECTRE I Multicriteria Method for Performance Assessment and Team Selection,” Khatrouch, Kermad, Mhamedi, and Boujelbene propose an evaluation model
to help decision makers in a team selection problem. The model uses two Multi-criteria Decision Model (MCDM) methods: Analytical Hierarchy Process (AHP) and ELECTRE I. The chapter begins with a detailed description of AHP and ELECTRE I. AHP is a decision approach designed to solve complex multiple criteria problems involving qualitative decisions; the purpose is to determine the relative importance of a set of activities in the multi-criteria decision problem. ELECTRE I aims at reducing the size of the alternatives set in a multi-criteria problem, exploiting the dominance concept. A proposed model for team selection is then presented with a detailed explanation of the four stages of the model. The proposed model combines the two methods of MCDM, (AHP and ELECTRE I), in order to help the decision maker choose the best team. AHP is used to determine weights for each criteria and ELECTRE I is applied to evaluate the alternatives combining all criteria.

To assess the computational tractability and efficiency of the developed model, the model was tested on a set of data collected from the ‘Habib Bourguiba’ Hospital in Tunisia. The approach led to the determination of the best team with understanding of the outcomes presented in the form of a graph. The benefit of this chapter is the assessment model that it provides decision makers in the selection of an optimal team.

In their chapter entitled “Predictive Modelling and its Role in Effective Health Informatics Deployment,” Ricci and Tamburis present the works they did for the LUMIR Project. This chapter introduced Longitudinal Electronic Healthcare Record (L-EHR) handled by the LuMiR system. They also discussed its implementation in the Basilicata Region of Italy. The primary goal of LuMiR is to build a system that can be accessed by all healthcare providers and their support staff including GPs, lab analysts, nurses, pharmacists, social workers, etc. They accomplish this by implementing a timely “infostructure.” They also propose a mathematical model that deals with all the possible issues, both technical and political and can give possible optimal solutions.

In their chapter entitled “Analytics Overuse in Advertising and Promotion Budget Forecasting,” Güçlü and Canela study the effect of information overload and its effect on marketing spending. They conduct a longitudinal experiment that shows that “firms employing simple marketing analytics are less prone to increase their marketing expenditures due to the fear of losing customers, and have a lower expectancy that their competitors will increase their brand-level advertising and promotional expenditures, compared to firms using a combination of simple and complex marketing analytics.”

In the chapter entitled “Mastering Business Process Management and Business Intelligence in Global Business,” Kasemsap describes the concepts of Business Process Management (BPM) and Business Intelligence (BI) and how they can be used to detect significant events and trends that a business faces and also to come up with strategies to adapt to them. The author describes how BPM and BI can be used by companies to be competitive in a global business environment.

In their chapter entitled “Information and Communication Technology Impact on Supply Chain Integration, Flexibility and Performance,” Talamantes-Padilla, García-Alcaráz, Maldonado-Macias, Alor-Hernandez, Sanchéz-Ramírez, and Hernández-Arellano study the idea of integration and performance analysis in supply chains. They analyse the impact of information and communications technology (ICT) on Supply Chain Integration. They analyse four latent variables that can be used to test ICT integration, SC integration, SC flexibility and SC performance. A survey of 284 managers in companies located in Cuidad Juarez, Mexico was conducted. The results were used to generate a structural equation model in order to learn the relationships between variables.
In their chapter entitled “A Causal Analytic Model for Labour Productivity Assessment,” Kumar, Singh and Singh, discuss five drivers of labour productivity that were developed by the Indian government and those of the devolved administrations. These five drivers were adopted as a part of a policy framework for boosting regional productivity. They use structural equation modelling to see how the five drivers are related to each other. They show that spending more on research and development and workforce development increases labour productivity. Workforce development includes increasing capital-worker ratio and the percentage of highly qualified workers. They also show that promoting entrepreneurship has a positive relationship on regional labour productivity and regulatory barriers seem to have no effect, positive or negative on regional labour productivity.

In their chapter entitled “Effective Tools for Improving Employee Feedback During Organizational Change,” Sedej and Justinek consider the importance of timely and relevant feedback on Organisational change and productivity. Organisations have a wide range of internal communication tools at their disposal in order to effectively realize their goals, strategy and vision. The challenge does not lie in the use of all available internal communication tools, but in the optimal selection that will be the most suitable to solve the organizational problem.

The keystone of organizational change lies in internal communications, and employee communication is a pivotal element in achieving business success. They surveyed 105 employees at various organizations that have direct knowledge of internal communications. They considered 10 key communication tools. Of the 10 key internal communication tools listed, electronic and verbal communication tools dominate.

They show that in order to get the best results in communicating change, it is often necessary to deliver the message several times using different internal communication tools. After each internal communication especially during process of change, it is necessary to ensure a relevant follow up with possibilities for feedback to verify the employee’s level of awareness, understanding as well as their emotional reactions and commitment to include it daily work.

In their chapter entitled “A Conceptual and Pragmatic Review of Regression Analysis for Predictive Analytics,” Kalaian, Kasim, and Kasim present a conceptual and practical overview of regression analysis which is one of the most commonly used modeling tools used to perform predictive analytics. The conceptual overview provides analysts with the skills necessary to understand and use regression analysis. The methods that are covered in the chapter are: (1) Simple Linear Regression and (2) Multiple Linear Regression. They describe in detail these methods and discuss issues related to them like the correlation coefficient, the coefficient of determination, scatterplots and statistical significance of the coefficients.

In their chapter entitled “Student Retention Performance Using Absorbing Markov Chains,” Crossen explores and analyzes student retention within an arbitrary university setting using absorbing Markov chains. The researcher formulates two cases which account for freshman recidivism and increased enrollment of incoming freshman. He develops the research progression by establishing the baseline theory of mathematical modeling using the conceptual and theoretical framework for stochastic processes, discrete random variables, and the memoryless properties of Markovian analysis. In this development, conditional probabilities are reviewed to build toward advancing the concepts of state transition diagrams and retention models, in general. More specifically, the author formulates 6-year transition probabilities in order to analyze the long term probabilities, absorption time, and expectation times within each state classification across the both cases. Three period moving averages and seasonality forecasts are integrated to discover potential linear relationship of the data as it sequences through its life-cycle.
In their chapter entitled “An Analytical Employee Performance Evaluation Approach in Office Automation and Information Systems,” Kalhori and Kargar argue that one of the most important issues in human resource management is performance evaluation. They argue that there is a lack for systematic and quantitative approaches for performance evaluation. They focus on issues such as incomplete information, subjective and qualitative metrics, and also the difficulty of evaluating the performance and present an approach for quantitative and automatic evaluation of employee performance using office automation systems. They show that the automatic employee performance evaluation system is a discrete dimension for employee performance evaluation systems.

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REFERENCES