

HUMAN RESOURCES ANALYTICS FOR BUSINESS MANAGERS

Kankana Mukhopadhyay

Human Resources Analytics for Business Managers

Human Resources Analytics for Business Managers

By

Kankana Mukhopadhyay

**Cambridge
Scholars
Publishing**



Human Resources Analytics for Business Managers

By Kankana Mukhopadhyay

This book first published 2023

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Copyright © 2023 by Kankana Mukhopadhyay

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

ISBN (10): 1-5275-2435-3

ISBN (13): 978-1-5275-2435-4

**In Honour of
and
Dedicated to**

Late Amal Kumar Mukhopadhyay (Baba)
Late Jharna Mukherjee (Ma)

CONTENTS

List of Figures and Tables	ix
Preface	xii
Acknowledgments	xvi
Foreword	xvii
By Prithwis Mukerjee, PhD	
Why Read This Book?.....	xix
About the Author	xxi
Chapter 1	1
HR	
Chapter 2	8
Why is HR Analytics Important?	
Chapter 3	11
Employee Life Cycle and HR Analytics	
Chapter 4	19
HR Analytics Maturity Model	
Chapter 5	31
HR Metrics	
Chapter 6	108
Creating HR Dashboard using Microsoft Excel, TABLEAU, Power BI, and Looker Studio	
Chapter 7	124
Applications of Machine Learning Tools in HR Problems	

Bibliography	154
Index	159

LIST OF FIGURES AND TABLES

Figures

- 1.1 Change in the role of HR over time
- 1.2 The HR Value Chain
- 1.3 HR Impact Model
- 3.1 Employee Life Cycle and the Critical Measures
- 4.1 Analytics Maturity Model
- 4.2 HR Analytics Maturity Levels and Tools
- 5.1 HR Metrics in Sync with the Firm's Goals
- 5.2 HR Functions
- 5.3 Recruitment Funnel
- 6.1 HR Dashboard in Excel
- 6.2 Dynamic HR Dashboard in Excel
- 6.3 Dynamic HR Dashboard in TABLEAU
- 6.4 Dynamic HR Dashboard in Power BI
- 6.5 Dynamic HR Dashboard in Looker Studio
- 7.1 Employee Survival Analysis
- 7.2 Example of SEM Application
- 7.3(a) Decision Tree (Years with Current Manager)
- 7.3(b) Decision Tree (Years at Company)
- 7.3(c) Beautiful Tree (Years at Company)
- 7.4(a) Boxplot (to see the outliers)
- 7.4(b) Confusion Matrix
- 7.4(c) ROC Curve
- 7.4(d) Performance Plot
- 7.5 Association Analysis
- 7.6 Survey Comments for Sentiment Analysis
- 7.7 Sentiment Analysis
- 7.8 AHP Analysis Layout
- 7.9 DEMATEL Analysis Layout
- 7.10 TOPSIS Analysis Layout
- 7.11 VIKOR Analysis Layout
- 7.12 Interpretation of Naïve Bayesian Classifier using Excel

Tables

4.1	Analysis at different levels of HR Analytics Maturity Levels
5.1	HR Metrics (Workforce - Demographic)
5.2	Workforce Generations
5.3	HR Metrics (Workforce - Structural)
5.4	HR Metrics (Workforce - Tenure)
5.5	Sample Dataset (Workforce)
5.6	HR Metrics (Acquisition - Recruitment)
5.7	HR Metrics (Acquisition – Internal Movement)
5.8	HR Metrics (Acquisition – Staffing Effectiveness)
5.9	Sample Dataset (Acquisition)
5.10	Data Interpretation (Recruitment Source Breakdown)
5.11	Data Interpretation (Staffing Rate – Male/Female)
5.12	Data Interpretation (Marital Status)
5.13	Data Interpretation (Employment Level Staffing Breakdown)
5.14	Data Interpretation (New Hire Failure Rate)
5.15	HR Metrics (Performance & Career Management – Performance Management)
5.16	HR Metrics (Performance & Career Management – Career Management)
5.17	Sample Dataset (Performance & Career Management)
5.18	Data Interpretation (Performance Rating Distribution)
5.19	Data Interpretation (Performance-Based Pay Differential)
5.20	HR Metrics (Training & Development – Training)
5.21	HR Metrics (Training & Development – Education and Development)
5.22	Sample Dataset (Training & Development)
5.23	HR Metrics (Compensation & Benefits – Compensation)
5.24	HR Metrics (Compensation & Benefits – Benefits)
5.25	HR Metrics (Compensation & Benefits – Equity)
5.26	Sample Dataset (Compensation & Benefit)
5.27	HR Metrics (Turnover)
5.28	HR Metrics (Employee Engagement)
5.29	HR Metrics (Cost of Turnover)
5.30	Data Interpretation (Acquisition)
5.31	HR Metrics (Productivity)
5.32	HR Metrics (Structural)
5.33	HR Metrics (Innovation)
6.1	Data Interpretation (Acquisition)

- 6.2 Data Interpretation (Staffing Rate – Male/Female) Data Interpretation (Position-Wise Male/Female Percentage)
- 7.1 RFM Framework
- 7.2 RFM Analysis for Employee Classification
- 7.3 RFM Analysis Scale
- 7.4 Interpretation of RFM Analysis
- 7.5 HR Strategy related to the result of RFM Analysis
- 7.6 Sample Dataset for Naïve Bayesian Classifier

PREFACE

During my professional journey, the course that excited me the most has been HR Analytics. I missed this course during my MBA but got the opportunity to explore it while teaching in an autonomous B-School. I was brought up in a family which often discussed sports and politics over the dinner table. The pros and cons of the various initiatives taken by political leaders to run the state, or the country were analysed and often compared to the promises made by them to the society. The same applied to the sports fraternity. I have seen my dad engrossed in discussing and analysing the results of football matches held between local football clubs with our uncles and even suggesting how to improve the players' performance in the next attempt... although those findings, and suggestions, never reached the club owners or coaches, nevertheless, that triggered my interest in discussing and analysing the situations happening around me and deriving meaningful insights out of analysis for my improvement.

When I was asked to teach *HR Analytics* for the first time, I was clueless about where to start. Simultaneously, I was teaching Strategic Human Resource Management, which drew my immediate attention not only to unfold HR's contribution in creating value for the business but also to the way their contribution can be measured and improved. This perspective helped me in exploring how human contribution can be quantified.

I was tempted to write this book to express some of my excitement about HR Analytics, a subject that I felt any person with an interest in business management would love to explore, learn, and execute. The objective of this book is to convey the way in which people are perceived within organizations, how their contributions are channelized into productivity, and their potential utilized to produce differences in this competitive world with analytics interventions.

This book is devoted to applications of different tools and techniques in analysing HR issues with sample datasets. Although the applications of Analytics are timeless, with the applications of certain Machine Learning tools, the performance of the HRM operative functions can be enhanced to a great extent and the same has been established in this book in a step-by-step manner.

How is this book organized?

I attempted to write a crisp and user-friendly book with a data-driven approach. The contents of the book, I believe, will help the user to understand how the pieces fit together.

Introduction

Chapter 1, “*HR*”, introduces to the user the HR Value Chain and shows how HR can create value for the organization that competitors are unable to duplicate. Proper HR enablers, streamlined HR processes, and commensurate HR strategy, as well as measuring the HR outcomes and channelizing them to business goals, can be the success mantra for a company in a competitive environment. The chapter previews some of the critical HR issues that bother business leaders, such as a high attrition rate, high attrition cost, low employee engagement, high employee cost, insufficient employee utilization, and their impacts on effectively accomplishing the promised business goals.

Creating the HR Analytics platform

The next three chapters provide an explanation of how to create the scope and platform for the successful implementation of Analytics in business, to derive critical and meaningful insights to support decision-making.

Chapter 2, “*Why is HR Analytics Important?*”, examines how HR Analytics is a facilitating tool for data-driven decision-making. This is explained in a question-and-answer manner.

Chapter 3, “*Employee Life Cycle and HR Analytics*”, presents how in different parts of the Employee Life Cycle viz, acquisition, development, and retention, with the right HR measures such as renege cost, cost of employee turnover, performance appraisal, right training interventions, etc., the contribution of human resources can be controlled and enhanced.

Chapter 4, “*HR Analytics Maturity Model*”, explains the different phases of the analytics maturity model and how the company’s analytic maturity can be assessed to make it a useful tool for business growth.

HR Measurement

Having examined how to do the right things right for HR, the book considers the yardsticks with which it is to be ensured that the HRM activities are being performed as decided.

Chapter 5, “*HR Metrics*”, explains the importance of implementing HR metrics (HRM) in ensuring HR goal accomplishments. The HR metrics are discussed and explained with a formula for each HRM operative function. The chapter helps the user to understand how to execute the HR metrics and derive meaningful insights to support HR decisions with sample datasets.

HR Data Visualization

A dashboard is a facilitating tool for understanding the situation and hidden patterns among the concerned variables represented in terms of pictures, graphs, or charts.

Chapter 6, “*Creating HR Dashboard using Microsoft Excel, TABLEAU, Power BI, and Looker Studio*”, unfolds data visualization with dashboards using different tools. A step-by-step approach is adopted in this chapter to explain how to create a dashboard to derive extensive insights for better decision-making.

HR Analytics Applications

Chapter 7, “*Applications of Machine Learning Tools in HR Problems*”, orients the user to different tools and techniques of Machine Learning (ML)

and their applications in solving HR problems. Most of the ML tools are theoretically explained with examples and a few are explained with sample datasets and R Studio code. The interpretations of models like Logistic Regression, Decision Tree, and Naïve Bayesian Classifier are explained with tables and visuals.

Supplements

This book provides a lot of supplements for users, instructors, and students. A lot of sample datasets are given in Chapter 5, “*HR Metrics*”, for understanding and practice. The datasets and the related R codes used in Chapter 7, “*Applications of Machine Learning Tools in HR Problems*”, have been uploaded to GitHub to be used by readers for reference.

ACKNOWLEDGMENTS

I am indebted to Prof. Prithwis Mukerjee, who inspired me to write this book and has kindly written the foreword of this book. I am grateful to Prof. Jaydip Sen for guiding me in this process of book writing. I am thankful to all my colleagues for the perspectives they have brought from time to time during our lunchtime discussions and to the students with whom I had a lot of interactions in which valuable perspectives were brought. I am obliged to my family for the cooperation and support rendered.

Kankana Mukhopadhyay

Program Codes: The program codes associated with the chapters of this book are available at the following GitHub link:
<https://github.com/kankana1976/HR-Analytics>

FOREWORD

In the feudal era, when the economy was entirely dependent on agriculture, wealth was a function of land and labor. With the advent of the industrial revolution, wealth became a function of man, machine, and materials. Now in the transition to a post-industrial society, the concept of men embracing women, gender nonconformity, and other forms of intelligence, information becomes an important material to work with and machines mutate to reflect this new reality. Nevertheless, till the advent of the singularity when man and machine will converge and will be seen as two aspects of the same phenomenon – as in the convergence of mass and energy – humans remain central to the success of any commercial enterprise. Hence managing people – it is rather demeaning to refer to them as human resources – continues to be a key function in the process of managing a business.

Historically, people have been managed or controlled by coercion. The process was initially physical, as in slaves and whips, but later became mental or circumstantial where the termination or lack of employment was felt to be as traumatic as physical abuse. But today, because of the diversification and expansion of employment opportunities beyond traditional areas, we see an increase in the mobility of the working population and the ability of people to deliver services remotely over the Internet. In this rapidly evolving economy, coercion as a means of control loses its effectiveness and needs to be replaced with something consensual, convenient yet cost-effective. Managers must find and retain people who are competent at a price point that the company can afford, and employees must find employment to be lucrative enough to join and remain in. This may sound obvious, and it is, but it leads to the next and not-so-obvious issue. How to make this happen? The *what* is always easy if you do not have to do anything about it. It is the *how to* that is the real challenge in today's business environment. *How to* locate, recruit and retain useful employees without busting the company's bottom line?

Dr. Kankana Mukhopadhyay's short and peppy book on HR Analytics offers interesting insights into how managers can control their employees in today's world. What you cannot measure, you cannot control and so the starting point is to locate data that can be used to delineate the employee and define the environment in which they operate. Unlike in the past, this data is not just numeric. One simply cannot have a simple set of metrics to measure the productive output of an employee and connect it to a single financial reward. The world is much more complicated, the data is multidimensional and the process of analysing this data and arriving at actionable insights, calls for tools and techniques that need to be borrowed from other disciplines of management.

Management literature has never been found lacking in buzzwords like quantitative techniques (QT), mathematical models of management (3M), and data-driven decisions (3D). While it may be easy for practicing managers to be condescending towards such jargon, they would be ignoring these developments to their utter peril. While intuitive approaches to managing people might have worked in the past, the volatility, uncertainty, complexity, and ambiguity (jargonized as VUCA) of the new world, calls for a dramatically different approach. This is where we need to add disciplines like data science and techniques like machine learning (ML), deep learning (DL), and eventually artificial intelligence (AI).

The prerequisite for this approach is a set of software tools that can capture, store, analyze, and report on vast amounts of data that are being churned out on a plethora of platforms and in a range of structured and unstructured formats. But what is more important is the ability to understand *how to* apply these tools to manage people in a manner that meets the goals of the organization. This *how to* is explained very elegantly, yet concisely, in this book.

Prithwis Mukerjee, PhD

Engineer | Programmer | Teacher | Author

Director, Praxis Business School

December 2022

WHY READ THIS BOOK?

The three broad dimensions of human resource management are acquisition, development, and retention. The concern is how to perform these broad functions and sub-functions efficiently and effectively to contribute to organizational goals in a better way. HR Analytics is a facilitating tool that ensures the effectiveness of HR operative functions by measuring the contribution of the workforce. This helps the company in formulating the right HR strategies to achieve the desired business outcomes more effectively than its competitors.

HR Analytics enhances the ability of managers to handle HR data in a more structured way which previously they were not exposed to. This helps them in making data-driven HR decisions to derive better performance advantages through human resources.

This book takes a step-by-step approach to unfold the implementation of HR Analytics tools in the operative functions of HRM to enhance the throughput of each function by linking them to business outcomes. Furthermore, lots of sample datasets are used to make readers conversant with the relevant HR measures.

The HR measures help in doing a gap analysis of expected performance and actual performance to derive critical insights to enhance workforce contribution to business goals.

The data-driven approach of the book helps readers relate the execution of HR measures with parameters that are required to be considered for future HR prediction and prescription to HR issues like, how to control attrition, reduce HR cost and improve workforce performance, etc.

The outcomes of HR measures are explored further with visualization tools like Tableau, Power BI, etc., to understand the hidden patterns and interrelationships among variables.

The book also covers the applications of Machine Learning Tools in HR issues with relevant examples. A few ML tools are discussed in which analysis of HR data shows how to derive critical and valuable insights to support HR decision-making.

Overall, this book enables the reader to practice how HR Analytics can be useful to support business managers in taking superior data-driven workforce decisions and linking the same to business deliverables.

Kankana Mukhopadhyay

ABOUT THE AUTHOR



Kankana Mukhopadhyay is currently a professor of Human Resources Management at Praxis Business School, Kolkata, India, she earned a bachelor's degree in Physics from University of Calcutta, a master's degree in Human Resources Management from Indian Institute of Engineering Science and Technology, Shibpur, another master's degree in Computer Science from Indira Gandhi National Open University, and a Ph.D. in Management Science from Indian Institute of Engineering Science and Technology, Shibpur. Her doctoral dissertation examined the use of IT-Enabled Competency Management with the application of Artificial Neural Networks in assessing employee competencies. She has guided one doctoral thesis in return-to-work initiatives for facilitating the women talent pool from Bharathiar University, Coimbatore.

Since joining the faculty of the School of Management Sciences at the Indian Institute of Engineering Science and Technology, Shibpur in 2005, she has taught all levels of organizational behavior and HRM courses.

She has published several articles in national and international journals of repute. She has also authored a few book chapters.

Her research interests include HR Analytics, Digital HR, HRIS, Strategic HR, Competency Mapping, Performance Management, etc.

Kankana Mukhopadhyay and her husband have a son, Sourish. Her hobbies include singing and painting.

CHAPTER 1

HR

Human Resources are acquired by organizations to utilize their potential and performance in exchange for compensation and other rewards for the successful accomplishment of organizational goals. Human Resource Management is a comprehensive set of activities or functions to acquire the right talent, developing and retaining them to utilize their contribution to accomplish business goals in a faster and more effective way. The contribution of human resources in an organization is vital and critical since it makes other resources functional and operational.

HR Management sets a solid foundation for the vision, mission, values, goals, and objectives of a firm with a focus on people, processes, and performance. With VRIO analysis, several pieces of literature on resource-based theory establish that Human Resources have a strategic impact (Essenberg, 2017). HR creates Value that is appreciated by the stakeholders, and this provides competitive equality; if Human Resources are Valuable and Rare in strategic thinking, talent, and implementation, the combination provides a competitive advantage. If resources are Valuable, Rare, and Inimitable in a way people think, perceive, behave and execute the business ideas in an Organized way and the combination is difficult for competitors to copy, this can provide a sustained competitive advantage.

To effectively manage the contributions of HR to achieve business goals, the leaders need to investigate the way the following three broad operative functions of human resource management are performed:

- a. Acquisition;
- b. Development; and
- c. Retention.

HR management starts with acquiring the right workforce; developing their ability, skill, knowledge, and performance to derive performance advantages that competitors are unable to duplicate (Grant, 2009). In acquiring strategic competitive advantage, the most challenging and critical human resource function is retaining high-performing talents and channelizing their competencies and contribution to expected business outcomes (Kankana, Jaya, & N.R., 2011).

Considering today's economic volatility and uncertainty, every aspect of the business is being re-visited and re-examined for its promised value and the way it contributes to the profitable growth of the organization. The first question needs attention is ***"How does HR add value to a business?"***

Traditionally, HR has been perceived with a cost center approach, i.e., the company incurs costs to acquire, develop, and compensate the human resources for accomplishing the business goals. With the advent of Big Data and Business Analytics, HR is being perceived with an investment center approach, with a focus on transforming the contribution of HR to a sustained competitive advantage by investing in the development of their skill sets, knowledge, and job-related behaviors.

In this endeavor, with HR Analytics interventions, the throughput of HRM operative functions can be measured and improved. The existing workforce can be classified better in terms of performance and potential and the right HR strategies can be formulated by deriving critical insights to improve their contribution to gain performance advantages which the competitors are often unable to copy (Kankana, 360-Degree Appraisal – A Performance Assessment Tool, 2006).

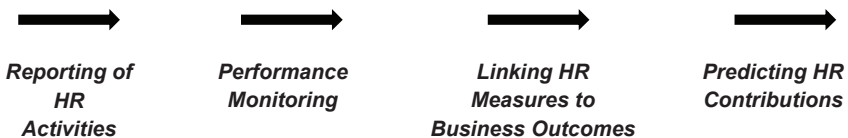


Figure 1.1: *Change in the role of HR over time*

We have seen in the past that the functioning of HR transitioned into different phases; starting from simple monitoring of human resources

activities to report generation to support managers' queries. It was later realized that only monitoring and report generation is not enough in improving the throughput of HR functions. **Measures** became the need of the hour with which the performance of HR operative functions can be analyzed and improved. Measures give results, identify problems, and create a platform for further investigation. With time, business managers realized that only diagnosing the problem by doing root-cause analysis will not lead them to predict what will happen next and how to control the adverse impact of their prediction. Business managers understood, to predict "*what will happen in future?*", they need to analyze past data to identify variables that may impact future performance. These impacting variables need focus and are to be accommodated in a model for predicting what will happen next and provide a solution to control the adverse effects of the impacting variables on HR issues (Uppal, 2021).

Let's take an example, suppose a company's employee cost is 70% of its total cost. This is a manager's nightmare. The management is desperate to reduce employee costs to increase profit margin. To do that, business managers need to carefully investigate the apportionment of the employee cost in various heads and come up with correct measures to reduce and control costs. This process will help business managers not only in predicting the future anticipated employee cost but also indicate how to control costs with proper regulations.

$$\textbf{Employee Cost} = \textit{Cost of Acquisition} + \textit{Cost of Development} + \textit{Compensation Cost} + \textit{other Overhead Costs}$$

Business managers need to understand how to leverage data and figure out the possible avenues of cost control with the help of analytical tools and methods to better utilize the workforce and get the best value for the business.

According to leading thinkers like Jac Fitz-enz, an HR organization will never be able to utilize its full potential unless it can describe the role of human resources in creating value and ensuring investment in return (Frangos, 2002). Hence, it is of prime importance for business managers to identify and understand the relationship between business outcomes and the

contribution of HR. This can be linked if we consider the following model (a concept adopted from the article *The HR Value Chain: An Essential Tool for Adding Value to HR* by Erik van Vulpen, 2018). The model depicts how HR outcomes are ultimately impacting business outcomes when measured from three dimensions of a Balanced Scorecard: financial, customer satisfaction, and processes (Vulpen, 2018).

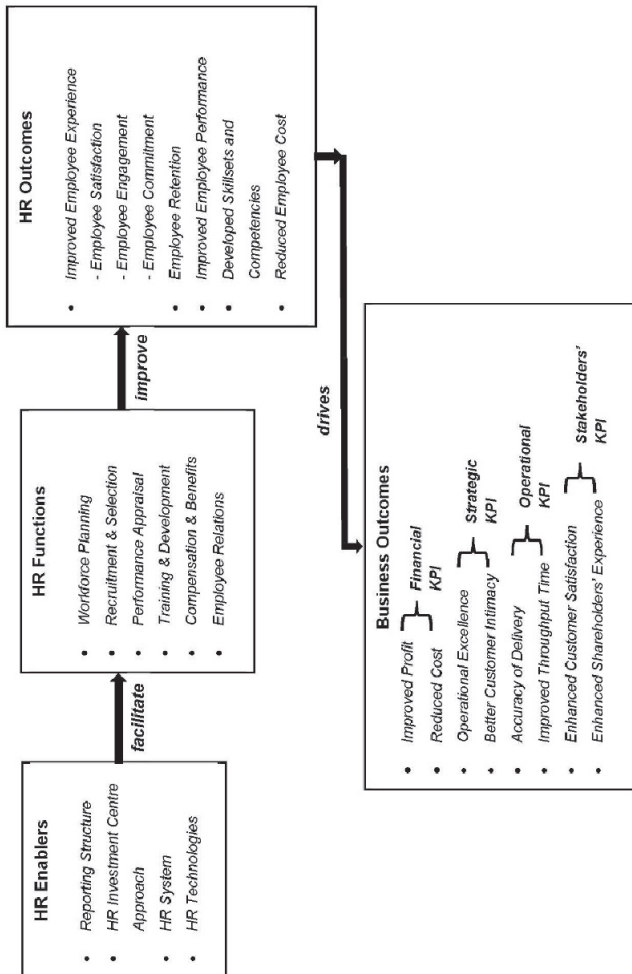


Figure 1.2: The HR Value Chain

HR enablers create a platform for the smooth functioning of HR activities. The proper execution of **HR activities with calculated measures** ensures better HR outcomes in terms of better employee engagement, employee retention, etc., and workforce cost is also reduced to a certain extent. The question remains.

“With a better level of HR outcomes can the company achieve business goals in a better way?”

HR outcomes can ensure that the company is earning higher profit and turnover by optimizing HR operating costs, with better employee engagement and retention. Furthermore, with a higher level of workforce competence and performance, the accuracy of delivery of product or service quality improves with reduced throughput time. This ultimately leads to higher customer and promoter satisfaction and experience. The same is explained with the following figure (a concept adopted from the article *How HR Can Boost Its Business Impact* by Wouter van Essenberg, 2017).

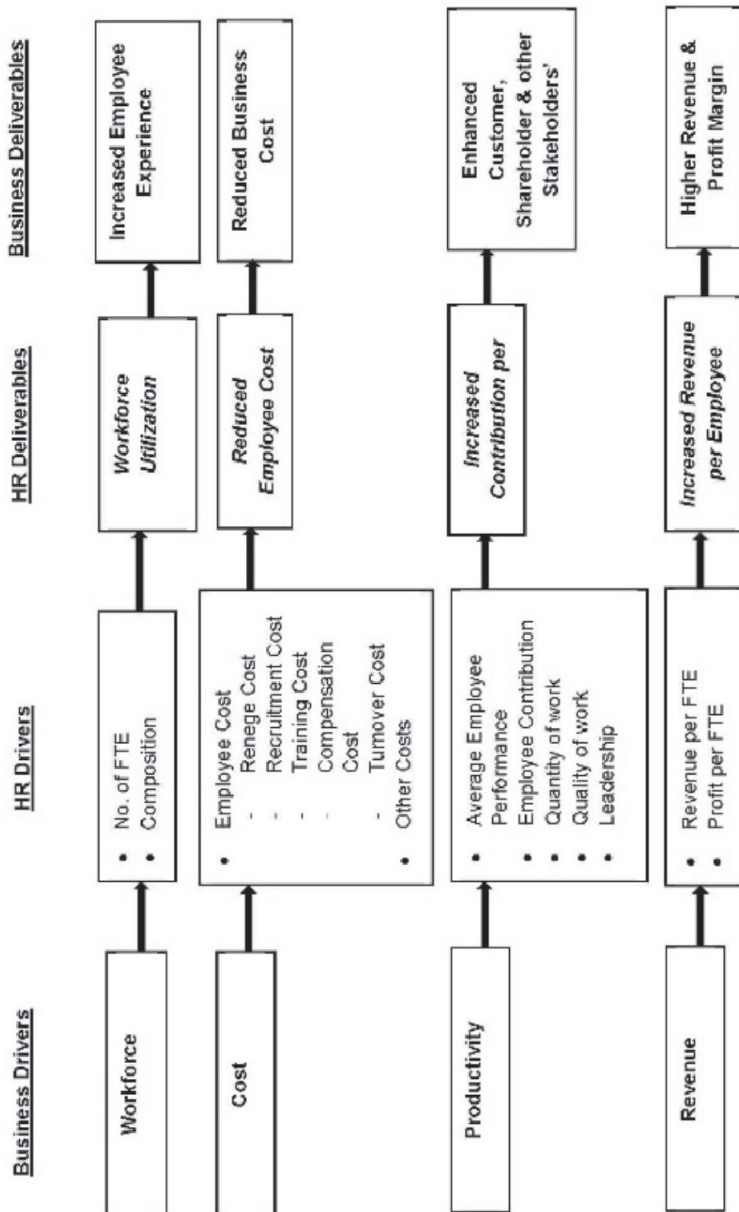


Figure 1.3: HR Impact Model

The business drivers like *Gross Margin*, *Productivity*, etc., are forcing business managers to check how *Cost Per Full-Time Employee* can be reduced further and better *Employee Utilization* can be assured (Nyberg, 2010). These measures are further triggering the questions like –

“Can we reduce our salary offer to a certain extent and increase the secondary benefits to control Attrition Costs?”

Or

“Can we have a relook at our Employee Productivity to check if our Employability is in question or if we are not utilizing human potential to the extent needed? If so, how to manage employee performance and develop them for leadership positions for better engagement?”

Or

“What percentage of our Total Cost is Employee Cost and how to reduce Cost per Hire, Cost of Training, and Cost of Compensation?”

To do that, HR must talk in quantitative terms and develop some measures and accountability tools.

CHAPTER 2

WHY IS HR ANALYTICS IMPORTANT?

Analytics plays a pivotal role in bridging the gap between promised outcomes and stakeholders' perceived expectations. It is a set of tools to analyze data to derive valuable insights for making decisions. It comprises:

1. Collecting data
2. Processing the collected data
3. Interpretation of processed data to derive meaning.

Analytics can be defined as a process that involves the use of statistical techniques (measures of central tendency, graphs, Regression Analysis, etc.), Information System software (Human Resource Information System, Decision Support System, etc.), and Operations Research tools (Markov Decision Processes, Linear Programming Problems, etc.) to explore, visualize, discover, and communicate patterns or trends in data. Put simply, analytics convert data into useful information.

Today's business decisions are data-driven. If data are properly analyzed and interpreted, they can be a source of competitive advantage that competitors may not be able to copy. HR data is no exception. Hence, HRM functions also need to talk in quantifiable terms. The better the analysis of HR data, the more effective the HR decisions are to improve the utilization of the workforce.

HR Analytics is a facilitating tool or a set of tools to analyze HR-related data to derive meaningful and valuable insights to effectively manage human resources for making better HR decisions to achieve business goals.

The business decisions are not solely based on leaders' intuition, experience, or expertise, but to a great extent are data-driven. It takes

business managers a position to justify their decisions supported by numerical analysis based on outcomes of different HR functions carried out in an organization. It enables the organization to measure the impact of HR functions on overall business performance. In this journey the following generic questions are addressed:

- a) Is the function necessary for the organization in terms of its contribution to business goals? If yes/no, why?
- b) What is the expected outcome of this function?
- c) What is its impact on other functions?
- d) How it can be improved?

But, before we get into details, we must answer the most fundamental questions in terms of the business position of a firm:

- Where are we?
- Where do we want to go?

These questions determine the competitive orientation of the firm and the projection of its future journey.

HR analytics help HR teams formulate HR goals, assess success in terms of performance advantages, and optimize HR processes so the company can focus on driving revenue. When used responsibly and effectively, HR analytics provide insights with which companies need to tackle difficult challenges like lack of diversity in the workforce, high renege costs, or a high turnover rate which is otherwise overlooked (Chaturvedi, 2016).

Holistically, HR Analytics creates value in:

- Ensuring human capital by creating value through better employee engagement (Kumar, Chebolu, & Babu, 2016).
- Social capital by social network analytics which gives better insights to business managers to instill a sense of togetherness.
- Identifying the sources of performance advantages by assessing competencies, tenure and the number of promotions individual employee has achieved, etc (Soundararajan & Singh, 2017).

- Leadership performance by discovering the leadership potential to ensure a fruitful succession pipeline for leadership positions (Suri & Lakhanpal, 2022).

HR Analytics is often used as synonymous with People analytics or Workforce Analytics which is a data-driven approach to managing people, specifically solving people's issues in Hiring, Performance Management, Employee Cost, Retention, etc.

CHAPTER 3

EMPLOYEE LIFE CYCLE AND HR ANALYTICS

Employee Life Cycle (ELC) is a HR model that identifies the different stages of how an employee advances in an organization and the role HR plays in optimizing that progress.

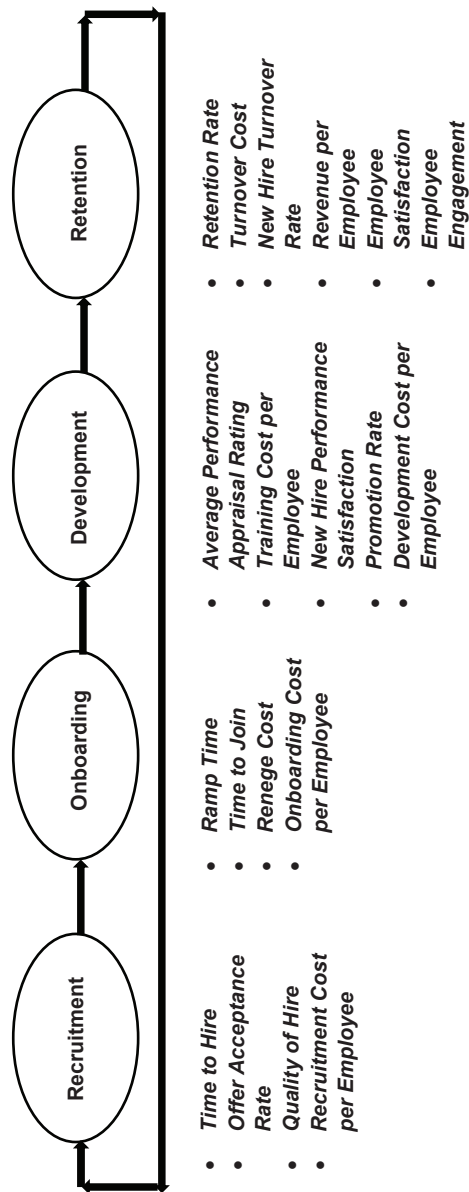


Figure 3.1: Employee Life Cycle and the Critical Measures

The Employee Life Cycle has three major following phases:

- i) **Planning and Acquisition**
 - Workforce Planning
 - Recruitment
 - Onboarding
- ii) **Development and Performance**
 - Learning
 - Performance
 - Rewards
- iii) **Engagement and Retention**

3.1 Planning and Acquisition

In this phase of ELC, workforce demographics and the costs associated with recruitment and hiring are analyzed to understand the possible provisions for minimizing cost and improving the recruitment and hiring process efficiency and effectiveness (Divatia, Tikoria, & Lakdawala, 2017). The following are some of the important measures of this phase:

- No. of vacant positions;
- Average time to fill;
- Offers accepted versus declined;
- Renege Cost;
- Optimize workforce mix and fulfillment plan considering workforce diversity;
- Predicted time to hire;
- Predicted offer decline rate;
- Assessing the performance of a candidate during screening, etc.

One of the critical components of Employee Cost is **Renege Cost**. Renege Cost is incurred by the company due to the non-joining of a candidate after accepting the job offer or delay in joining and also for unfilled positions (Tursunbayeva, Lauro, & Pagliari, 2018).

Let's take an example of **High reneging**. The concerns are:

- unfilled positions; and
- loss due to delay in joining or non-joining after acceptance of job offer.

The steps to calculate the **Loss** due to **reneging** for unfilled positions are as follows:

- **Annual Revenue Per Employee** = Annual Company Revenue/No. of Full-Time Employees
- **Daily Revenue Per Employee** = Annual Revenue Per Employee/260 Days*
- **Revenue Lost Per Unfilled Job per Day** = Daily Revenue Per Employee x Number of Days Positions are vacant
- **Total Revenue Lost for All Open Jobs** = Revenue Lost Per Unfilled Job per Day x No. of Vacant Positions

**Considering the average number of working days in a year is 260.*

Let's consider the following hypothetical situation:

- Annual Revenue = 100 Crore
- No. of Full-Time Employees = 30000
- No. of Vacant Positions = 950
- No. of Days the Positions are vacant = 33

Hence, the **RENEGE COST** for the unfilled position can be calculated as below:

- **Annual Revenue Per Employee** = 100 Crore /30000 Employees = 33333.33
- **Daily Revenue Per Employee** = 33333.33/260 Days = 128.20
- **Revenue Lost Per Unfilled Job per Day** = 128.20 x 33 Days = 4230.76
- **Total Revenue Lost for All Open Jobs** = 4230.76 x 950 = **40.19 Lakhs**

Renegé seems to be a major contributor to the company's loss. This revenue loss is quite high, and the possible causes should be diagnosed immediately (Yadav, Khanna, Panday, & Dasmohapatra, 2019).

- It is to be checked if the *Time to Hire* has increased to a significant amount.
- Classification of ***Renegé Yes*** and ***Renegé No*** of historical data using any of the Machine Learning algorithms will help in predicting who will renege or not join the organization etc.

3.2 Development and Performance

The next phase of ELC is Employee Development and managing their Performance. This phase has the following measures:

- a. Employee performance levels and comparing the same with Key Performance Indicators (KPI) to identify areas where the employee is doing well and areas in which the employee is unable to perform. The KPIs are derived from the Job Descriptions of each job role. *For example, for a Sales Manager profile, one of the most important KPIs can be Client Meeting to Sales Conversion Rate.*
- b. Employee categorization in terms of performance bands is an important measure which sets the basis for the execution of the right HR strategy for each band.
- c. Profile high performers and high potentials within the organization and frame appropriate motivational strategies (appreciation, reward, recognition, promotion, challenging job roles, etc.) for them to contribute more.
- d. The pay parity needs to be analyzed and should be linked to employee performance with proper Performance Based Pay Differential Plans.
- e. Analysis of compensation and benefits trends, flexible rewards, etc. to make employees better connected to their job role.
- f. Link capabilities and proficiency levels with the performance and assess gaps and identify the appropriate training interventions required for the right people.

- g. Measure the impact of engagement on business outcomes and identify key drivers and interventions.
- h. Maximize the anticipated monetary value of rewards, minimize cost, and enhance employee engagement (III, E., Levenson, & Boudreau, 2004).

Some of the important measures related to this phase of ELC for the Performance Based Classification of employees are:

- Average Performance Appraisal Rating;
- Effectiveness of Training Need Assessment;
- High Performer Rate;
- High Performer Growth Rate;
- Training Cost per FTE;
- Training Program Effectiveness;
- Training Hour per FTE;
- Performance Based Pay Differential;
- Effectiveness of Training Channel Delivery Mix etc.;
- Contribution per FTE (before and after the training program).

All the relevant measures are discussed with sample datasets in Chapter 5.

3.3 Engagement and Retention

This phase of the ELC has the following points to address with HR Analytics interventions:

- a. Investigation of unanticipated absenteeism patterns and the financial consequences of the lost man-hours.
- b. Determination of the drivers for absenteeism and their impact on attrition.
- c. Analysis of voluntary and involuntary attrition trends and patterns and create a platform to predict attrition risk at an individual level.
- d. Understand the retirement trend and link it to the successor pool to see if there is any possibility of a leadership vacuum.

- e. Analysis of engagement levels and trends, identify key drivers and limiters of employee engagement and articulate the financial value of employee engagement to business.

One of the most critical applications of HR Analytics is predicting attrition, especially the voluntary part of it. The major point of concern is **“You cannot afford to see the departure of your best contributors or a large No. of Employees”**. The general causes of Employee Turnover are:

- Restricted Growth Opportunities - denial of promotion of deserving employees.
- Job Dissatisfaction due to unchallenging job roles and incompatibility between employees and management.
- Wrong placement - an employee may think of himself as a misfit on a team of talented employees and superiors.
- Person Job Misfit - he thinks that his job is out of sync with his job description.
- Failing to meet the employer's expectation due to lack of skill, knowledge, and confidence and lack of management support in employee development.
- When an employee is unable to balance his work life with social or family life.
- Not satisfied with the compensation, benefits, rewards, and other employee-friendly policies, etc.

Let's figure out the quantitative impact of attrition:

- Literature suggests that the **cost of losing an employee** can range from 1.5 to 2.0 times the employee's annual salary,
- This cost includes:
 - Hiring Cost;
 - Renege Cost (if any);
 - Cost of Training or onboarding;
 - Cost for Learning and Development;
 - Revenue loss due to Ramp Time to Pick Productivity;

- Revenue loss due to lack of engagement from others because of high turnover;
- Revenue loss due to Higher Business Error Rates; and
- Revenue loss due to other General Cultural Impacts.

Literature suggests for critical employees (for example, C-Suite employees/Leadership roles), Turnover cost = 213% of the Total Compensation of that employee.

How HIGH is it for you?

Turnover Cost = Average Cost of Turnovers x Number of Turnovers (Exact Cost cannot be calculated as there are several Hidden Costs)

Annual Cost of Employee Turnover = (Hiring Cost + On-Boarding Cost + Development Cost + Unfilled Time Cost) x (No. of Employees x Annual Turnover Percentage)

Let's consider this with a hypothetical example:

- Annual Turnover is 11%
- No. of Employees = 150
- The recruitment Cost is 25 Lakhs
- The development Cost is 25 Lakhs
- To fill in one vacant position, investment is Rs. 50,000
- No. of Vacant Positions is 30
- For On-Boarding expenditure is 30 Lakhs

Therefore, the Annual Cost of Employee Turnover = $[(2500000 + 3000000 + 2500000 + (50,000 \times 30)) \times 150 \times 11\%]$ = 15.67 Crore

15.67 Crore is the Annual Cost of Employee Turnover

Through these insights, HR Analytics helps organizations in making smarter, more strategic, and more informed talent decisions. With HR Analytics interventions, business managers can make smarter hiring decisions which may eventually increase talent performance and contribution.

CHAPTER 4

HR ANALYTICS MATURITY MODEL

A company needs to assess its analytic maturity, i.e., “*Where are we in our Analytic Journey?*” The Analytics Maturity Model evaluates the analytic maturity of the company in terms of their degree of preparedness to move to the next level of the analytics maturity hierarchy (Baesens, Winne, & Sels, 2017). It comprises four phases:

- i) Descriptive Analytics
- ii) Diagnostic Analytics
- iii) Predictive Analytics
- iv) Prescriptive Analytics

4.1 Descriptive Analytics in HR

Raw data is not useful unless it is intervened and analyzed. It should be investigated to address what has happened to understand the pattern and the interrelationships of impacting variables to derive meaningful insights from past occurrences.

Descriptive Analytics uses raw data to derive insights. In this phase, the data is observed to deal with ad-hoc queries or for operational purposes, but the data is not used for anything specific. This stage has the following three sub-stages:

- i) **Data Collection (Collect and Gather relevant Data):**

Human resources functions deal with a vast amount of data spread across multiple HR systems. For analysis, demographic data can be extracted from Human Resource Information System (HRIS), recruitment data can be captured from Application Tracking System (ATS), Time and attendance data can be taken from HR payroll systems, etc.

ii) **Measurement Standards (Define Standard metric to interpret data):**

Once the data are collected from various sources, appropriate metrics are executed to derive insights into how these data make sense. The HR manager may come up with a query as follows:

“What percentage of our workforce is leaving annually?”

iii) **Reporting (Integrate data and report intuitive information):**

The inferences or insights derived through metrics are reported in a structured manner to business managers. For example, dealing with the possible reasons for the departure of high-performing employees with priorities and supporting data are reported to them in a structured reporting style.

For example, in a hypothetical situation, the past data suggests that 15% of the workforce left the organization last year which is 3% higher than the previous year. This is a critical indicator of employee attrition. The other HR queries can be:

- What is the average tenure of people in our organization? In the last five years, has it increased, decreased, or remained the same?
- What percentage of the workforce is promoted annually?
- What percentage of critical roles is still vacant?
- What percentage of the workforce are frequent absentees?

The use of historical data to describe things today has been a practice for many organizations. This is done to check things like absence rates, skills level, pay, remuneration, etc. Descriptive Analytics deals with the basic details of an employee. For example:

- No. of years *Mr. A* has been working with us.
- CTC of *Mr. A*.
- Performance rating of *Mr. A*.
- The average rate of absenteeism of *Mr. A*.

- Average man-days of training of *Mr. A*.
- No. of internal movements including promotions happened for *Mr. A*.
- No. of years *Mr. A* will continue working with us.
- Likely CTC of *Mr. A* after 5 years.
- Likely performance rating of *Mr. A* after three years.
- Number of man-days of skill-change training required by *Mr. A* after five years.

Specific Career-Related Information

- How many years *Mr. A* has been working at the same job level?
- How many times *Mr. A* was recommended for promotion by his superior?
- What performance-potential score has *Mr. A* got over the last 3 years?
- What seniority score *Mr. A* has at present and to what extent he is prepared for the next promotion?

Predictions on Mr. A based on his basic details

- Several promotions need to be given to *Mr. A* in his career span with the company in the next 10 years in the organization.
- Year-wise likely rate of performance of *Mr. A* in the next 3 years.
- Year-wise performance-potential score of *Mr. A* for the next 5 years.
- Year-wise seniority score of *Mr. A* for the next 5 years.

The prediction is possible by retrospection or hind sighting information such as ratios, **metrics**, data in absolute numbers, and so on, and by using tools such as tracking signals, **dashboards**, Gantt Chart, review reports, etc. at the initial level and then fore sighting information such as probability, likelihood, hidden pattern with the help of statistical models, forecasting models and so on.

4.2 Diagnostic Analytics in HR

Descriptive Analytics can provide quantitative performance information, but the mystery is why specific performance was good or bad.

Diagnostic Analytics identifies the root cause. For Example:

“Why a percentage of critical roles are vacant as of today?”

“Why our high performers are at risk of departure?”

This phase provides interesting insights – one of the reasons for employee departure is compensation offered for a particular position is much lesser than what other organizations are offering with the same skill set and for the same job role. There may be several other reasons. Through Diagnostic Analysis, the root causes are not only identified but are also prioritized in terms of their ability to create an adverse impact on the problem. For example, one such observation can be *Dissatisfaction due to Compensation* being less important in comparison to *Dissatisfaction with the Supervisor* as per the departing employees.

4.3 Predictive Analytics in HR

Predictive Analytics focuses on what might happen in the future based on detailed past events. **For example**, through **Diagnostic Analytics** if it is known that the salary we are offering for a specific position is quite low in comparison to that of our competitors, whereas through **Predictive Analytics** *“who are the employees who will leave the company soon?”* can be predicted considering their dissatisfaction with salary as one of the impacting parameters for attrition along with other parameters. These impacting parameters on employee attrition are identified and are considered in a predictive model to predict *“Who is next?”*

Statistical techniques are used to understand current or historical facts to make future predictions. Some regular business flows can be very predictable, such as absence and the time it takes to hire people. Others are less predictable, such as when a candidate will join the company after accepting the offer or who will leave and when. **It's in this phase HR can**

deliver significant strategic advantage by taking the help of analytics to make suitable predictions (Fitz-enz, Jac, & Mattox, 2014).

4.4 Prescriptive Analytics in HR

Predictive Analytics predicts what will happen next, but cannot suggest how to control it, whereas *Prescriptive Analytics* is dedicated to finding the most suitable course of action for a given situation. Hence, Predictive Analytics tells us “*What Will Happen?*” Prescriptive Analytics tells us “*Why It Will Happen? And How to Control It?*”

For example, through *Predictive Analytics* if it is predicted who are the critical resources who will leave the organization shortly, through *Prescriptive Analytics*, that can be controlled.

Prescriptive Analytics creates the platform for examining the outcomes of computerized modeling exercises for predictions using different variables including data from outside HR functions to recommend the best course of action to handle the problem.

4.5 Cognitive Analytics in HR

Cognitive Analytics refers to the usage of computer algorithms to imitate human **cognitive** capabilities and find quick solutions to complex problems. It accommodates almost all the relevant components for analysis which otherwise the decision-makers may have overlooked.

The applications include talent acquisition using **cognitive** solutions, talent development through **cognitive** technologies, and optimizing **HR** operations through **cognitive** solutions.

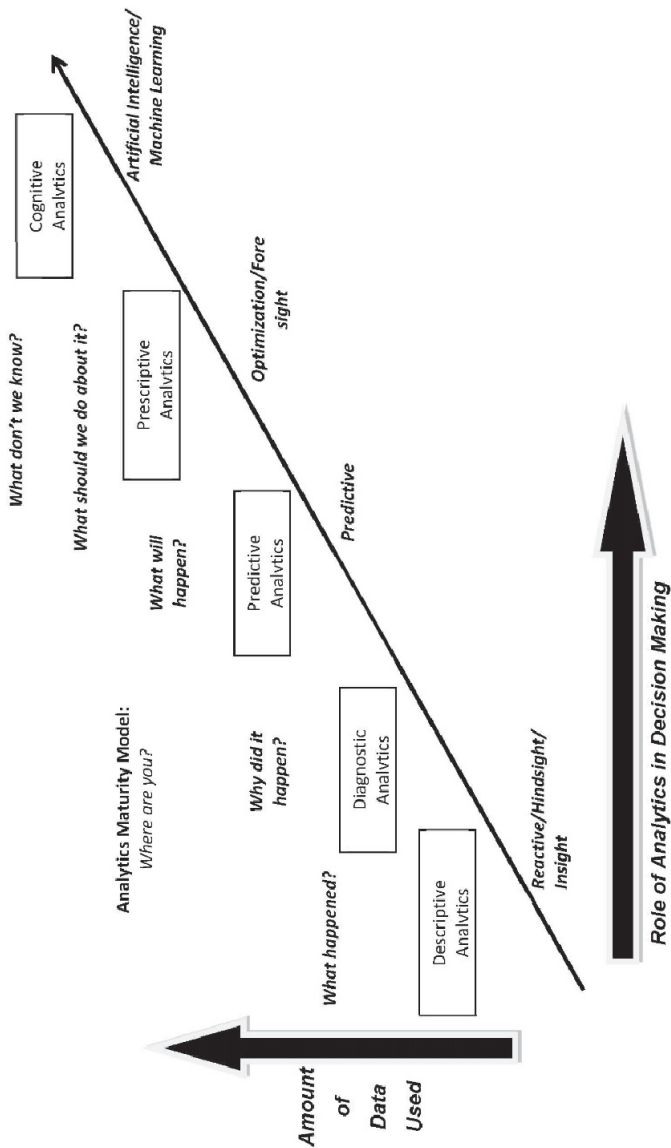


Figure 4.1: Analytics Maturity Model

Process Analytics deals with how efficiently and effectively the following HR operative functions can be carried out:

- Recruitment and Selection
- Onboarding
- Performance Management
- Work-life balancing

Integrated Analytics deals with how the HR operative functions can contribute to the business goals in terms of the following functions:

- Talent Management
- Human Resource Planning
- Succession Planning
- HR strategy framing

To create a platform for executing Process Analytics and Integrated Analytics, the HR Analytics maturity level of a firm need to be assessed, and, in this context, the following model may be adopted:

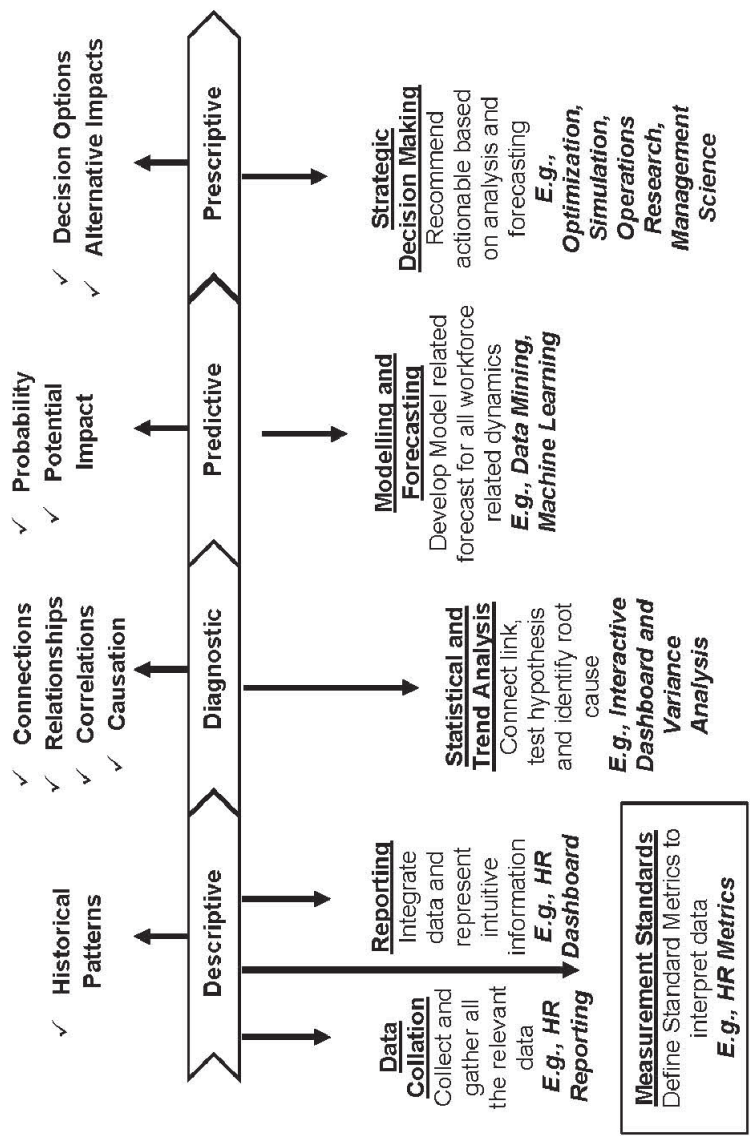


Figure 4.2: HR Analytics Maturity Levels and Tools

How to conduct HR Analytics Maturity Assessment?

If the company wants to understand how through data, methods, and analytical tools it can better assess and improve human capital to derive the best value for the business, the company needs to understand its analytical maturity status (Lismont, Jasmien, Vanthienen, Baesens, & Lemahieu, 2017). To understand a company's analytics maturity level, Wayne Eckerson describes an analytical maturity model with four major dimensions in his famous book "Secrets of Analytical Leaders" and the dimensions are:

- data maturity;
- analytical maturity;
- analytical culture; and
- scale and scope.

According to him, **Analytical maturity** depends on the company's analytical capabilities in terms of standard reporting to predictive reporting. To assess the analytic maturity level of a company the question is "*Where are we?*"

To check the Analytic maturity of the HR system, the following questions may be addressed:

- *Do we have an employee database with relevant data?*
- *Does our HR system analyze diversity, pay, attrition, performance rates for different groups of employees, service tenure, etc.?*
- *Does our HR system conduct external benchmarking of employee data such as Job Grading, Salary Surveys, etc.?*
- *Does our HR system continually work on predicting models to support strategic decision-making?*

Data maturity is moving one step ahead and is related to collecting and integrating data from all departments of the company and consolidating them.

Scale and Scope increase as the company starts to implement analytics in a consolidated way and can derive benefits from implementation.

To check the Data maturity and scale and scope of the HR system, the following questions can be asked:

- *Does our HR Dashboard include headcount, termination, transfer, leave, and recruitment data with relevant metrics to support managerial decisions?*
- *Does our HR department work in sync with the other departments to collect and analyze data to provide enterprise-wise analytics solutions? For example, through analytics, a company can check the extent of the impact of a product-related training program on sales team performance.*
- *Does our HR system work in tandem with all other departments to conduct any organization-wide survey like an organizational climate survey, employee satisfaction survey, employee sentiment survey, etc.?*

Analytical culture is a change agent as it sets the platform for this analytical journey for a company. To check the extent to which the company is adaptable to the HR Analytical culture, the following question can be asked:

- *Does our company have representatives from the HR department in C-Suite position(s)?*

HR Analytics Maturity Levels Self-Audit

There are several ways in which HR Analytics maturity level can be assessed. One of the most widely read approaches was proposed by Josh Bersin and his team in 2012. A company may check with the following benchmarked levels and can administer a self-audit.

Level 1 - At this level HR sticks to operational reporting or traditional reporting, i.e., mostly day-to-day reporting in terms of headcount, absenteeism, attrition, workforce cost, turnover cost, training cost, etc. More than 50% of organizations are at level 1.

Level 2 - Level 2 is related to advanced reporting. At level 2, the HR department proactively creates relevant reports to support decision-making. Benchmarks are applied to HR data to derive meaningful insights. Additionally, interlinked metrics (measures) are executed using HRIS and reports are generated and presented to the management in dashboards. Only 30% of companies are at level 2, whereas only 14% of them are at higher levels.

Level 3 - At level 3, companies try to answer the question “What can we understand from our HR data to make better people-based decisions shortly?” Proactively identifying the issues and providing workable solutions is the key to this level. At this level, analyses may occur in the form of developing causal models or looking at how relationships between variables affect outcomes.

Level 4 - At this level, mitigating risks through predictive analytics takes the company to a position of better strategic workforce planning. For example, if the departure of potential successors of business leaders can be predicted then the risk of losing business due to renege may be handled effectively.

Level 1	Level 2	Level 3	Level 4
Operational reporting of HR data like headcount, absenteeism, payroll, termination, etc. Focus: is employee termination too high?	Advanced reporting with tables, charts, MS Excel/Tableau/Power BI tools, and metrics such as Revenue Per Employee, Employee Turnover Cost, etc. Focus: what percentage of the total cost is employee termination cost?	Using statistical and other analytical tools, HR data are further analyzed to derive critical insights to formulate the right HR strategy. Focus: if inadequate compensation is one of the reasons for employee termination, will a job grade analysis help to formulate a better compensation strategy?	Predictive analysis using advanced analytics such as Machine Learning, AI interventions, and Natural Language Processing, Analytics is integrated, and its contribution is ensured at the organizational level. Focus: looking at all the parameters impacting termination and accommodating them in a model for predicting “who is next?” will help the company to formulate and execute the HR plan in a better manner

Table 4.1: Analysis at different levels of HR Analytics Maturity Levels

CHAPTER 5

HR METRICS

A metric is an accountability tool that makes it easy to see if a company is producing results. Most metrics have six key elements: measurements of quantity, quality, time, money, satisfaction, and benchmark comparisons (Weiss, S., & Finn, 2005). Metrics have the following features:

- Metrics are geared toward the organization's goals and strategies.
- Metrics are identified to monitor key HR practices proven to develop human capital.
- Metrics are used to encourage change and help to make better decisions on human capital.
- Metrics are identified to measure outcomes, not only an activity.
- Metrics tell us what changes are required to the business functions.

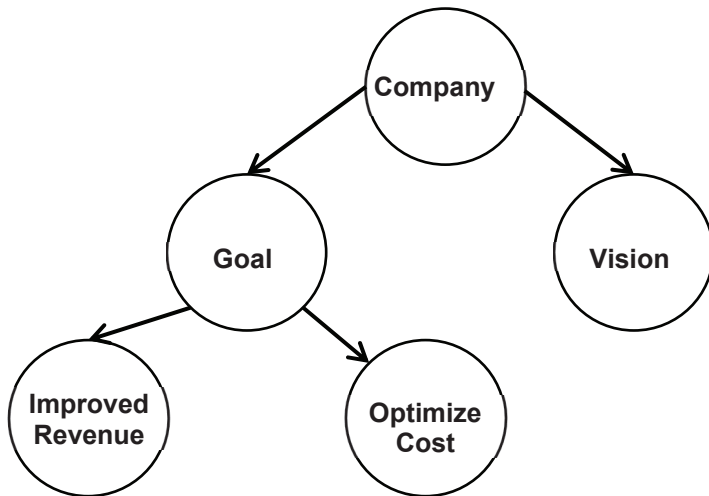


Figure 5.1: HR Metrics in sync with the Firm's goals

HR metrics are the measures with which the performance of HR operative functions is improved. HR metrics are implemented to find the extent the HR operative functions: acquisition, development, and retention are contributing and can contribute better to the business goals. The contribution of HR functions can be measured from the above-mentioned perspectives of quantity, quality, time, money, satisfaction, and benchmark comparisons (Boudreau, 2017). Let's discuss some of these perspectives.

HR's Contribution to improving revenue

HR can contribute to revenue with an enhanced level of performance. Metrics can contribute to workforce performance improvement by identifying the drivers for high and low performance in the following ways:

- High performers when utilized appropriately can result in increased revenue.
- Identification of low performers can help organizations decide on appropriate training, mentoring, and counseling interventions for them and ultimately experience a pull in revenue.

HR's contribution to optimizing cost

HR can contribute to optimizing costs by identifying the areas in which workforce costs can be curtailed. This can be done in the following ways:

- by retaining the high performers by maximizing the benefits of rewards and recognition with proper utilization of funds for better employee performance management;
- by identifying and addressing the drivers of attrition through some relevant metrics and reducing their impacts on workforce attrition; and
- by reducing employee cost through certain HR metrics that enable the management to derive employee contribution and maximize their potential to reduce the No. of Employees required to achieve business goals.

The ecosystem of HR Metrics

HR Metrics are useful to identify performance gaps in HR operative functions and are addressed to improve their result next time (Beatty, W., Huselid, & Schneider, 2003). For example, if the company's attrition rate is more than 30%, the HR Metrics ecosystem needs to address the following points related to high attrition:

HR Questions:

- Are our high performers leaving?
- What are the associated costs of high attrition?

Recommended Metrics:

- Average tenure of high performers
- Voluntary/involuntary/total turnover rates
- Reasons for turnover
- Costs of turnover

Inputs required:

- Types of attrition: *voluntary or involuntary*
- Reasons for departure: *salary, job role, working conditions, restricted growth opportunity etc.*
- Performance level of departing employees: *high, medium, or low*
- Average tenure of high performers: *<5 years or >=5 years etc.*

Data availability, quality, and location

- Where is the data stored? (*Do we have a centralized HRIS?*)
- How is the data stored? (*Do we have structured relationships between data collected by different departments to handle ad-hoc queries generated by managers?*)
- What is the duration of data? (*Past data preserved for how many years?*)

Issues/Barriers

- Exit Interview Questions or surveys are not standardized and hence are not exhaustive to accommodate all possible reasons for employee departure.
- Departments may have inconsistent definitions of “High Performing Employees”, it may be based on a manager’s discretion or understanding without any proper system.

Fix the issues

- Execute the improvements required in conducting exit interviews with the departing employees to understand the parameters impacting their departure.
- Streamline HR data capturing process to handle manager’s queries on attrition effectively and support decision-making and formulate the right HR strategy.
- Standardize the processes with HR metrics to reduce attrition. For example, if a good number of high-performing employees are dissatisfied with the biases existing in the performance management process and that is one of the reasons for their departure, the management should figure out and execute critical HR metrics related to performance management function and derive meaningful insights to make necessary changes in the execution of the function (Dulebohn, H., & Johnson, 2013).

Let’s discuss some metrics in some critical areas of HR

Talent Acquisition*Cost Per Hire*

- It adds up all the expenses incurred by the company for hiring each new employee.
- It is a great way to measure the economic value of an individual resource.

- Its value can never be zero.
- Check the Cost Per Hire (CPH) of each recruitment source: *CPH of Employee Referrals*, *CPH of Social Media candidates*, *CPH of Agencies* from which candidates are taken, etc.
- Breaking down CPH will help managers find and eliminate unnecessary costs or relocate resources more efficiently.

Cost Per Hire = [Total External Cost of Hires + Total Internal Cost of Hires]/Total Number of Hires

Time to Fill

- It adds up to the total number of days an open job goes unfilled.
- If a critical position is vacant for several days, the company incurs high renege costs for the same (calculation of renege cost is explained later).

The relevant questions at this juncture are:

Are the recruiters reaching out to qualified candidates immediately after they apply?

and

How long does it take to schedule interviews?

***Time to Fill = [Total Number of Days the Job is Available and Unfilled]
= [The day the job vacancy is filled] – [The day the job vacancy was posted]***

Training and Development

Skills Attainment - Measures the Trainee's Level of Skill pre- and post-learning.

Workplace Application - Is the Trainee applying newly learned skills in the workplace?

Individual Behavior Change - Has the Trainee's behavior changed in the workplace after he attended the behavioral training program?

Team Behavior Change - Is the team working more coherently, more effectively, post-training?

Meeting Goals and Targets - Record the individual/team's performance against goals and targets and measure the same in 3-, 6-, or 9-months post-learning period to monitor the impact of learning

Performance Management

Revenue Per Employee

1. It is a straightforward way to measure the whole team's performance. This provides a snapshot of how well the company is doing overall.

Revenue Per Employee = Total Revenue for a given time/The Total No. of Employees

Let's consider some HR Metrics related to each of the following HR functions.



Figure 5.2: HR Functions

5.1 HR Metrics – Workforce

Analyzing and understanding the workforce composition is important to make suitable HR strategies to develop and enhance the contribution of HR to business goals. The Workforce HR Metrics can be considered in terms of the following three components:

5.1.1 Workforce Metrics (*Demographic*)

Demographic
a) Age-Staffing Breakdown
b) Average Workforce Age
c) Ethnic Background Staffing Breakdown
d) Gender Staffing Breakdown
e) Staffing Rate – Specially Abled
f) Staffing Rate – Female
g) Staffing Rate – Minority
h) Staffing Rate – Multilingual

Table 5.1: *HR Metrics (Workforce - Demographic)*

This investigates the demographic composition of the workforce with the above-listed metrics. The explanation of each metric is given below:

- a) **Age-Staffing Breakdown** – this metric denotes the age-wise workforce composition. Workforce age distribution can be understood in terms of generations of employees in the following way:

Baby Boomers:	Born 1946-1964 (57-75 years old)
Generation X:	Born 1965-1980 (41-56 years old)
Millennials (Gen Y):	Born 1981-1996 (25-40 years old)
Generation Z:	Born 1997-Present (24 years old and below)

Table 5.2: *Workforce Generations*

If the percentage of the workforce in different generations of employees is identified, the right HR strategies can be formulated and executed to make them contribute more to their job roles. For example, if 25% of the workforce is Baby Boomers, the company needs to think of assigning them roles that require more experience and expertise than the job roles related to the upcoming technologies. Furthermore, it is to be checked what percentage of this 25% are in leadership positions or are in critical roles to come up with the talent pipeline for their replacement in the future (Hans & Mnkandla, 2017).

- b) **Average Workforce Age** - With aging, the workforce gathers more experience and that leads to higher productivity. If Average Workforce Age is around 55, further analysis can be done to make sure that the percentage of the workforce who will be retiring in the next five years has created or developed their successors to manage the business in their absence. On the other hand, if Average Workforce Age is 24, it may be assumed that the company has a highly enthusiastic, agile, and risk-taking workforce with less experienced professionals, and suitable job roles are to be assigned to them.
- c) **Ethnic Background Staffing Breakdown** – this measure denotes the workforce composition in terms of ethnicity. Companies promote diversity and inclusion in the workforce to allow wider perspectives to be integrated while brainstorming, problem-solving, and developing new ideas for business.
- d) **Gender Staffing Breakdown** – this indicates the percentage of the workforce represented by each gender. This measure helps the company maintain the gender balance in its workforce.
- e) **Staffing Rate – Specially Abled** – this measure indicates the percentage of the workforce with disability. Diversity inclusion policy helps line managers realize that high-potential candidates are to be hired irrespective of their disabilities for the growth of the company. This can be calculated as:

$$\text{Staffing Rate (Specially Abled)} = (\text{No. of Employees who are Specially Abled}) / (\text{Total No. of Employees in the Company}) \times 100$$

- f) **Staffing Rate – Female** – this indicates the percentage of female employees in the workforce. Companies are focusing on gender diversity and gender equality to promote women in leadership with a belief that the presence of women in the C-Suite category may allow the company to explore certain rare talents which are otherwise overlooked. This can be calculated as:

$$\text{Staffing Rate (Female)} = (\text{No. of Female Employees}) / (\text{Total No. of Employees in the Company}) \times 100$$

- g) **Staffing Rate – Minority** – research suggests that companies emphasizing unconventional or different backgrounds are doing well in this ever-changing dynamic environment. This policy promotes the philosophy of believing in potential and equality without considering religion as a barrier. This can be calculated as:

$$\text{Staffing Rate (Minority)} = (\text{No. of Employees with Minority Background}) / (\text{Total No. of Employees in the Company}) \times 100$$

- h) **Staffing Rate – Multilingual** – Multilingual means a person who can speak multiple languages. A multilingual workforce has different language backgrounds. It increases cultural sensitivity, builds trust, fosters workforce relationships, and increases productivity. This can be calculated as:

$$\text{Staffing Rate (Multilingual)} = (\text{No. of Employees who are from Different Language Backgrounds}) / (\text{Total No. of Employees in the Company}) \times 100$$

5.1.2 Workforce Metrics (*Structural*)

Structural
a) Average Span of Control
b) Customer-Facing Time Rate
c) Employee Ownership Rate
d) Employment Level Staffing Breakdown
e) Staffing Rate – Corporate
f) Staffing Rate – Customer Facing
g) Staffing Rate – Managerial
h) Staffing Rate – Revenue Generating

Table 5.3: *HR Metrics (Workforce - Structural)*

This explores the workforce composition from the perspective of reporting structure with the above-listed metrics. The explanation of each metric is given below:

- a) **Average Span of Control** – Span of Control denotes the number of employees working directly under the supervision of the supervisor. The Average Span of Control is calculated as:

$$\text{Avg. Span of Control} = \text{Total number of reporters} / \text{Total number of managers}$$

The Span of Control depends on the following factors:

- Size of the organization
- Nature of business
- Skills and competencies of the managers
- Skills and competencies of the reportees
- Nature of job role

- The interaction required between the supervisor/manager and the employees/reportees

A wide span of control indicates a flat organization structure whereas a narrow span of control generally indicates there are more layers in the organization. According to modern organizational experts, for a large organization average span of control should be 15-20 for efficient and effective use of resources.

- b) Customer-Facing Time Rate** – this is a relevant measure in case the job role requires customer face-to-face interaction for business. The measures related to this are:
- What is the Customer-Facing Time Rate?
 - Is it adequate for the job role?
 - What is its impact on revenue generation?
 - How can this be improved?
 - What percentage of the workforce is involved in face-to-face interaction with customers?

This is calculated as:

$$\text{Customer Facing Time Rate} = (\text{Total Customer Facing Time in Manhour}) / (\text{Total Manhour in a period}) \times 100$$

- c) Employee Ownership Rate** – Employee Ownership Rate shows the percentage of the workforce covered under the Employee Stock Ownership Plan (ESOP). Companies with high Employee Ownership Rates have better productivity, and higher profitability and revenue. This is calculated as:

$$\text{Employee Ownership Rate} = (\text{No. of Employees covered under ESOP} / \text{Total number of Employees}) \times 100$$

- d) Employment Level Staffing Breakdown** – it indicates the percentage of the workforce at each employment level. Companies who want to increase the No. of Employees in managerial positions to support their business strategy will investigate this measure.

- e) **Staffing Rate – Corporate** – it indicates the percentage of the workforce at the corporate level. If the percentage is high, it shows that the top level is heavy. This measure helps in reshaping the structure of the organization. This is calculated as:

$$\text{Staffing Rate – Corporate} = (\text{No. of Employees at Corporate Level} / \text{Total number of Employees}) \times 100$$

- f) **Staffing Rate – Customer facing** – it indicates the percentage of the workforce who are in a job role that requires customer-facing time. This measure needs to be checked with other relevant measures like customer satisfaction or experience to check if this staffing rate is adequate to maintain or improve customer satisfaction. This is calculated as:

$$\text{Staffing Rate – Customer facing} = (\text{No. of Employees in Customer-Facing Job Role} / \text{Total number of Employees}) \times 100$$

- g) **Staffing Rate – Managerial** – this measure indicates the percentage of the workforce who are in managerial positions. This measure may be checked with *Contribution per Manager* to understand the number of managers presents in the organization to manage the business goals. This is calculated as:

$$\text{Staffing Rate – Managerial} = (\text{No. of Employees in Managerial Job Roles} / \text{Total number of Employees}) \times 100$$

- h) **Staffing Rate – Revenue Generating** - it indicates the percentage of the workforce contributing to revenue generation. This can be checked with other measures like *Contribution per Full-Time Employee*, and *Revenue Per Full-Time Employee* to analyze how far the percentage of revenue generated by all the employees is coming from this employee category to facilitate their growth further. This is calculated as:

$$\text{Staffing Rate – Revenue Generating} = (\text{No. of Revenue Generating Employees} / \text{Total No. of Employees}) \times 100$$

5.1.3 Workforce Metrics (*Tenure*)

Tenure
a) Average Workforce Tenure
b) Organization Tenure Staffing
c) Breakdown Staffing Rate - < 1-year tenure

Table 5.4: *HR Metrics (Workforce - Tenure)*

This shows the workforce composition in terms of time spent by them in the company with the above-listed metrics. The explanation of each metric is given below:

- a) **Average Workforce Tenure** – this measure indicates the average service tenure of employees in an organization. If it is too low, further investigation needs to be carried out to understand at which level or in which job role employees are leaving the most and what are the reasons for the same. On the other hand, if the average workforce tenure is high it indicates that the employees want to continue with their current employer.

$$\text{Average Workforce Tenure} = \frac{\text{Total Tenure} * \text{of Service of all the Employees}}{\text{Total No. of Employees}}$$

$$*Tenure = [\text{Date of Joining} - \text{Today's Date}]$$

- b) **Organization Tenure Staffing** – this indicates the percentage of the workforce under different tenure groups. Employees with long tenure need to be handled differently. Management needs to think of their growth and development.
- c) **Breakdown Staffing Rate - < 1-year tenure** – it indicates the percentage of employees with less than 1 year of service.

Let's consider the following dataset:

Emp ID	Name	Gender	Disability	Age	Tenure	Manager's Name
E001	Sanjoy	Male	Yes	21	0	Ashish
E002	A	Male	No	28	3	Tulika
E003	Priya	Female	No	45	22	Tulika
E004	Ashwini	Female	No	57	22	Mohan
E005	Nutan	Female	No	34	8	Ashish
E006	Shivam	Male	No	51	28	Tulika
E007	Puspa	Female	No	54	32	Mohan
E008	Rohit	Male	No	28	16	Mohan
E009	Vinit	Male	No	47	25	Tulika
E010	Koelina	Female	No	30	7	Ashish
E011	Bhaskar	Male	No	36	14	Ashish
E012	Varun	Male	No	26	5	Ashish
E013	Tushit	Male	No	49	28	Tulika
E014	Srinjoy	Male	No	38	15	Mohan
E015	Rubina	Female	Yes	33	21	Tulika

Table 5.5: Sample Dataset (Workforce)

We can calculate the following metrics from this dataset:

- **Average Age** – 38.5 years
- **Average Tenure of Service** – 16 years
- **Gender Staffing Breakdown** – 60% Male, 40% Female
- **Staffing Rate – Disability** – 13%
- **Breakdown Staffing Rate** – < 1-year tenure – 7%
- **Average Span of Control** – 5

5.2 HR Metrics – Acquisition

Recruitment is the process of attracting a pool of applicants for a specific job position and Selection is the process of choosing the most suitable candidate out of the pool of applicants.

5.2.1 HR Metrics –Recruitment

Recruitment
a) Employment Brand Strength
b) External Hire Rate
c) Net Hire Ratio
d) New Position Recruitment Rate
e) Recruitment Source Breakdown
f) Rehire Rate

Table 5.6: *HR Metrics (Acquisition - Recruitment)*

The recruitment metrics listed above are inclined more towards assessing the extent the external candidates are eager to join the employer's brand, the hiring composition in terms of different recruitment channels, etc. The explanation of each metric is given below:

- a) **Employment Brand Strength** – this metric shows the extent the employer's brand is attracting candidates for vacant positions or job roles. A survey may be conducted among the pool of applicants to take their views on reasons to join this brand and why they think the employer is a good brand in terms of certain perceived parameters (like reputation of the company, high compensation package, good work environment, etc.). It is a relative measure of the attractiveness of the organization's employment value proposition.

If **Employment Brand Strength** is high, the company enjoys the benefit to eliminate unsuitable candidates and selecting the best among the applicants.

- b) **External Hire Rate** – it is a measure of the percentage of external hires to the total hires in each period. This is calculated as:

$$\text{External Hire Rate} = (\text{No. of External Hires} / \text{Total No. of Hires}) \text{ in a year} \times 100$$

This shows the rate at which new employees are entering the organization. A very low **External Hire Rate** can also potentially foster insularity which leads to the stagnancy of skills and ideas.

A very high **External Hire Rate** may indicate an **expansion of the workforce or high turnover**.

Generally, organizations prefer to have some external recruitment activity, which is beneficial for fostering new ideas and growth. However, a high level of external recruitment reflects large costs to the organization, including direct costs and indirect costs of hiring, productivity ramp-up time, and dilution of organization culture (Marler, H., & Boudreau, 2016).

- c) **Net Hire Ratio** – shows the number of new hires for every termination in the reporting period. If it is greater than 1, the workforce grew otherwise the workforce shrank.

$$\text{Net Hire Ratio} = (\text{No. of New Hires} / \text{No. of Terminations}) \text{ in a year}$$

- d) **New Position Recruitment Rate** – this indicates the percentage of new positions that got filled in with candidates. The new positions may be fulfilled with both internal and external hires.

$$\text{New Position Recruitment Rate} = (\text{No. of Hires for New Positions} / \text{No. of New Positions}) \text{ in a year} \times 100$$

100% indicates that there are no vacancies remaining in new positions.

- e) **Recruitment Source Breakdown** – this measure applies to organizations that explore multiple channels to publicize employment opportunities to attract talent.

$$\text{Recruitment Source Breakdown} = (\text{No. of Hires for Specific Source Group} / \text{Total No. of Hires in a year}) \times 100$$

For example, if 10 candidates are hired through *Employee Referral* and the total number of hires for the financial year is 50, the Recruitment Source Breakdown (Employee Referrals) is 20%, i.e., 20% of the total hires are taken through *Employee Referrals*.

A specific employment sourcing channel may not have a significant impact on the performance of new staff, but certain channels may be leveraged to increase employee retention. By analyzing records, the organization may understand the impact each recruitment source is creating on employee retention. This will help the organization to choose among the recruitment sources which have worked well for the company in terms of generating employee contribution.

- f) **Rehire Rate** – it is a measure to see the percentage of total hires from rehires. Rehire indicates hiring former employees.

$$\text{Rehire Rate} = (\text{No. of Rehires} / \text{Total No. of Hires in a year}) \times 100$$

This is preferred by many organizations as it requires less investment in recruiting and onboarding and the training cost is also reduced to a substantial extent. Since the employee is familiar with the organizational culture, the productivity ramp-up time is typically less than that of employees who are new to the organization. They may already have a strong understanding of organizational history, processes, and culture. An increase in rehire rate has a direct relationship with the enhancement of employer brand strength to a certain extent.

5.2.2 HR Metrics –Internal Movement

Internal Movement
a) Career Path Ratio
b) Cross-Function Mobility
c) Internal Hire Rate
d) High Potential Internal Hire Rate
e) Lateral Mobility
f) Promotion Rate
g) Promotion Speed Ratio
h) Transfer Rate
i) Upward Mobility

Table 5.7: HR Metrics (Acquisition – Internal Movement)

Internal movement is related to filling job vacancies internally through transfer, promotion, lateral movement, demotion, etc. The related HR Metrics are:

- a) **Career Path Ratio** – it indicates an employee’s rate of growth depending on vertical and lateral movements.

Career Path Ratio = (No. of Promotions/Total No. of Internal Movements) in a year

For example, if the company has 20 promotions and 30 lateral moves, the career path ratio will be 0.4.

Generally, a healthy career path ratio is around 0.25, i.e., about four lateral moves for every promotion. Research suggests between 50% to 70% of workers at any given organization have reached their promotion ceiling.

Too many lateral movements show that employees are exploring the options like new roles, and challenging job opportunities as they have understood that the possibility of upward movement is quite restricted. This may also happen in cases when external candidates are preferred for leadership positions.

Conversely, if the ratio is 0.5 or *more*, the organization might be giving too many promotions. In cases like these, there could be a surplus of middle managers, or the leadership team might be discouraging employees from making lateral moves altogether.

- b) *Cross-Function Mobility*** – it indicates the percentage of internal staff movements i.e., movements from one function to another. Cross-function mobility for a particular organization for a specific reporting period is 30% means the rest 70% of movements happened within the same functions.

This measure is useful to specific employee groups in terms of their present performance and who have the potential to grow further. With these metrics, the organization may like to see the employees who are exposed to different functions and thereby generate diversified skillsets that make them better leaders in the future.

- c) *Internal Hire Rate*** – it indicates the proportion of employees who move into new roles over the reporting period.

Internal Hire Rate = (Total Internal Hires/Total No. of Hires) in a year

The internal Hire Rate shows how well a company is creating developmental opportunities for internal employees.

- d) *High Potential Internal Hire Rate*** – this is a special version of the internal hire rate. Here the focus is only on the “High Potential” employees. This indicates the percentage of high-potential employees hired internally to fill in the vacant positions out of the total number of high-potential employees present in the company each year.

High Potential Internal Hire Rate = (No of High Potential Internal Hires/Total No. of High Potential Headcount) in a year x 100

An extremely low High Potential Internal Hire Rate suggests limited growth and restricted developmental opportunities for high-potential employees.

- e) ***Lateral Mobility*** – Lateral Mobility is considered as the movement of an employee at a similar or equivalent role without any/much salary change. This is a part of employee development, and this improves the versatility of an employee as he gets exposure to other work domains. These metrics indicate the percentage of employee mobility at the same level out of the total number of employee movements and the same is calculated as:

Lateral Mobility = (Number of Employee Mobilities at the same level/Total number of Employee Mobilities) in a year

- f) ***Promotion Rate*** – Promotion Rate indicates the percentage of the workforce given a promotion in a year. The formula is:

Promotion Rate = (Number of Promotions given)/(*Total No. of Employees) in a year x 100

**Total No. of Employees: wherever in this book “Total No. of Employees” is coming in the denominator of the formula of any metrics, the same may be substituted with “Average No. of Employees”, as, the figure of “Total No. of Employees” varies from year to year, it’s better to consider the “Average No. of Employees” which equals [No. of Employees at the beginning of the year + No. of Employees at the end of the year]/2*

A high promotion rate indicates the company is taking big initiatives or executing changes and hence, the company needs employees to handle larger responsibilities. Whereas a low promotion rate may be linked to company policy or other issues like a high attrition rate or low employee engagement level. In that case, an employee needs to work hard and spend substantial time with the company to get promoted.

- g) Promotion Speed Ratio** – this indicates the speed at which employees in a company are getting promoted on an average and can be calculated as:

$$\text{Promotion Speed Ratio} = (\text{Tenure of the employee}) / (\text{Number of promotions given})$$

If an employee is promoted twice in 4 years, then his promotion speed is 2 years.

- h) Transfer Rate** – this indicates the number of times the employee is transferred out of the total number of his movements. This is calculated as:

$$\text{Transfer Rate} = (\text{Number of transfers}) / (\text{Total number of movements of employees in a year}) \times 100$$

i.e., the percentage of employee transfers out of total movements.

- i) Upward Mobility** – this indicates the percentage of total mobility is upward mobility and is calculated as:

$$\text{Upward Mobility} = (\text{Number of upward mobility}) / (\text{Total number of mobility of employees in a year}) \times 100$$

i.e., the rate at which employees are getting into new positions with additional responsibilities and higher compensation.

5.2.3 HR Metrics –Staffing Effectiveness

Staffing Effectiveness	
a)	Applicant Interview Rate
b)	Applicant Ratio
c)	Average Interviews Per Hire
d)	Average Sign-On Bonus Expense
e)	Average Time to Fill
f)	Average Time to Start
g)	Interviewee Offer Rate
h)	Interviewee Ratio
i)	New Hire Failure Factor
j)	New Hire Performance Satisfaction
k)	New Hire Satisfaction Rate
l)	New Hire Failure Rate
m)	Offer Acceptance Rate
n)	On-Time Talent Delivery Factor
o)	Recruitment Cost Per Hire
p)	Recruitment Expense Breakdown
q)	Referral Conversion Rate
r)	Referral Rate

Table 5.8: *HR Metrics (Acquisition – Staffing Effectiveness)*

This checks the yield ratio at each stage of the recruitment funnel:

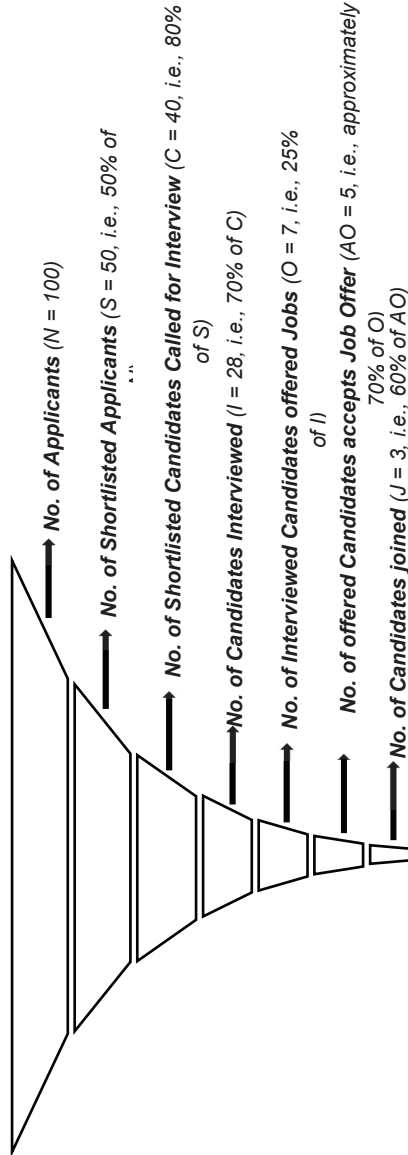


Figure 5.3: Recruitment Funnel

The performance of HR acquisition depends on how far the hired candidates are productive in their job roles with the following metrics:

- a) **Applicant Interview Rate** – it indicates the percentage of applicants called for an interview. A high applicant interview rate shows that a good number of applicants are eligible for the vacant position, hence they are called for interviews. It is calculated as:

$$\text{Applicant Interview Rate} = (\text{Number of Applicants called for Interview}) / (\text{Number of Job Applicants}) \times 100$$

- b) **Applicant Ratio** – this metric indicates the number of applicants over the number of vacant positions. This may be calculated as:

$$\text{Applicant Ratio} = (\text{Total Number of Applicants for Vacant Positions}) / (\text{Total Number of Vacant Positions})$$

- c) **Average Interviews Per Hire** – this indicates the average number of interviews conducted per vacant position and the same can be calculated as:

$$\text{Average Interviews Per Hire} = (\text{Total Number of Interviews taken}) / (\text{Total Number of Hires})$$

- d) **Average Sign-On Bonus Expense** – Sign-On Bonus is the financial award offered by the company to prospective candidates to join the company. This can be calculated as:

$$\text{Average Sign-On Bonus Expense} = (\text{Total Sign-On Bonus Given by the Company}) / (\text{Total Number of Candidates given Sign-On Bonus})$$

- e) **Average Time to Fill** – this shows the average time taken by the company to fill the vacant positions. This can be calculated as:

$$\text{Average Time to Fill} = (\text{Total Time taken to Fill all the Positions}) / (\text{Number of Vacant Positions})$$

This is an important indicator as this can be directly linked to Renege Cost and in turn with total Employee Cost. For example, the high *Time Taken to Fill* (*Date of filling the vacant position – Date of posting the job vacancy*)

the critical positions will increase the renege cost (calculation of renege cost was shown earlier) and will impact the total Employee Cost.

- f) **Average Time to Start** – this shows the average time taken by the selected candidates to join the company and is calculated as:

$$\text{Average Time to Start} = (\text{Total Time taken by the Selected Candidates to join the company}) / (\text{Number of candidates issued the job offer})$$

- g) **Interviewee Offer Rate** – this denotes the percentage of candidates offered the job for the number of candidates interviewed. This is calculated as:

$$\text{Interview Offer Rate} = (\text{Number of candidates issued job offer}) / (\text{Number of candidates interviewed}) \times 100$$

This indicates the percentage of interviewees rejected by the company after the interview and vice versa.

- h) **Interview Ratio** – this shows the number of candidates interviewed for the number of candidates who applied for the vacant job positions. This can be calculated as:

$$\text{Interview Ratio} = (\text{Total number of candidates interviewed for the vacant positions}) / (\text{Total number of candidates applied for the vacant positions of the company})$$

This shows the percentage of the applied candidates who were interviewed by the company.

- i) **New Hire Failure Factor** – this indicates the factors responsible for the departure of new hires. New Hires are employees whose tenure with the company is less than 1 year. This instigates the management to find out the possible causes for the new hires to leave the company so that the same can be predicted for the future to control the cost implications like recruitment cost, renege cost, training cost, turnover cost, etc.

j) **New Hire Performance Satisfaction** – this indicates the extent to which management is satisfied with the performance of new hires. This can be linked to the effectiveness of recruitment and selection and induction and orientation functions. If New Hire Performance Satisfaction is low, different HR strategies are to be formulated rather than assigning them critical job roles or investing much in their development.

k) **New Hire Satisfaction Rate** – this indicates the extent to which the company or the management is satisfied with the performance and behavior of new hires. This is calculated as:

$$\text{New Hire Satisfaction Rate} = (\text{Number of New Hires management is satisfied with}) / (\text{Total number of New Hires}) \times 100$$

l) **New Hire Failure Rate** - this shows the percentage of new hires who could not perform as per expectation and is calculated as:

$$\text{New Hire Failure Rate} = (\text{Number of New Hires could not perform as expected}) / (\text{Total number of New Hires}) \times 100$$

m) **Offer Acceptance Rate** – this denotes the percentage of candidates who accepted job offers to the total number of candidates issued job offers. This is calculated as:

$$\text{Offer Acceptance Rate} = (\text{Number of candidates who accepted the job offers}) / (\text{Total Number of candidates given job offers}) \times 100$$

n) **On-Time Talent Delivery Factor** – this indicates to the extent the different recruitment channels can supply candidates on time. *Time Taken to Supply Talent* can be one of the most prominent comparison parameters for recruitment source analysis.

o) **Recruitment Cost Per Hire** – this is an important measure as it indicates the percentage of total employee cost is the recruitment cost. This is calculated as:

$$\text{Recruitment Cost per Hire} = (\text{Total Recruitment Cost}) / (\text{Total Number of Hires})$$

If the Recruitment Cost is too high, the company needs to take certain measures to reduce Recruitment Cost. Some of them may be:

1. By reducing the Recruitment Source Cost with proper analysis of the different recruitment source channels and identifying the recruitment sources which are cost-effective for the company.
2. By reducing the costs related to other overhead components without compromising the quality of candidates.

p) Recruitment Expense Breakdown – This shows the percentage of total recruitment expenses spent by different recruitment expense heads.

The components of Recruitment Costs are:

Recruitment Cost = (Cost related to the Recruitment Sources + Expert Cost for conducting the interviews + Venue Cost + Sign-On Bonus Cost + Travel Cost of the HR Recruitment Team + Other Overhead Expenses)

The Recruitment Expense Breakdown denotes the ratio of each part of the total recruitment cost to the total recruitment cost. For example, this can be calculated as:

Recruitment Expense Breakdown = [(Cost related to the Recruitment Sources)/(Total Recruitment Cost)] + [(Expert Cost for conducting the interviews)/(Total Recruitment Cost)] + ...]

It can be checked, which part of the recruitment expense is the highest and the same may be controlled to reduce the expense.

q) Referral Conversion Rate – this indicates the percentage of candidates taken through Employee Referral to the number of candidates referred by employees. This is calculated as:

Referral Conversion Rate = (Number of candidates taken through employee referral)/(Number of candidates referred by the Employees) x 100

Employee Referral is one of the Recruitment Sources in which internal employees refer their acquaintances for vacant positions for the company. It is to be judged, to what extent this recruitment source is productive for the company in terms of performance satisfaction of selected candidates through this channel.

- r) **Referral Rate** – this indicates the percentage of total hires through employee referrals, and this can be calculated as:

$$\text{Referral Rate} = (\text{Number of candidates hired through Employee Referrals}) / (\text{Total Number of Candidates hired}) \times 100$$

Let's consider the following dataset:

Employee No.	Age	Sex	Marital Dec.	Tenure	Position	Employee Source	Performance Score
1103024456	22	Female	Married	13	Accountant I	Diversity Job Fair	Fully Meets
1106026572	38	Male	Divorced	8	Accountant I	Website Banner Ads	Fully Meets
1302053333	35	Male	Single	1	Accountant I	Internet Search	Poor
1211050782	36	Female	Married	7	Administrative Assistant	Pay Per Click - Google	Poor
1307059817	34	Female	Single	7	Administrative Assistant	Website Banner Ads	Poor
711007713	35	Female	Married	10	Administrative Assistant	Diversity Job Fair	Fully Meets
1102024115	58	Male	Married	10	Shared Services Manager	Monster.com	Fully Meets
1206043417	59	Male	Married	7	Shared Services Manager	Diversity Job Fair	Fully Meets
1307060188	35	Female	Married	10	Sr. Accountant	Diversity Job Fair	Poor
1201031308	33	Female	Married	1	Sr. Accountant	Other	Fully Meets
1001495124	53	Female	Married	11	President & CEO	Pay Per Click - Google	Fully Meets
1112030816	51	Female	Single	7	CIO	Employee Referral	Exceptional
1102024056	67	Female	Single	8	Database Administrator	Search Engine - Google Bing Yahoo	Fully Meets
905013738	53	Female	Single	11	Database Administrator	Glassdoor	Fully Meets

Table 5.9: Sample Dataset (Acquisition)

We may consider the following metrics and compute each one of them using MS Excel:

Recruitment Source Breakdown:

Recruitment Source Breakdown	No. of Emps	Percentage
<i>Diversity Job Fair</i>	<i>4</i>	<i>28.57%</i>
Employee Referral	1	7.14%
Glassdoor	1	7.14%
Internet Search	1	7.14%
Monster.com	1	7.14%
Other	1	7.14%
Pay Per Click – Google	2	14.29%
Search Engine - Google Bing Yahoo	1	7.14%
Website Banner Ads	2	14.29%
Grand Total	14	100.00%

Table 5.10: Data Interpretation (Recruitment Source Breakdown)

Observation: the highest number of candidates were taken through the ‘Diversity Job Fair’.

Average Workforce Age: 51 years

Average Workforce Tenure: 8 years

Staffing Rate - Male/Female:

Staffing Rate (M/F)	Percentage
<i>Female</i>	<i>71.43%</i>
Male	28.57%
Total	100.00%

Table 5.11: Data Interpretation (Staffing Rate – Male/Female)

Observation: The company is dominated by female employees.

Staffing Rate - Marital Status:

Staffing Rate (Marital Status)	Percentage
Divorced	7.14%
<i>Married</i>	<i>57.14%</i>
Single	35.71%
Total	100.00%

Table 5.12: Data Interpretation (Marital Status)

Observation: Most of the employees are married.

Employment Level Staffing Breakdown:

Employment Level Staffing Breakdown	Percentage
Accountant I	21.43%
Administrative Assistant	21.43%
<i>CIO</i>	<i>7.14%</i>
Database Administrator	14.29%
<i>President & CEO</i>	<i>7.14%</i>
Shared Services Manager	14.29%
Sr. Accountant	14.29%
Total	100.00%

Table 5.13: Data Interpretation (Employment Level Staffing Breakdown)

Observation: 14.28% of the workforce is at the top level of management.

New Hire Failure Rate:

New Hire Failure Rate	No. of Emps
Fully Meets	1
<i>Poor</i>	<i>1</i>
Total	2

Table 5.14: Data Interpretation (New Hire Failure Rate)

Observation: Since there are only two employees whose tenure with the organization is less than or equal to 1 year and out of them one belongs to

the 'poor' performance category and the other is in the 'fully meets' category, New Hire Failure Rate is 50%

5.3 HR Metrics – Performance and Career Management

Performance management is one of the most important functions of HRM as it ensures the utilization of human potential to the extent with which the company can gain a competitive advantage. The process needs to be completely transparent to motivate the employees to see their contribution is ensuring a better financial position for the company and is being valued by the stakeholders. Let's consider the following metrics:

5.3.1 Metrics – Performance Management

Performance Management
a) Average Performance Appraisal Rating
b) Employee Turnaround Rate
c) Employee Upgrade Rate
d) High Performer Growth Rate
e) Peer Review Rate
f) Performance Appraisal Participation Rate
g) Performance Rating Distribution
h) Performance-Based Pay Differential
i) Self-Review Rate
j) Upward Review Rate

Table 5.15: *HR Metrics (Performance & Career Management – Performance Management)*

This shows the extent of employee performance improvement in comparison to the past years and the enhancement in performance in terms of reviews by self/peer/subordinate with the following metrics:

- a) **Average Performance Appraisal Rating** – it denotes the average performance appraisal rating obtained by the employees in the organization on a pre-defined scale. For example, a 5-point performance rating scale may be considered with the following anchor points of measurement:

- 1 – Poor
- 2 – Satisfactory
- 3 – Good
- 4 – Excellent
- 5 – Outstanding

For a company with 500 employees, if all the employees' performance is measured on the same scale and the average is 3.75, the company can do further analysis to find out the best and the least performers and come up with the right HR strategies for them.

b) Employee Turnaround Rate

This indicates the percentage of employees whose performance improved from the low to the high band of the performance rating scale in comparison to the previous year. This may be calculated as:

$$\text{Employee Turnaround Rate} = (\text{No. of Employees whose performance improved from low to the high-performance band}) / (\text{No. of Employees whose performance was evaluated}) \times 100$$

If Employee Turnaround Rate is improving in comparison to that of the previous years, it is favorable for the company.

c) Employee Upgrade Rate

This indicates the percentage of employees whose performance improved in comparison to the previous year. This may be calculated as:

$$\text{a) Employee Upgrade Rate} = (\text{No. of Employees whose performance improved}) / (\text{No. of Employees whose performance was evaluated}) \times 100$$

In case, Employee Upgrade Rate is improving in comparison to that of the previous years, it is favorable for the company.

The difference between Employee Turnaround Rate and Employee Upgrade Rate is, even if there is a small improvement in the performance of an employee in comparison to the previous occasion, he will be counted under Employee Upgrade Rate and not under Employee Turnaround Rate, i.e., if an employee's performance has improved from 1 to 2, 2 to 3, 3 to 4, 4 to 5 or 1 to 3, 2 to 4, etc. he will be considered under "Employee Upgrade Rate", but, if his performance has improved from 1 to 4, 1 to 5 or 2 to 5, he will be considered under "Employee Turnaround Rate".

b) High Performer Growth Rate

This shows that if there is an increase in the percentage change in the number of high performers in comparison to the previous year, then the number of high performers is increasing for the company and is calculated as:

$$\text{High Performer Growth Rate} = (\text{Number of high performers in the current year} - \text{Number of high performers in the previous year}) / ((\text{Number performers in the current year} + \text{Number of performers in the previous year}) / 2) \times 100$$

c) Peer Review Rate

The Peer Review Rate is an interesting measure from the perspective of allowing and encouraging peers or co-workers to review the performance of other employees. With this, the company can transition into a 180-degree appraisal system by including peers or co-workers as evaluators. This helps the management in taking the average review of the supervisor and peers', which reduces biases significantly. This is calculated as:

Peer Review Rate = (No. of Employees' performance reviewed by their peers or co-workers)/(Total No. of Employees whose performance is evaluated) x 100

d) Performance Appraisal Participation Rate

This measures the percentage of employees whose performance is evaluated. This is calculated as follows:

Performance Appraisal Participation Rate = (No. of Employees whose performance is evaluated)/(Total No. of Employees in the organization) x 100

All employees may be not covered under the performance evaluation umbrella in the same evaluation cycle and hence, this measure has significance.

e) Performance Rating Distribution

This measure indicates the percentage-wise distribution of employees in terms of their performance. For example, in a company, say 15% of the workforce belongs to the high-performance band, 55% belongs to the middle-performance band and the rest belongs to the low-performance band. This data helps the business managers to formulate requisite HR strategies with which employees' performance can be improved to make sure that the high performers are retained successfully.

f) Performance-Based Pay Differential

This metric shows the difference in the payment of employees based on their performance. For example, continuing with the above example, 15% of the workforce who are in the high-performance band are given higher 'Performance Linked Pay' in comparison to other performance bands of employees.

g) Self-Review Rate

This indicates the percentage of employees who evaluated themselves. It can be calculated as:

Self-Review Rate = (No. of Employees who evaluated themselves)/(No. of Employees whose performance was evaluated) x 100

h) Upward Review Rate

This is different from the above metrics in a way that this considers the percentage of employees who evaluated their supervisor's performance. It is calculated as:

Upward Review Rate = (No. of Employees who evaluated their supervisor's performance)/(No. of Employees whose performance was evaluated) x 100

Peer Review Rate, Upward Review Rate, and Self-Review Rate are parts of a 360-degree appraisal system (Kankana, 360-Degree Appraisal – A Performance Assessment Tool, 2006).

5.3.3 Metrics - Career Management

Career Management
a) Cross-Function Mobility – Managers
b) Employee Satisfaction with Leadership
c) LDP Prevalence Rate
d) Manager Instability Rate
e) Manager Quality Index
f) Positions Without Ready Candidate Rate
g) Successor Pool Coverage
h) Successor Pool Growth Rate

Table 5.16: HR Metrics (Performance & Career Management – Career Management)

This shows the scope of employee career management through possible internal mobilities from one job role to another. The following are the related metrics:

- a) **Cross-Functional Mobility (Managers)** – It indicates the number of times, the managers are moved from one functional area to the other, say from Marketing to Finance. This is mostly done as part of employee development to give managers exposure to the other verticals of business. This may be calculated as:

$$\text{Cross-Functional Mobility – Managers} = (\text{Number of Managers moved from one functional area to another}) / (\text{Total Number of Internal Movements of Managers}) \times 100$$

b) **Employee Satisfaction with Leadership**

This measure indicates the employee satisfaction level with the way they are being handled and managed by the leaders of the business. This is a subjective measure, and this is evaluated by administering a questionnaire consisting of questions related to employees' satisfaction with leadership, like –

- How far your effort or work are recognized or appreciated by your managers?
- What type of feedback do you get from your manager?
- What growth opportunities are created and implemented successfully for the employees?
- How far your manager is approachable to consider and appreciate your advice?

c) **LDP Prevalence Rate**

This measure applies to organizations that are focused on the development of future leaders, and they have appropriate leadership development plans in place and are executed to develop employees. This indicates the percentage of managers who are developed as future leaders out of the total number of managers present in the organization and is calculated as:

LDP Prevalence Rate = (Number of Managers who are covered under Leadership Development Program (LDP))/(Number of Managers present in the workforce) x 100

d) Manager Instability Rate

This indicates the percentage of the workforce whose supervisor was changed this year. The same may be calculated as:

Manager Instability Rate = (No. of Employees whose Supervisor were changed this year)/(Total No. of Employees in a year) x 100

e) Manager Quality Index

This subjective measure is executed to check the satisfaction level of employees with their manager's knowledge, skill, personality, performance, behavior, creating growth opportunities, etc.

f) Positions Without Ready Candidates Rate

This shows the percentage of vacant positions without ready candidates out of the total positions. If there are 30% of positions vacant in the company, the management needs to examine out of the total vacant positions how many positions are critical in terms of revenue earning to understand the urgency of filling those critical vacant positions first. Positions without Ready Candidates Rate is calculated as:

Positions Without Ready Candidates Rate = (No. of Vacant Positions)/(Total Number of Positions in the Organization) x 100

g) Successor Pool Coverage

This indicates the number of managers who require succession management focus out of the total number of managers present in the organization. Let's say, 10% of the total number of managers require succession management focus as they will be either promoted or be shifted to some other functional domains or are approaching retirement, etc. This is calculated as follows:

Successor Pool Coverage = (Number of Managers who require succession management focus)/(Total Number of Managers in the Organization) x 100

h) Successor Pool Growth Rate

This indicates the percentage increase in the successor pool in comparison to that of the previous year. This is calculated as:

Successor Pool Growth Rate = (Successor Pool Headcount of Current Year – Successor Pool Headcount of the Previous Year)/[(Successor Pool Headcount of the Current Year + Successor Pool Headcount of the Previous Year)/2] x 100

Let’s consider the following dataset:

Emp ID	Age	Sex	Marital Desc	Tenure	Reviewed By	Performance Rating	Performance Based Pay	Employee Satisfaction with Leadership
10026	38	M	Single	10	Self	4	40	3
10084	47	M	Married	7	Peer	3	30	4
10196	33	F	Married	10	Peer	1	10	3
10088	33	F	Married	14	Peer	2	20	2
10069	32	F	Divorced	10	Self	3	30	5
10002	45	F	Single	10	Manager	4	40	3
10194	43	F	Single	7	Manager	3	30	2
10062	39	M	Widowed	8	Manager	2	20	4
10114	52	F	Single	12	Self	2	20	3

10250	34	M	Divorced	7	Manager	3	30	1
10252	48	F	Married	11	Manager	3	30	3
10242	48	M	Married	10	Peer	3	30	2
10012	34	M	Divorced	7	Self	4	40	3
10265	38	M	Single	10	Self	3	30	4
10066	44	M	Divorced	9	Manager	1	10	3
10061	40	M	Single	11	Manager	3	30	5
10023	56	F	Married	5	Manager	4	40	1
10055	51	F	Single	11	Self	3	30	2
10245	36	F	Single	7	Peer	1	10	3
10277	43	M	Single	8	Manager	1	10	2

Table 5.17: Sample Dataset (Performance & Career Management)

The following metrics can be considered for calculation using MS Excel:

Average Performance Appraisal Rating: 2.65

Peer Review Rate:

Peer Review Rate = (No. of employees' performance reviewed by peers)/(No. of employees whose performance were reviewed) x 100

$$= (5/20) \times 100$$

$$= 25\%$$

Self-Review Rate:

Self-Review Rate = (No. of employees' performance reviewed by themselves)/(No. of employees whose performance were reviewed) x 100

$$= (6/20) \times 100$$

$$= 30\%$$

Performance Rating Distribution:

In this dataset, the Performance Evaluation Scale is as follows:

1 – Poor; 2 – Meets; 3 – Fully Meets and 4 – Exceeds

Performance Rating	No. of Emps	Percentage
1	4	7.55%
2	3	11.32%
3	9	50.94%
4	4	30.19%
Total	20	100.00%

Table 5.18: Data Interpretation (Performance Rating Distribution)

Observation: From the above Pivot Table, we understand that the majority of the workforce belongs to the “Fully Meets” Performance Band.

Performance-Based Pay Differential:

Performance Rating	Average Performance-Based Pay
1	13
2	22
3	32
4	43

Table 5.19: Data Interpretation (Performance-Based Pay Differential)

Observation: This shows as performance improves the Performance-Based Pay increases. This acts as a source of motivation for employees to focus on their performance.

Employee Satisfaction with Leadership:

Observation: Here, the average Employee Satisfaction with Leadership is 3 (Approx.) on a 5-point scale, 5 is the highest, and 1 is the lowest score.

5.4 HR Metrics – Training and Development

Training is the process of imparting basic skills to individuals. Development is a continuous process.

5.4.1 HR Metrics –Training

Training
a) Average Training Class Size
b) e-Learning Abandonment Rate
c) Employee Satisfaction with Training
d) Training Channel Delivery Mix
e) Training Course Content Breakdown
f) Training Expense Per Employee
g) Training Hours Per FTE
h) Training Hours Per Occurrence
i) Training Penetration Rate
j) Training Quality
k) Training Staff Ratio
l) Training Total Compensation
m) Training Expense Rate

Table 5.20: *HR Metrics (Training & Development – Training)*

This shows the effectiveness of the training programs conducted with the above-mentioned metrics:

- a) Average Training Class Size** – Average Training Class Size denotes the number of trainees considered in each training program. This is calculated as follows:

Average Training Class Size = (Total number of trainees accommodated)/(Number of training programs conducted) in a year

In case this measure is low in comparison to the workforce size and the management wants to cover more employees under next year's training umbrella, the next year's training budget and the training calendar are to be prepared accordingly.

- b) e-Learning Abandonment Rate** – this measure denotes the No. of Employees who opted for e-Learning but left the courses in between. This is calculated as follows:

e-Learning Abandonment Rate = (No. of employees who opted for e-Learning and could not complete)/(No. of employees who opted for e-Learning) x 100

In case the e-Learning is company-sponsored, and the e-Learning Abandonment Rate is quite high, the company needs to re-visit the e-Learning policy and make sure that it does not harm employee costs.

- c) Employee Satisfaction with Training** – this is a subjective measure and the trainees' perception of the training program can be evaluated by executing a questionnaire consisting of relevant questions related to their expectations from the training program and the extent the training program could do justice to that. The dimensions of evaluation of satisfaction can be:

- Evaluation of the Content
 - Relevant
 - Adequate
 - Suggestions for improvement etc.
- Evaluation of the Trainer
 - Knowledge Level
 - Communication Skill
 - Behavioral Skill
 - Training Pedagogy
 - Suggestions for improvement etc.

- Evaluation of Training Materials
 - Relevant
 - Adequate
 - Understandable
 - Given beforehand
 - Suggestions for improvement etc.
- d) **Training Channel Delivery Mix** – this shows how the training program was conducted by delivery type, e.g., classroom, e-learning, etc., as per requirements. Further analysis may be done to check which delivery pedagogy was the most effective in changing the trainee’s performance and why?
- e) **Training Course Content Breakdown** – this shows the structure of the training program in terms of contents or components and which content or component is given what weightage according to the importance. For example, for training in “*Communication*”, the contents can be “*Verbal Communication*” and “*Non-verbal Communication*”. “*Non-verbal Communication*” can be further divided into “*Body Language*”, “*Gesture*”, “*Posture*”, etc.
- f) **Training Expense Per Employee** – This shows the average training expense per employee and is measured as:

$$\text{Training Expense Per Employee} = (\text{Total Training Expense}) / (\text{Average No. of Employees in a year})$$

As per Economic Times (Sep 03, 2018), the average Learning and Development Expense per FTE* in India is Rs 41,838. This figure can be roughly considered for anticipating the future training expenditure of any standard company.

*Full-Time Employee

- g) **Training Hours Per FTE** – This indicates the average man-hours invested in training the employees and is calculated as:

Training Hours Per FTE = (Total Training Hours)/(Average No. of FTE) in that year

In the IT service industry in India, each employee is trained for 12 man-days per year.

- h) Training Hours Per Occurrence** – This is calculated as:

Training Hours Per Occurrence = (Total Training Hours)/(No. of Training programs conducted) in that year

This indicates the average length of a training program in terms of man-hours. This measure considers all training occurrences irrespective of their length. Hence, Training Hours Per Occurrence may be the same for a company that is conducting frequent short-duration programs as another company that is conducting moderate long-duration programs.

- i) Training Penetration Rate** – it is a measure of the rate with which the total workforce is covered under the training umbrella. This is calculated as follows:

Training Penetration Rate = (No. of Trainees)/(Total Number of FTE) in a year x 100

A 60% Training Penetration Rate indicates 60 out of 100 employees have gone through training programs in that year.

- j) Training Quality** – this is not a direct measure and is evaluated in terms of the extent to which the training program was effective in improving employee performance or changing employee behavior. This can be measured in terms of change in employee performance before and after the training program.

- k) Training Staff Ratio** – this indicates the percentage of employees in the training department out of the total workforce and it is calculated as follows:

Training Staff Ratio = (No. of Training Staff members)/(Total No. of FTE) in a year

If the percentage is too low, further investigation can be carried out to see whether with this number of training staff members the planned training programs are effectively delivered.

- l) **Training Total Compensation** – it measures what percentage of total employee compensation is the compensation of the training staff members and is calculated as:

$$\text{Training Total Compensation} = (\text{Total compensation of the Training Staff members}) / (\text{Total Employee Compensation}) \text{ in a year}$$

- m) **Training Expense Rate** – it indicates what percentage of total business expense is training expense and can be calculated as:

$$\text{Training Expense Rate} = (\text{Total Training Expense}) / (\text{Total Expense}) \text{ in a year}$$

This measure sets the guideline for anticipating the next year's training budget.

5.4.2 HR Metrics –Education & Development

Education and Development
a) Development Program Penetration Rate
b) Educational Attainment Breakdown
c) Staffing Rate – Graduate Degree
d) Staffing Rate – High Potential
e) Tuition Reimbursement Request Rate

Table 5.21: HR Metrics (Training & Development – Education and Development)

This indicates the workforce composition in terms of the level of education and the extent to which employees want to develop themselves with further education and developmental interventions.

- a) **Development Program Penetration Rate** – this shows the percentage/number of employees at the managerial level covered under the Development Program. It is calculated as:

$$\text{Development Program Penetration Rate} = (\text{No. of managerial employees trained under Development Program}) / (\text{Total No. of managerial employees}) \text{ in a year}$$

- b) **Educational Attainment Breakdown** – this is explored to categorize the employees in terms of their educational attainment. For example, what percentage of the workforce are master's degree holders, graduates, or undergraduates? The same is explained in the next metrics.

- c) **Staffing Rate – Graduate Degree** – it indicates the percentage of FTEs with graduate degrees. This depends on the type of job roles they are in and the requirements of the job roles in terms of qualifications.

$$\text{Staffing Rate – Graduate Degree} = (\text{No. of Employees with Graduate Degrees}) / (\text{Total No. of Employees}) \times 100$$

- d) **Staffing Rate – High Potential** – it indicates the percentage of employees with high potential out of the total workforce and can be calculated as:

$$\text{Staffing Rate – High Potential} = (\text{No. of High Potential Employees}) / (\text{Total No. of Employees}) \times 100$$

- e) **Tuition Reimbursement Request Rate** – this shows the percentage of employees who requested tuition reimbursement out of total No. of Employees who are eligible to apply for tuition reimbursement. This can be calculated as:

$$\text{Tuition Reimbursement Request Rate} = (\text{No. of Employees requested for Tuition Reimbursement}) / (\text{Total No. of Employees who are eligible to apply for Tuition Reimbursement}) \times 100$$

This measure is important for anticipating the number of employees who may opt for tuition reimbursement next year and if this year the rate is lower than the previous year, the management may have a re-look at the tuition reimbursement policy to check if is good to continue with the policy or to discontinue to support training budget.

Let's consider the following dataset:

Training Name	No. of Trainees	Training Type	No. of Days	Online/ Classroom
Advanced Management Skills	12	Professional Development	2	Online
Business Writing	8	Professional Development	2	Internal
7 Habits of Highly Effective Executives	17	Professional Development	2	Online
Creativity and Innovation	13	Professional Development	1	Internal
7 Habits of Highly Effective Executives	7	Professional Development	1	Internal
Business Grammar	41	Skill Development	1	Internal
Six Sigma	62	Skill Development	2	External

Communicate to Impact	25	Professional Development	1	External
Creativity and Innovation	22	Professional Development	2	External
Advanced Management Skills	15	Professional Development	1	External
Microsoft Excel	45	Skill Development	1	External
Path to Extraordinary Productivity	52	Professional Development	2	Internal
Business Grammar	62	Skill Development	1	Online
Microsoft Excel	37	Skill Development	2	Online

Table 5.22: Sample Dataset (Training & Development)

Let's calculate the following metrics:

Average Training Class Size = (Total No. of Trainees)/(No. of Training occurrences) = $418/14 = 30$ (approx.)

e-Learning Rate = (No. of trainees trained in e-Learning mode)/(Total No. of trainees) $\times 100 = 128/418 \times 100 = 31\%$ (approx.)

Training Hours Per Occurrence = (Total training hours)/(No. of Training occurrences) = $21/14 = 1.5$ hours

5.5 HR Metrics – Compensation and Benefits

Compensation and Benefits are given to the employees in exchange for their contribution to the company. A part of compensation is the salary which is the fixed part that the employee is entitled to get irrespective of his level of

performance. There are certain non-monetary parts included in compensation and benefits which are given to employees to motivate them and to make the work environment enjoyable for them.

5.5.1 Metrics – Compensation

Compensation
a) Average Cost Rate of Contractors
b) Average Hourly Rate
c) Bonus Actual to Potential Rate
d) Bonus Compensation Rate
e) Bonus Eligibility Rate
f) Bonus Receipt Rate
g) Compensation Satisfaction Index
h) Direct Compensation Operating Expense Rate
i) Direct Compensation Breakdown
j) Direct Compensation Per FTE
k) Market Compensation Ratio
l) Overtime Expense Per FTE
m) Overtime Rate
n) Total Compensation Expense Per FTE
o) Upward Salary Change Rate

Table 5.23: HR Metrics (Compensation & Benefits – Compensation)

This shows the cost consequences of compensation to the total cost of the company with the following metrics:

- a) **Average Cost Rate of Contractors** – this indicates the average amount of money spent to pay the contractors through whom workers/employees are taken either temporarily or on a contingency basis. This is calculated as:

Average Cost Rate of Contractors = (Total amount spent in acquiring the workers/employees from the contractors)/(Number of contractors from whom the workers are taken) x 100

- b) **Average Hourly Rate** – this indicates the average amount of money paid to workers per hour and it is calculated as:

Average Hourly Rate = (Total amount spent on workers)/(Total working hour for workers) x 100

- c) **Bonus Actual to Potential Rate** – this indicates the ratio between the total amount of actual bonus given to employees to the amount of bonus that could have been given to them had they fulfilled the expected level of performance. This shows the percentage of Potential Bonus is given as Actual Bonus. The formula is:

Bonus Actual to Potential Rate = (Total amount of money given to the employees as a bonus)/(Total amount of money they would have gotten had they fulfilled the expected level of performance) x 100

- d) **Bonus Compensation Rate** – this indicates the percentage of the total compensation given as a bonus to employees. The formula is:

Bonus Compensation Rate = (Total amount of money given as Bonus to the employees)/(Total amount of money given as compensation to the employees) x 100

- e) **Bonus Eligibility Rate** – this shows the percentage of the workforce eligible for a bonus. This is calculated as:

Bonus Eligibility Rate = (No. of employees who are eligible for bonus)/(Total No. of employees) in a year) x 100

- f) **Bonus Receipt Rate** – this shows the percentage of the workforce that received a bonus. This is calculated as:

Bonus Receipt Rate = (No. of employees who get bonus)/(No. of employees eligible for bonus) x 100

- g) **Compensation Satisfaction Index** – this is a subjective measure and in this, the employees' views are taken about their satisfaction with compensation in a pre-defined scale. This is an important indicator for predicting employee attrition. If the average compensation satisfaction level is low, this may be one of the reasons for employees to depart in the future.

- h) **Direct Compensation Operating Expense Rate** – this indicates the percentage of the total operating expense of the company is the direct compensation given to employees. This is calculated as:

Direct Compensation Operating Expense Rate = (Amount of Direct Compensation given to the employees)/(Total Operating Expenditure of the company) x 100

- i) **Direct Compensation Breakdown** – this shows how the direct compensation is apportioned into different components. For example, what percentage of direct compensation is given as Basic or Dearness Allowance or House Rent Allowance, etc? The formula is:

Direct Compensation Breakdown = (Amount of money given as the Basic or others as a part of Direct compensation)/(Amount of money given as total Direct Compensation to the employees) x 100

- j) **Direct Compensation Per FTE** – this shows the average amount of money given to each Full-Time Employee as Direct Compensation. This is calculated as:

Direct Compensation Per FTE = (Total Direct Compensation given to the FTEs)/(Number of FTEs)

- k) **Market Compensation Ratio** – this denotes the extent the salary provided by the company is matching the market average salary. This is calculated as:

Market Compensation Ratio = (Current Salary)/(Average Market Salary)

This can be considered one of the effective predictors of Employee Attrition. If the current salary of the company is less than the market average salary, that can be a serious concern for the company. The result can be checked with the Compensation Satisfaction Index.

- l) **Overtime Expense Per FTE** – this denotes the average overtime expense of the FTEs. This is calculated as:

Overtime Expense Per FTE = (Total Overtime Expense)/(Total Number of FTEs)

This measure is applicable when all the employees are needed to work overtime.

- m) **Overtime Rate** – it is the amount of money given to employees for each extra hour of work. This is calculated as:

Overtime Rate = (Total Overtime Expense)/(Total Overtime Hour) x 100

- n) **Total Compensation Expense Per FTE** – this shows the total amount of compensation given to an individual employee. This is calculated as:

Total Compensation Expense Per FTE = (Total Compensation Expense for all the FTEs)/(Number of FTEs)

- o) **Upward Salary Change Rate** – this denotes the percentage of employees whose salary has increased out of the total workforce. This is calculated as:

Upward Salary Change Rate = (No. of Employees whose salary has increased)/(Total No. of Employees in the company) x 100

5.5.2 Metrics – Benefit

Benefit
a) Benefits Expense Per FTE
b) Benefits Expense Type Breakdown
c) Benefits Operating Expense Rate
d) Benefits Satisfaction Index
e) Benefits Total Compensation Rate

Table 5.24: HR Metrics (Compensation & Benefits – Benefits)

This examines the employee benefit expense and the extent they are satisfied with it with the above-mentioned metrics:

- a) **Benefits Expense Per FTE** – this indicates the average benefit expense per FTE. This is calculated as:

Benefits Expense Per FTE = (Total Benefit Expense for all the Employees)/(No. of FTEs)

- b) **Benefits Expense Type Breakdown** – This indicates how the expense of the total benefits is apportioned into different components. For example, benefits can be of different types, like – Medical Insurance, Life Insurance, Retirement Plans, Disability Insurance, etc. This metric can be calculated as:

Benefits Expense Type Breakdown = (Expense related to the different benefit components)/(Total Benefits Expense)

This shows what part of total benefits expense is the benefit related to Medical Insurance or Retirement Plans etc.

- c) **Benefits Operating Expense Rate** - this shows the percentage of the total operating expense of the company as the benefit expense. This is calculated as:

$$\text{Benefits Operating Expense Rate} = (\text{Total Benefits Expense}) / (\text{Total Operating Expense}) \times 100$$

- d) **Benefits Satisfaction Index** – this is a subjective measure, and it indicates the extent to which the employees are satisfied with the kind and number of benefits extended to them. This is understood by administering a questionnaire to the employees to check their satisfaction with benefits.
- e) **Benefits Total Compensation Rate** – this indicates the percentage of total compensation is the benefit expense. This is calculated as:

$$\text{Benefits Total Compensation Rate} = (\text{Total Benefits Expense} / \text{Total Compensation Expense}) \times 100$$

5.5.3 Metrics – Equity

Equity
a) Average Number of Options Per Employee
b) Equity Incentive Value Per Employee
c) Stock Incentive Eligibility Rate

Table 5.25: HR Metrics (Compensation & Benefits – Equity)

This deals with the Equity option for the employees and the eligibility to avail of the option. This is given by the companies to motivate the employees to enhance their contribution to the company. The metrics related to this are explained below:

- a) **Average Number of Options Per Employee** – This shows the average number of equity/stock options given to the employees of the company. This is calculated as:

$$\text{Average Number of Options Per Employee} = (\text{Total number of Equity/Stock options extended}) / (\text{Total No. of Employees})$$

- b) **Equity Incentive Value Per Employee** – this shows the average amount of Equity Value given to each employee as an incentive. This is calculated as:

$$\text{Equity Incentive Value Per Employee} = (\text{Total Equity Value given to the employees as an incentive}) / (\text{No. of Employees in the company})$$

- c) **Stock Incentive Eligibility Rate** – This indicates the percentage of employees eligible for getting the Stock Incentive option out of the total workforce. This is calculated as:

$$\text{Stock Incentive Eligibility Rate} = (\text{No. of Employees eligible for Stock Incentive}) / (\text{Total No. of Employees}) \times 100$$

Let's consider the following dataset in Rupees:

Employee Name	Job Title	Base Pay	Overtime Pay	Benefits	Bonus	Total Pay
A Sharma	General Manager-Metropolitan Transit Authority	167411.18	0	400184.25	Not Provided	567595.43
Sumit Agarwal	Captain (Police Department)	155966.02	245131.88	137811.38	Not Provided	538909.28
Smitha Rao	Captain (Police Department)	212739.13	106088.18	16452.6	Provided	335279.91
Bhavna Chopra	Wire Rope Cable Maintenance Mechanic	77916	56120.71	198306.9	Provided	332343.61
Pavan Kumar	Deputy Chief of Department, (Fire Department)	134401.6	9737	182234.59	Not Provided	326373.19
Atul Goenka	Assistant Deputy Chief	118602	8601	189082.74	Provided	316285.74

Chandan Gupta	Battalion Chief, (Fire Department)	92492.01	89062.9	134426.14	Not Provided	315981.05
Romita Pande	Deputy Director Of Investments	256576.96	0	51322.5	Not Provided	307899.46
Daksh P.D	Executive (Production)	176932.64	86362.68	40132.23	Provided	303427.55
Gaurav Rao	Department Head (IR)	285262	0	17115.73	Not Provided	302377.73
Gokul Sharma	Assistant Manager	194999.39	71344.88	33149.9	Not Provided	299494.17
Beauty Singh	Executive (Administration)	99722	87082.62	110804.3	Not Provided	297608.92
Peter Paul	Chief Executive (Marketing)	294580.02	0	0	Not Provided	294580.02
Harshit Malhotra	Department Head (Finance)	271329.03	0	21342.59	Provided	292671.62
Ritesh Basu	Executive (Production)	174872.64	74050.3	37424.11	Not Provided	286347.05
Rita Payne	Assistant Manager	198778.01	73478.2	13957.65	Provided	286213.86

Sourav Basu	Department Head (HR)	268604.57	0	16115.86	Provided	284720.43
Sarita Saxena	Manager, Emergency Medical Services	140546.87	119397.26	18625.08	Provided	278569.21
Tripti Karmakar	Chief, (Fire Department)	168692.63	69626.12	38115.47	Not Provided	276434.22
Avinash Pande	Associate Manager	257510.59	880.16	16159.5	Not Provided	274550.25
Total/Average	20	3747935	1096964	1672764		6517663

Table 5.26: Sample Dataset (Compensation & Benefit)

Let's consider the following metrics and calculated them using MS Excel:

Benefits to Total Compensation Rate = (Total Benefits)/(Total Compensation) x 100

$$= 1672764/6517663 \times 100 = \mathbf{26\%}$$

Benefits Expense Per FTE = (Total Benefits Expense)/(No. of FTE) = 16,72,764/20 = **83,638/-**

Overtime Expense Per FTE = (Total Overtime Expense)/(No. of FTE) = 10,96,964/20 = **54848/-**

Bonus Eligibility Rate = (No. of employees given Bonus)/(No. of FTE) x 100 = 8/20 x 100 = **40%**

Total Compensation Expense Per FTE = (Total Compensation expense for FTE)/(No. of FTE)

$$= 6517663/20 \\ = \mathbf{3,25,883/-}$$

5.6 HR Metrics – Retention

Employee retention is one of the major challenges faced by every company. Through proper employee retention strategies, the company can ensure that employee turnover is controlled, productive, talented employees are retained, and a positive work environment is maintained for sustainability.

5.6.1 Metrics – Turnover

Turnover
a) Involuntary Turnover Rate
b) New Hire Turnover Rate
c) Retention Rate
d) Termination Breakdown by Performance Rating
e) Termination Reason Breakdown
f) Voluntary Termination Rate

Table 5.27: HR Metrics (Turnover)

Employee Turnover is a major concern for the company. It has been explained with examples in Chapter 2. The metrics related to Turnover are explained below:

- a) **Involuntary Turnover Rate** – this shows the percentage of employees forced to leave the company in a year. This is calculated as:

$$\text{Involuntary Turnover Rate} = (\text{No. of employees forced to leave the company} / \text{Total No. of employees left}) \text{ in a year} \times 100$$

- b) **New Hire Turnover Rate** – it indicates the percentage of new employees who left the company in a year. This is calculated as:

$$\text{New Hire Turnover Rate} = (\text{No. of New Hires left the company} / \text{Total No. of employees in the company}) \text{ in a year} \times 100$$

It is a serious concern for management if the New Hire Turnover Rate is high. The new hires are either terminated or they are leaving on their own because of the following reasons:

- Performance expectations are not met
- Dissatisfaction with the supervisor
- Job role – profile mismatch
- Not satisfied with the compensation
- Better job opportunities
- Fewer growth opportunities
- Incommensurate work ambiance etc.

The above-mentioned points can be considered to analyze the voluntary/involuntary employee turnover of the company.

- c) **Retention Rate** – this indicates the percentage of employees who are continuing with the company. It is just the reverse of the Turnover Rate. If the Turnover Rate for a company is 23%, the Retention Rate is 77%.

$$\text{Retention Rate} = (\text{Remaining Headcount at the end of the year}) / (\text{Starting Headcount of the year}) \times 100$$

- d) **Termination Breakdown by Performance Rating** – this indicates the No. of Employees who left the company on each performance category. For example, if 5 out of 20 departing employees in a company belonging to the ‘low-performance category’, the ratio can be calculated as:

$$\text{Termination Breakdown by Performance Rating} = (\text{No. of employees left in each performance category or rating}) / (\text{Total No. of employees left})$$

The value of Termination Breakdown by Performance Rating is 5/20 i.e., one-fourth for the ‘low-performance category’ in the above-mentioned example.

- e) **Termination Reason Breakdown** – this denotes the reason-wise departure of employees in the year. The reasons for termination are already mentioned earlier. This can be calculated as:

$$\text{Termination Reason Breakdown} = (\text{No. of employees left in the year due to each termination reason}) / (\text{Total No. of employees left in the year})$$

For example, out of 20 employees if 4 have left because they were dissatisfied with their salary, *Termination Reason Breakdown* = $4/20 = 1/5$, and the same can be computed for other reasons for termination to check which one creates the most damage.

- f) **Voluntary Termination Rate** – this indicates the percentage of employees who have left the company voluntarily (on their own) in a year. This is calculated as:

$$\text{Voluntary Termination Rate} = (\text{No. of employees left voluntarily in a year}) / (\text{Total No. of employees at the start of the year}) \times 100$$

The Voluntary Turnover Rate is just the reverse of the Involuntary Turnover Rate. If the Turnover Rate of a company is 13% and the Voluntary Turnover Rate is 75% of 13%, then the Involuntary Turnover Rate is 25% of 13%.

To control the Voluntary Turnover Rate, the company needs to conduct formal exit interviews with the employees who have already resigned to know the actual reasons behind their leaving. If this is not measured and corrective actions are not taken on time, it may aggravate further leading to further loss of revenue.

5.6.2 Metrics - Employee Engagement

Employee Engagement
a) Employee Commitment Index
b) Employee Engagement Index
c) Employee Retention Index
d) Market Opportunity Index
e) Offer Fit Index

Table 5.28: HR Metrics (Employee Engagement)

Employee Engagement is one of the most important HR Outcomes (see Figure 1.2). If employees are engaged, their performance improves, and higher revenue can be generated with engaged employees, which improves shareholders' experience. The related metrics are explained below:

a) **Employee Commitment Index** – this subjective measure is executed to understand the commitment level of employees to check if they are losing interest. This is done by administering a questionnaire consisting of questions related to:

- *Willingness to work*
- *Desire to grow etc.*

b) **Employee Engagement Index** – this is also a subjective measure to understand the extent the employees are engaged in their respective job roles. This is done by administering a questionnaire based on Kahn's 3 Dimensions of Employee Engagement with questions like –

- *Physical engagement*: what level of physical effort is exerted to perform the job role.
- *Cognitive engagement*: whether they are aware of the employer's vision, mission, and strategic objectives and how they perform to meet those.
- *Emotional engagement*: to the extent they are emotionally connected to their employer.

c) **Employee Retention Index** – this indicates the extent to which employees want to leave the organization. This is not a direct measure but a subjective one. It is a predictive metric to predict the separation of employees in the future. This can be assessed in terms of the following parameters:

- *Employee commitment*
- *Employee engagement*
- *Offer fit*
- *Market opportunities etc.*

A declining Employee Retention Index leads to high Employee Turnover.

d) Market Opportunity Index – this indicates the possibility for the employees to switch jobs in the market for better prospects. The employees' views can be taken related to market opportunities in terms of:

- *job and career growth prospects*
- *better compensation and other benefits*
- *challenging job roles*

This is to be done to suitably address the lacking internal parameters to control future attrition.

e) Offer-Fit Index – this measures the satisfaction level of employees related to given job offers to their skill sets and potential.

5.6.3 Metrics – Cost of Turnover

Cost of Turnover
a) Average Termination Value
b) Average Voluntary Termination Value
c) Termination Value per FTE
d) Turnover Cost for less than 1 Year Tenure

Table 5.29: HR Metrics (Cost of Turnover)

a) Average Termination Value – this indicates the revenue the company will forego due to termination for the total number of terminations. This is calculated as:

$$\text{Average Termination Value} = (\text{Total Revenue lost due to Termination}) / (\text{Total No. of Terminations})$$

**Total Revenue Lost due to Termination can be replaced by Turnover Cost. The calculation was shown in Chapter 2 with an example.*

- b) Average Voluntary Termination Value** - this indicates the revenue the company must forego due to voluntary termination for the total number of voluntary terminations. This is calculated as:

$$\text{Average Voluntary Termination Value} = (\text{Turnover Cost for Voluntary Terminations}) / (\text{Total No. of Voluntary Terminations})$$

- c) Termination Value per FTE** – this denotes the amount of revenue the company must forego due to employee termination for the total number of FTEs. This is calculated as:

$$\text{Termination Value per FTE} = (\text{Turnover Cost}) / (\text{Total No. of FTEs})$$

- d) Turnover Cost for less than 1 Year Tenure** – this indicates the revenue lost due to the termination of employees with less than one-year tenure.

It is an important measure as the average cost to replace an employee is almost 50% of the employee's annual salary. If the company incurs this cost due to the departure of employees with less than one-year tenure, that is a serious concern for the company.

Let's consider the following dataset:

Employee Number	Pay Rate	Date of Hire	Tenure	Reason For Term	Performance Score
1103024456	28.5	27-10-08	13.7	N/A - still employed	Fully Meets
1106026572	23	06-01-14	8.5	N/A - still employed	Fully Meets
1302053333	29	29-09-14	7.8	Voluntary	Fully Meets

1211050782	21.5	16-02-15	7.4	Involuntary	N/A- too early to review
1307059817	16.56	01-05-15	7.2	N/A - still employed	N/A- too early to review
711007713	20.5	26-09-21	0.8	Voluntary	Fully Meets
1102024115	55	15-08-21	0.9	N/A - still employed	Fully Meets
1206043417	55	18-08-14	7.9	Involuntary	Fully Meets
1307060188	34.95	20-02-12	10.4	N/A - still employed	90-day meets
1201031308	34.95	18-08-14	7.9	Voluntary	Fully Meets
1001495124	80	07-03-11	11.3	Involuntary	Fully Meets
1112030816	65	07-07-14	8.0	Involuntary	Exceptional
1102024056	43	12-05-14	8.1	Voluntary	Fully Meets
905013738	48.5	07-03-11	11.3	Voluntary	Fully Meets
1410071156	40.1	30-04-12	10.2	Voluntary	N/A- too early to review
1105025718	34	29-09-14	7.8	N/A - still employed	N/A- too early to review
1003018246	40	05-01-15	7.5	N/A - still employed	90-day meets

1406068403	35.5	27-09-10	11.8	N/A - still employed	Exceptional
1102023965	41	05-07-21	1.0	Voluntary	Fully Meets
1108027853	42.75	05-03-12	10.3	N/A - still employed	Exceptional
Total/ Average	39.44		8.0		20

Table 5.30: Data Interpretation (Acquisition)

Let's calculate the following metrics using MS Excel:

Turnover Rate

$$\begin{aligned}
 \text{Turnover Rate} &= (\text{No. of Terminations})/(\text{Total No. of Employees}) \times 100 \\
 &= 11/20 \times 100 \\
 &= 55\%
 \end{aligned}$$

Therefore, Employee Retention Rate = $(100 - 55)\% = 45\%$

Involuntary Termination Rate

$$\begin{aligned}
 \text{Involuntary Termination Rate} &= (\text{No. of Involuntary Termination})/(\text{Total No. of Termination}) \times 100 \\
 &= 4/11 \\
 &= 36.3\%
 \end{aligned}$$

Therefore, the Voluntary Termination Rate is $(100 - 36.3)\% = 63.7\%$

New Hire Turnover Rate

$$\begin{aligned}
 \text{New Hire Turnover Rate} &= (\text{No. of New Hires Terminated})/(\text{Total No. of Terminations}) \times 100 \\
 &= 2/20 \times 100 \\
 &= 10\%
 \end{aligned}$$

Termination Breakdown Per Performance Rating

$$\begin{aligned}
 \text{Termination Breakdown Per Performance Rating} &= [1 (\text{Performance Rating - Meets}) + 7 (\text{Performance Rating - Fully Meets}) + 3 (\text{Performance Rating - Exceptional})] / 11 (\text{Total No. of Terminations}) \\
 &= 1/11 + 7/11 + 3/11 \\
 &= 9\% + 64\% + 27\%
 \end{aligned}$$

Termination Reason Breakdown

$$\begin{aligned}
 \text{Termination Reason Breakdown} &= [7 (\text{Voluntary Termination}) + 4 (\text{Involuntary Termination})] / (\text{Total No. of Terminations}) \\
 &= 7/11 + 4/11 \\
 &= 64\% + 36\%
 \end{aligned}$$

5.7 HR Metrics – Organizational Effectiveness

Effective organizations can accomplish their goals. But the emphasis is given on not “What they achieve?” but “How they achieve?” Effective organizations embrace technology and focus on designing and managing processes with people interventions. They appreciate and realize that Human Recourses are the drivers of company productivity and profit as wastage of acquired human potential may lead to a downfall in their competitive position.

Higher employee productivity leads to higher profit margins. A study of Operating Expenses for employees incurred by the company and the Operating Profit generated by HR can bring interesting insights. The related metrics are explained below:

5.7.1 Metrics – Productivity

Productivity
a) Human Investment Ratio
b) Operating Expense per FTE
c) Operating Profit per FTE
d) Return on Human Investment Ratio

Table 5.31: HR Metrics (Productivity)

- a) Human Investment Ratio** – this is measured as the total amount of money invested in employees for the total investment made by the company in that year. This is calculated as:

$$\text{Human Investment Ratio} = (\text{Total Investment on Employees}) / (\text{Total Investment in Business}) \text{ in a year}$$

This indicates the percentage of the total investment in the business is the employee investment. If it is too high, further investigations are required to find avenues to control the over-expenses.

- b) Operating Expense per FTE** – it indicates the average operating expense per FTE. This is calculated as:

$$\text{Operating Expense per FTE} = (\text{Total Operating Expense} / \text{Total No. of FTEs}) \text{ in a year}$$

This ratio is useful in comparing the result with that of the previous years and controls the acquisition, development, and retention functions accordingly to optimize cost.

- c) Operating Profit per FTE** – this is a measure of average operating profit per FTE and is calculated as:

$$\text{Operating Profit per FTE} = (\text{Total Profit earned by the company} / \text{No. of FTEs}) \text{ in a year}$$

The result may be compared to that of the previous years to check if it is improving.

- d) **Operating Revenue per FTE** – this is a measure of the average revenue generated by each FTE. This can be calculated as:

$$\text{Operating Revenue per FTE} = (\text{Total Revenue Earned by the Company} / \text{Total No. of FTEs})$$

This can be compared to that of the previous years to check if it is increasing or decreasing so that the business managers take corrective measures in case it is decreasing.

- e) **Return on Investment Ratio** – this indicates the percentage of investment that has been generated as a return. It is calculated as:

$$\text{Return on Investment Ratio} = (\text{Total Revenue}) / (\text{Total Investment})$$

This is not a direct measure related to the HR functions, but with this, it can be understood how far human resources are productive in generating revenue out of the investment.

5.7.2 Metrics – Structural

Structural	
a)	Corporate Expense Rate
b)	Employee Stock Ownership Percentage
c)	Intangible Asset Value per FTE
d)	Market Capitalization per FTE

Table 5.32: HR Metrics (Structural)

- a) **Corporate Expense Rate** – it indicates what percentage of the total expense is a corporate expense. This is calculated as:

$$\text{Corporate Expense Rate} = (\text{Corporate Expense}) / (\text{Total Operating Expense}) \times 100$$

A lower corporate operating rate is desirable by the investors as it means the expenses are minimized relative to revenue. This is also not a direct measure for HR functions, but with this, it can be analyzed to what extent through employee performance a lower Corporate Expense Rate may be obtained.

- b) **Employee Stock Ownership Percentage** – this indicates the percentage of the workforce owning company stocks. It is calculated as:

$$\text{Employee Stock Ownership Percentage} = (\text{No. of Employees owning Company Stocks} / \text{Total No. of Employees in the Company in a year}) \times 100$$

- c) **Intangible Asset Value per FTE** – Employees are considered the most valuable intangible asset. This metric indicates the average intangible asset value per employee. This is calculated as:

$$\text{Intangible Asset Value per FTE} = (\text{Total Asset Value of all Intangible Assets}) / (\text{No. of FTEs})$$

Higher Intangible Asset Value per FTE shows that the employees are contributing more to generate revenue.

- d) **Market Capitalization per FTE** – Market Capitalization is the total dollar value of all the outstanding shares in the current market. Market Capitalization is calculated as follows:

$$\text{Market Capitalization} = (\text{Current Market Price per Share}) \times (\text{Total No. of Shares})$$

Therefore,

$$\text{Market Capitalization per FTE} = (\text{Total Market Capitalization}) / (\text{No. of FTEs})$$

5.7.3 Metrics – Innovation

Innovation
a) New Products & Services
b) Revenue per FTE
c) R & D Expense Rate

Table 5.33: HR Metrics (Innovation)

- a) **New Products & Services** – this evaluates how many new products or services are introduced by the company in this FY. Though this is not a direct measure related to any of the HR operative functions, it is certainly a good indicator to know how the employees are performing and if their performance and ideas are leading the company to the journey of innovation in terms of launching new products and services.
- b) **Revenue per FTE** – it indicates the average amount of revenue generated by each FTE. This is calculated as

$$\text{Revenue per FTE} = (\text{Total Revenue earned by the company} / \text{Total No. of Employees}) \text{ in a year}$$

The company is looking for higher Revenue per FTE as it is also an indicator of higher profit.

- c) **R&D Expense Rate** – it indicates what percentage of total expenditure is the R&D expenditure. It is calculated as:

$$\text{R\&D Expense Rate} = (\text{Total R\&D Expense} / \text{Total Expense}) \text{ in a year} \times 100$$

If R&D Expense is too low, the company may compromise with quality or innovation in new products and development.

CHAPTER 6

CREATING HR DASHBOARD USING MICROSOFT EXCEL, TABLEAU, POWER BI, AND LOOKER STUDIO

Businesses have realized that the time has come for HR to be managed in quantitative terms. According to management experts:

- What gets measured gets done.
- If something can't be measured it can't be considered as success or failure.
- If we can't see success, we can't reward it.
- If we can't see failure, we can't rectify it.

Hence, measurement is the key to controlling and changing something, but only measuring some parameters is probably not enough. Results in terms of data and figures may not create much impact in taking prompt and conscious business decisions, instead, a pictorial representation of the measured outcomes is more impactful (Caughlin, E., & Bauer, 2019). This is a part of data visualization.

The dashboard is a data visualization tool with which data can be better interpreted than if data is represented simply in terms of facts and figures.

HR Dashboard is a business intelligence tool that reflects the visual representation of the HR Key Performance Indicators (KPIs) i.e., the HR Metrics. For example, if the Business Manager wants to know the following:

- Who are the frequent absentees?
- Who are the high-potential employees whose service tenure with the company is more than 10 years?

If the above queries are answered in terms of data and figures, it is difficult for the Business Manager to readily interpret the figures, instead, if the pattern of frequent absentees is depicted in terms of graphical representation, that gives a much better idea to the Business Manager to interpret and readily take the right decision to control absenteeism. The same applies to the second question.

With the help of Dashboard, business managers can derive meaningful insights to make better-informed business decisions. With HR Dashboard better insights can be derived to improve the throughput of operative functions of HRM: Acquisition, Development, and Retention.

6.1 How to create a Dashboard?

To create a dashboard the following steps can be performed:

- a) Frame the key questions.
- b) Identify the measures (KPIs) that address the questions.
- c) Name the KPIs as HR Metrics.
- d) Select an appropriate tool, like – MS Excel, Tableau, Power BI, Google Data Studio, etc. to depict the KPIs.

The challenge is to create a dashboard with appropriate charts and diagrams that truly reflect the KPIs. This will help in deriving meaningful insights from data visualization to make better-informed decisions (Berglund, Christopher, & Tenic, 2020).

6.2 HR Dashboard using MS Excel

HR Dashboard can be created for Acquisition, Development, Retention, and other sub-functions. A dynamic dashboard can even link the outcome of the other created dashboards and show us the related results. To keep it simple, Let's consider the following recruitment dataset:

Employee No.	Age	Sex	Marital Desc	Tenure	Position	Employee Source	Performance Score
1103024456	22	Female	Married	13	Accountant I	Diversity Job Fair	Fully Meets
1106026572	38	Male	Divorced	8	Accountant I	Website Banner Ads	Fully Meets
1302053333	35	Male	Single	1	Accountant I	Internet Search	Poor
1211050782	36	Female	Married	7	Administrative Assistant	Pay Per Click – Google	Poor
1307059817	34	Female	Single	7	Administrative Assistant	Website Banner Ads	Poor
711007713	35	Female	Married	10	Administrative Assistant	Diversity Job Fair	Fully Meets
1102024115	58	Male	Married	10	Shared Services Manager	Monster.com	Fully Meets
1206043417	59	Male	Married	7	Shared Services Manager	Diversity Job Fair	Fully Meets
1307060188	35	Female	Married	10	Sr. Accountant	Diversity Job Fair	Poor
1201031308	33	Female	Married	1	Sr. Accountant	Other	Fully Meets
1001495124	53	Female	Married	11	President & CEO	Pay Per Click – Google	Fully Meets
1112030816	51	Female	Single	7	CIO	Employee Referral	Exceptional
1102024056	67	Female	Single	8	Database Administrator	Search Engine - Google Bing Yahoo	Fully Meets
905013738	53	Female	Single	11	Database Administrator	Glassdoor	Fully Meets

Table 6.1: Data Interpretation (Acquisition)

Let's consider the following questions:

1. How many employees are there?
2. What is the average age of the workforce?
3. Categorization of the workforce in terms of gender, Marital Description, and Tenure.
4. What is the position-wise Male/Female ratio?
5. Which employee source is the most effective one in terms of tenure, performance score, and position?

Based on the above questions, Let's frame the following KPIs:

- Workforce Headcount
- Workforce Average Age
- Workforce Composition in terms of
 - Gender
 - Marital Description
 - Tenure
- Male/Female Percentages for different positions
- Employee Recruitment Source Analysis in terms of
 - Tenure
 - Performance Score
 - Position

To create a Dashboard using MS Excel the following steps can be performed:

1. Open the dataset in MS Excel.
2. Convert it into a table to make the dataset dynamic, i.e., if a new record is added, the change will be reflected in the dashboard. To do this please perform the following steps:
 - *Click on any cell with data*
 - *Press Ctrl + T to convert it into a table*

3. Focus on the KPIs – for example, in MS Excel with the “count” function “Workforce Headcount” can be calculated. To do this please perform the following steps:
 - Go to the “Table Design” tab and check the box “Total Row” in the “Table Style Option” group
 - A new row will be created at the end. Click on the drop-down arrow next to the “Employee No” column and select the “count” option for Workforce Count
4. The same applies to the “Age” column. Here we need to execute the MS Excel in-built “Average” function to get the “Average Workforce Age”; Syntax: = Average (Age Cell Selection) or perform the last step of No. 3 and for the “Age” field, select the “average” option
5. From the third KPI onwards, we may execute Pivot Table. Pivot Table is a useful option pervaded by MS Excel, which helps in summarizing the data in terms of one or more discrete categories. For example, to see the workforce distribution in terms of gender we can have the following Pivot Table:

Gender	No. of Emps	Percentage
Female	10	71.43%
Male	4	28.57%
Total	14	100.00%

Table 6.2: Data Interpretation (Staffing Rate – Male/Female)

The following steps are to be performed to do this:

- *Go to the “Insert” tab and select the “Pivot Table” option. If you want the Pivot Table to be entered in a new worksheet select accordingly in the dialogue box and click on “ok”.*
 - *You are in a new worksheet with the Pivot Table layout. Select the relevant field from the “PivotTable Fields” list. Drag and drop the field “Gender” to the “Rows” part of the “Columns” part and place the same field (Gender) in the “Values” part for calculation. Please note that for numeric fields (for example ‘Age’, ‘Tenure’ etc.) the default Excel function is “Sum” and for Alphanumeric fields (for example ‘Marital Description’ or ‘Performance Score’) it is “Count”. Since “Gender” is an Alphanumeric/Alphabetic field, the default function is “count” and the result will show the workforce composition in terms of the number of male and female employees. But the company may have 5 Lakh employees, and, in that case, the number of male/female employees will not make much sense hence, the percentage is used. To do that click on the drop-down arrow next to “Count of Gender”, and go to the “Value Field Settings” option. The “Value Field Settings” dialogue box opens. Click on the “Show Value As” tab and select the “% of total” option and click “Ok” to get the percentage value.*
 - *The same can be done for other KPIs considered for workforce composition, like – marital description, tenure, etc. For “Tenure/Age”, the “Group” option can be applied to see the workforce composition in terms of different age groups or tenure groups. To do this, right-click on any “Age” value on the Pivot Table and select the “Group” option. In the dialogue box, change the “Interval” option as per requirement and click “Ok”.*
6. For the fifth KPI, “Position-wise Male/Female Percentage”, please see the following Pivot Table:

Position-wise M/F Ratio	Gender		
	Female	Male	Total
Accountant I	10%	50%	21%
Administrative Assistant	30%	0%	21%
CIO	10%	0%	7%
Database Administrator	20%	0%	14%
President & CEO	10%	0%	7%
Shared Services Manager	0%	50%	14%
Sr. Accountant	20%	0%	14%
Total	100.00%	100.00%	100.00%

Table 6.3: Data Interpretation (Position-Wise Male/Female Percentage)

The same logic applies to the rest of the KPIs and thus we have the following HR Recruitment Dashboard wherein different pictorial representations are chosen for different KPIs. For example, for “Gender-wise Employee Categorization” a simple pie chart is chosen, whereas, for “Marital Status-wise Employee Categorization” a donut chart is chosen for better visuals. For “Tenure-wise Employee Categorization”, three tenure groups are created: (1-3) years, (7-9) years, and (10-13) years. This is done by observing the “Tenure” of employees in the organization. Since this is a very small dataset, it is possible to observe that there is no employee with a tenure of (4-6) years. For this KPI, an area chart is selected. An area Chart is normally used to see how things are developing over time. Here, we can see that the best “Employee Source (Tenure)” is the ‘Diversity Job Fair’. For the other categories, different charts have been used.

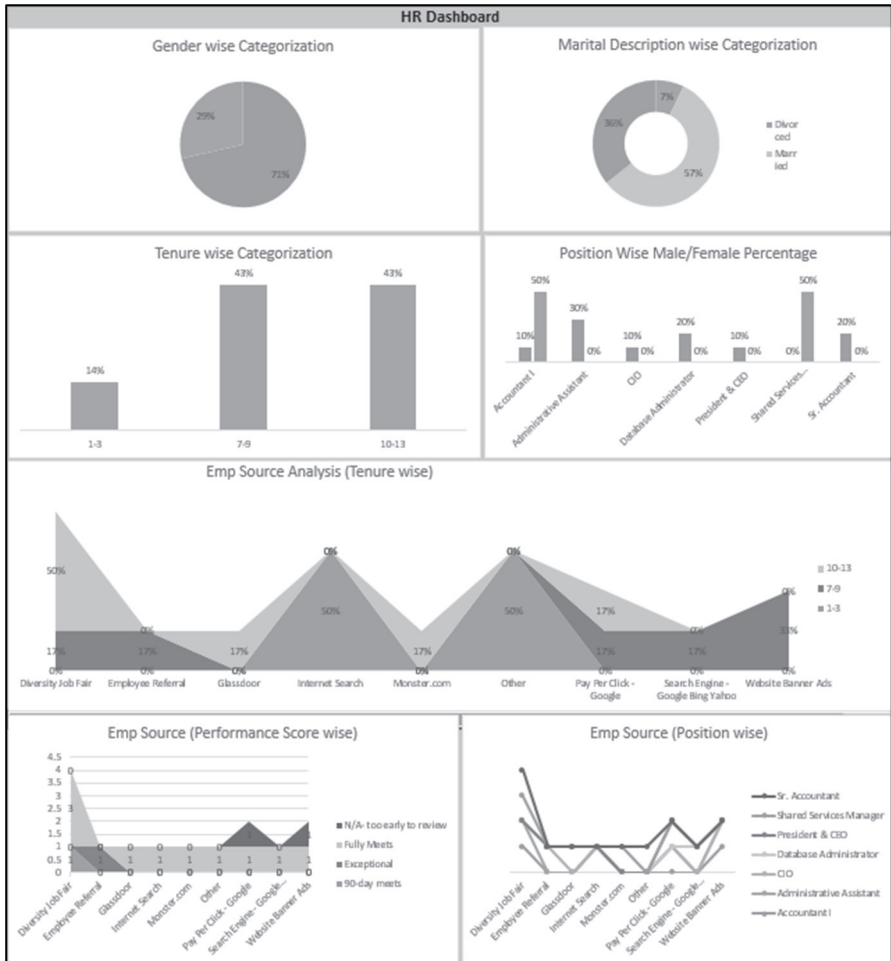


Figure 6.1: HR Dashboard in Excel

To make it a dynamic dashboard, we may apply another useful option of MS Excel, i.e., 'slicer'. We can consider any of the previously mentioned measures, like gender, tenure, marital status, etc. as a slicer and make the dashboard dynamic. For example, if we want to see the overall workforce scenario gender-wise, we can have the following layout of the same HR Dashboard:

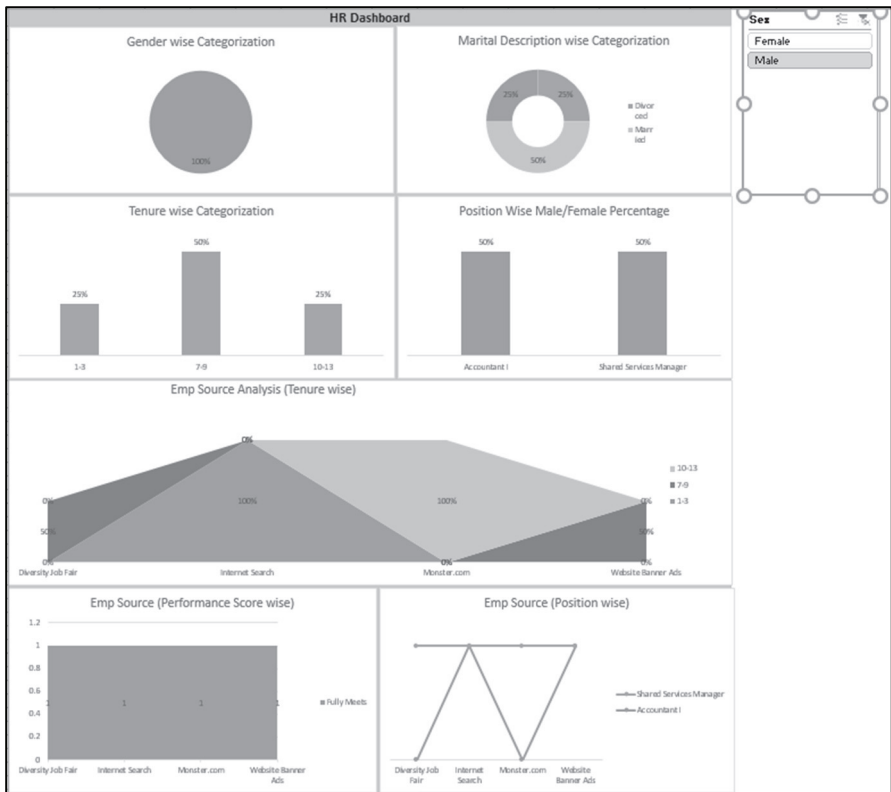


Figure 6.2: Dynamic HR Dashboard in Excel

So, the observation is if we apply a 'gender slicer' and select "Male" and want to check which employee source is working the best for the company, we can find that "Monster.com" is the one.

6.3 HR Dashboard using Tableau

Tableau is a data visualization tool, which can handle a large volume of data and can quickly create interactive visualizations. In Tableau, the variables or the data fields are divided into two categories:

- Dimensions – contain qualitative variables like name, address, etc.
- Measures – contain numeric variables like age, salary, etc.

Calculations can be performed on “Measure” variables. To compute any calculation on ‘Dimensions’, we need to convert them into “Measures” first. For example, if gender is written as Male and Female, we need to write a simple code to make it a measure to count the number of Male and Female employees. The code is as follows:

```
If Gender = “Male” then 1  
Else 0  
End
```

Since the dimension “Gender” is now converted to a measure, we can apply any function, for example, count, average, sum, etc., on the data.

Let us consider the same dataset (Refer to Table 6.1) and the same KPIs as below:

- Workforce Headcount
- Workforce Average Age
- Composition of the workforce in terms of
 - Gender
 - Marital Description
 - Tenure
- Male/Female Percentages for different positions
- Employee Recruitment Source Analysis in terms of
 - Tenure
 - Performance Score
 - Position

To create a Dashboard with Tableau the following steps can be performed:

1. Open the dataset in Tableau.
2. Go to a new sheet.
3. Look at the *dimensions* and *measures* and check if any conversion from dimension to measure is required. Here, by default, **Count** will appear in the *measure* part which will help us calculate the Workforce Headcount.
4. To compute the *Workforce Headcount* and *Average Age*, we can drag *Measure Names* under *Rows*, and *Measure Values* under *Columns* and drop the data fields which are not required like *Employee No.* and *Tenure* which are the other numerical data fields, i.e., *measures*.
5. The *Show Me* option shows the possible options for visualization. The appropriate representation can be selected from there. Here the **text tables** option is selected.
6. To understand Workforce Composition in terms of Gender, Marital Description, and Tenure we can drag and drop the data fields under *Rows* and drag and drop *Count* to the structure for values and from the *Show Me* option the best visualization option can be selected. Here **packed bubbles** option is selected.
7. The same steps are to be repeated for the other KPIs.
8. Next, add a *New Dashboard*.
9. In the left-hand side part of the Dashboard layout, all the previously constructed sheets are listed.
10. Drag and drop the previously constructed sheets in the desired positions of the Dashboard and give a relevant heading to get the following layout:

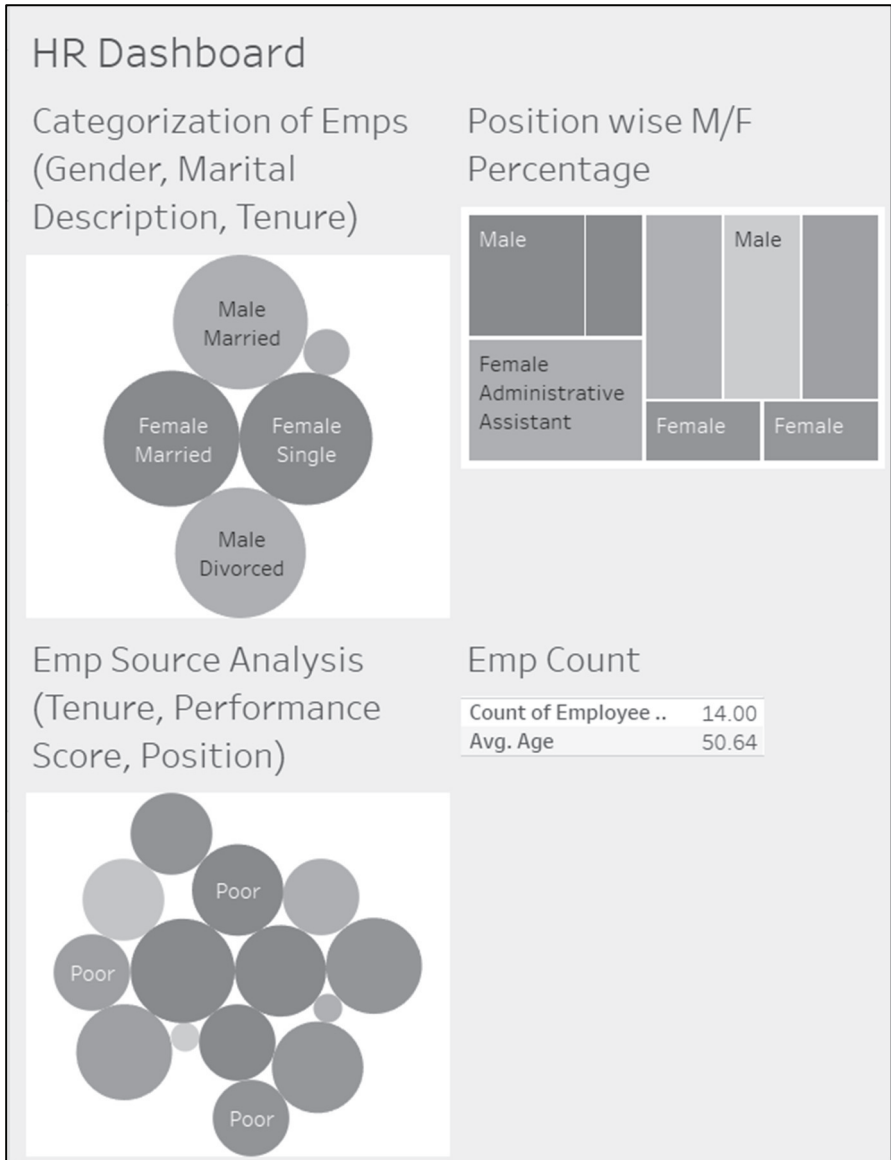


Figure 6.3: Dynamic HR Dashboard in TABLEAU

6.4 HR Dashboard using Power BI

Microsoft Power BI Desktop is another data visualization tool for creating HR Dashboard. Let us consider the same KPIs as below to create an HR Dashboard using Table 6.1:

- Workforce Headcount
- Workforce Average Age
- Composition of the workforce in terms of
 - Gender
 - Marital Description
 - Tenure
- Male/Female Percentages for different positions
- Employee Recruitment Source Analysis in terms of
 - Tenure
 - Performance Score
 - Position

To do this we can execute the following steps:

1. Open the Microsoft Power BI Desktop application.
2. Import the dataset using Excel.
3. Drag and drop the relevant fields to the blank space from the *Fields* part. Here we will drag and drop *Employee No.* to count the number of employees and *Age* to calculate the *Average Age*. We are considering *Employee No.* to calculate headcount as the values of this data field do not have duplicate entries, hence, by executing the *count* function the number of employees can be calculated. Both for *Age* and *Employee No.* data fields, the default function is *Sum* which is to be changed to *Count* for *Employee No.* and *Average* for *Age*.
4. For Male/Female Percentages for different positions, drag and drop *Position* and *Sex* and apply the suitable *Visualization Tool* from the *Visualization* option.
5. Perform the same for the rest of the KPIs to get the following layout:

Creating HR Dashboard using Microsoft Excel, TABLEAU, Power BI, 121 and Looker Studio

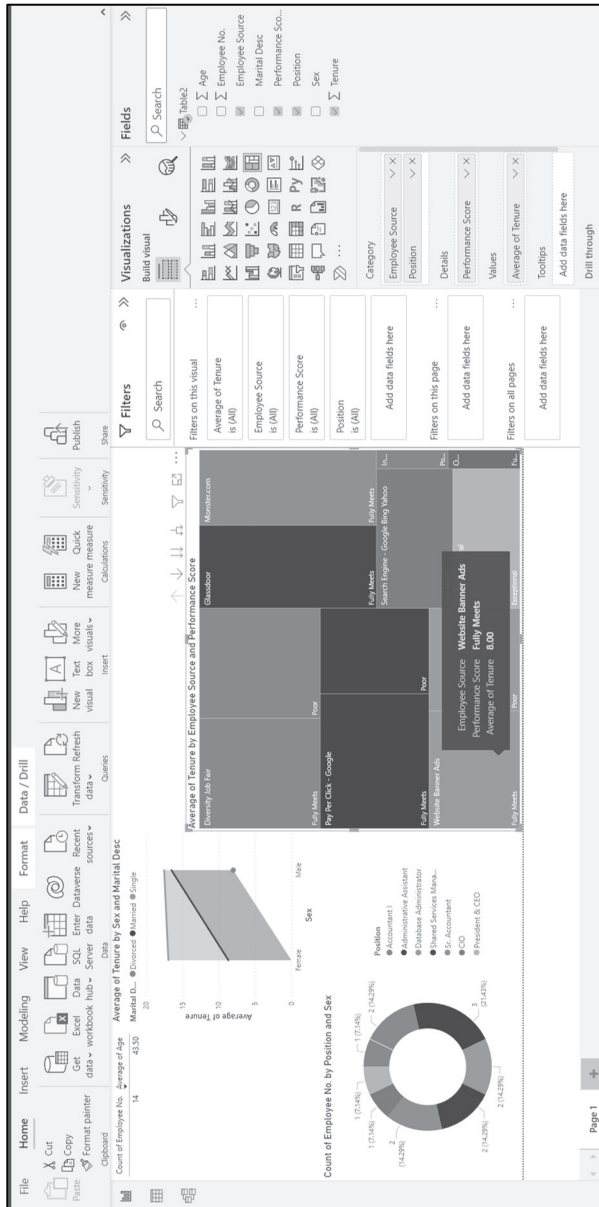


Figure 6.4: Dynamic HR Dashboard in Power BI

6.5 HR Dashboard using Looker Studio

Looker Studio is another data visualization tool that was earlier known as Google Data Studio. To create an HR Dashboard with the same dataset (refer to Table 6.1) considering the same KPIs the following steps can be performed:

1. Open Looker Studio.
2. A blank interface opens.
3. Click on *Add Data* option.
4. Import the dataset with Google Sheets option. The Excel file needs to be converted to CSV format.
5. The layout of Looker Studio is almost the same as that of Power BI.
6. Drag and drop the relevant fields in the blank space and click on the *Chart* option to select the appropriate tool for visualization.
7. Repeat Step 6 for all the KPIs to get the HR Dashboard.



Figure 6.5: Dynamic HR Dashboard in Looker Studio

CHAPTER 7

APPLICATIONS OF MACHINE LEARNING TOOLS IN HR PROBLEMS

Through Machine Learning (ML) interventions, a large volume of data can be analyzed quickly, and the patterns can be identified to predict what will happen in the future in a much more efficient manner. The patterns provide the analysts with critical insights with which better data-driven decisions can be made. Some of these patterns are often overlooked by the analysts while analyzing the dataset. These hidden or undiscovered patterns can be accommodated in the models to predict what will happen next with ML interventions (V., Chaitanya, Chaitanya, & Akshay, 2020).

For example, to predict the new joiner's work-related behaviors the following variables can be considered:

- a. His behavioral performance during an interview (often judged with STAR* approach).
- b. The No. of Employees he had handled in his previous assignment.
- c. His expectations related to the job role.
- d. His tenure with the previous organization; etc.

*Questions related to the business Situation he faced earlier, the Task he performed to handle the situation, the Action he had taken, and the result of his actions.

Along with the analysis of the above-mentioned parameters (a. to d.), his reactions in terms of facial expression, body language, gesture, and posture are also recorded along with his answers with the help of ML applications, and the gamut of information is analyzed to predict his future work-related behavior (Garg, Swati, Sinha, Kar, & Mani, 2021). Hence, a prediction can

be made if the candidate is selected and joined, what will be his work-related behavior 6 months down the line.

ML tools have applications in employee attrition prediction and to predict renege, i.e., who will join the company after accepting the job offer. Let's consider the following statistical and ML tools in the context of HR Analytics:

7.1 Regression Analysis

Regression Analysis is used for predicting the value of the target variable (dependent variable) based on the value of the predictor variable (independent variable). This is used in manpower demand forecasting. For example, if we consider 'Manpower Demand' depends on the 'Productivity' of the company, 'Manpower Demand' is the dependent variable, and 'Productivity' is the independent one. The general assumptions for regression analysis are:

- There is a linear relationship between the dependent (Manpower Demand) and the independent variable (Productivity).
- The dependent variable (Manpower Demand) is distributed normally for every value of the independent variable (Productivity).
- The variance of the dependent variable (Manpower Demand) at every value of the independent variable (Productivity) is the same.
- The observations are independent of one another.

Let's consider 'Manpower Demand' (MD) depends on Productivity (P), Replacement Needs (RN), Absenteeism (Ab), Expansion and Growth (EG), Employment Trends (ET), etc., then the equation is:

$$MD = f \{P, RN, Ab, EG, ET, \dots\}$$

A model can be conceptualized considering the independent variables to predict Manpower Demand for the company.

7.2 Dummy Variable Regression Analysis

Dummy Variable Regression Analysis helps us to use a single regression equation to represent multiple groups. For example, if we want to check the impact of demographic variables like age, gender, education, etc., on salary, we can use this tool. In that case, a candidate's salary can be predicted given his age is 45, gender is male, has an MBA degree, etc.

7.3 Survival Analysis

Survival analysis is done to predict employee churn. This is related to the expected duration of time till an event occurs. This concept is considered for predicting employee retention, i.e., how long the employee will remain with the company. The Kaplan-Meier method of survival analysis considers data from all observations and split them into the tenure of logical milestones, like 6 months, 1 year, etc. As the probabilities of survival are calculated based on each milestone, the probabilities are cumulative, meaning, the probability of reaching a given milestone depends on the achievement of each previous milestone, hence the function is always decreasing. The *timeline* is considered along the horizontal axis since it is the independent variable and the *No. of Employees may leave the company at a different point in time* is considered along the vertical axis as this is the dependent one.

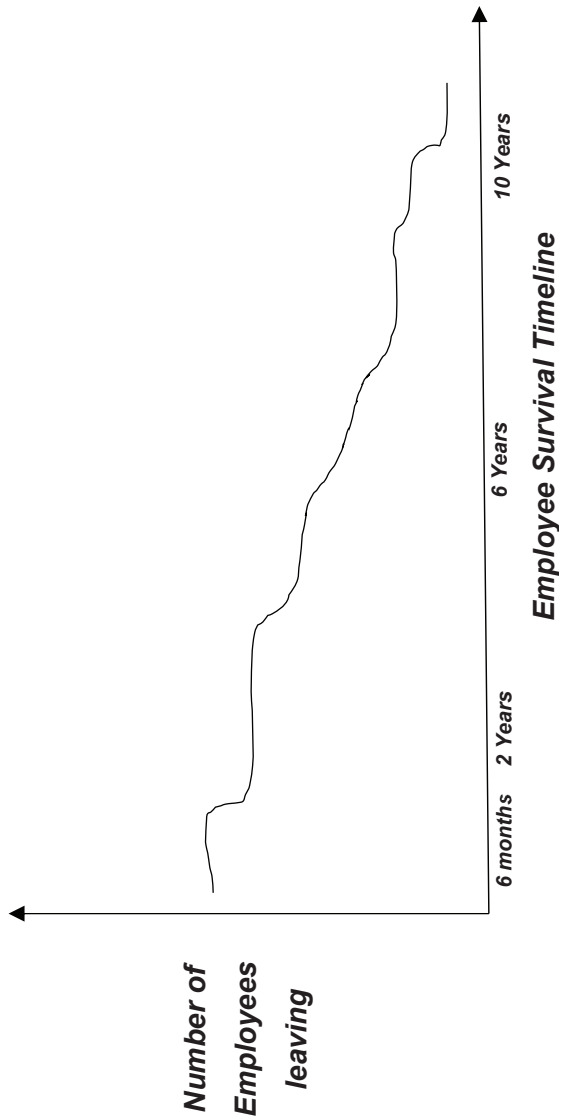


Figure 7.1: Employee Survival Analysis

This can be linked to the concept of the Leaky Bucket Algorithm. The Leaky Bucket Algorithm is a mechanism in which the bucket with a hole is never filled to the fullest capacity as the dimension of the hole lowers the capacity of the bucket. To predict the survival of the No. of Employees will remain in the company, the hole needs to be identified through diagnostic analysis. The possible root causes of the departure of employees are identified and those parameters are accommodated in a model to predict employee retention over time.

7.4 RFM (Recency, Frequency, and Monetary) Analysis

Recency (R), Frequency (F), and Monetary Value (M) analysis is used mostly for customer segmentation. It can also be applied for employee segmentation or categorization in terms of:

- Loyal employees
- Hibernate employees
- Going to churn
- High performers
- Behave very badly
- Negative attitude etc.

RFM analysis is done to identify the employees who are most likely to take on new challenges and are considered for promotion. This is analyzed based on the following factors:

Recency – if the employee is likely to respond to a new assignment.

Frequency – the employees who made more targets in the past are most likely to respond to new assignments.

Monetary Value – the employees who earned or generated more money out of their assignments are more likely to respond to new assignments than the employees who earned or generated less money.

Suppose there are three employees A, B, and C. Employee A had taken multiple assignments in the last six months and had completed all the assignments, he could generate a moderate amount of money out of his

assignments and is also ready to accept new assignments. Employee B had taken two assignments and had completed them, was able to generate some money out of his assignments but is not ready to take up any new assignments. Employee C did not take any new assignments in the last six months and is not ready to take up any new assignments. Hence, RFM analysis of the 3 employees reveals:

	<i>Recency (R)</i>	<i>Frequency (F)</i>	<i>Monetary Value (MV)</i>
<i>Employee A</i>	✓	✓	✓
<i>Employee B</i>	✓		✓
<i>Employee C</i>			

Table 7.1: RFM Framework

Suppose we have 10 employees. The ‘Recency’ column shows the date of the last assignment taken. The ‘Frequency’ column shows the number of times he has taken new assignments and the ‘Monetary Value’ column shows the amount of money he could generate from his assignments for the company.

We can consider the following hypothetical table:

Employee ID	Recency	Frequency	Monetary Value	Recency Score	Frequency Score	Monetary Value Score	RFM Score
E001	12.03.2020	5	2258				
E002	18.04.2019	2	2310				
E003	14.01.2015	1	1520				
E004	10.10.2020	4	112				
E005	13.02.2022	6	143				
E006	19.05.2018	8	168				
E007	16.12.2012	1	15638				
E008	14.02.2005	3	1453				
E009	08.04.2006	2	1287				
E010	09.01.2021	4	1254				

Table 7.2: RFM Analysis for Employee Classification

To do RFM analysis we have to perform the following steps:

1. Perform sort descending to column 'Recency' and assign a 'Recency Score' of 5 for the first two rows, 4 for the next two rows are so on.
2. Perform a sort descending to column 'Frequency' and assign a 'Frequency Score' of 5 for the first two rows, 4 for the next two rows are so on.
3. Perform the same to the column 'Monetary Value'.
4. Finally, compute the RFM Score with the following formula:

$$\text{RFM Score} = 100 \times \text{Recency Score} + 10 \times \text{Frequency Score} + 1 \times \text{Monetary Value Score}$$

Hence, the maximum possible RFM Score is 555 and the minimum is 111. We can certainly categorize the employees in this range. 555 is the worthiest employee and 111 is the least contributing employee. The scales for the three factors are as follows:

<i>Recency</i>	<i>Frequency</i>	<i>Monetary Value</i>
1. Not recent at all	1. Not frequent at all	1. Very small target money
2. Not recent	2. Not frequent	2. A small amount of target money
3. Somewhat recent	3. Somewhat frequent	3. Normal target money
4. Recent	4. Frequent	4. Large target money
5. Very recent	5. Very frequent	5. Very large target money

Table 7.3: RFM Analysis Scale

Employee ID	Recency	Frequency	Monetary Value	Recency Score	Frequency Score	Monetary Value Score	RFM Score
E006	19.05.2018	8	168	5	5	2	552
E002	18.04.2019	2	2310	5	2	5	525
E008	14.02.2005	3	1453	4	3	3	433
E007	16.12.2012	1	15638	4	1	5	415
E005	13.02.2022	6	143	3	5	1	351
E003	14.01.2015	1	1520	3	1	4	314
E001	12.03.2020	5	2258	2	4	4	244
E004	10.10.2020	4	112	2	4	1	241
E010	09.01.2021	4	1254	1	3	2	132
E009	08.04.2006	2	1287	1	2	3	123

Table 7.4: Interpretation of RFM Analysis

Table 7.4 shows that Employee E006 has taken assignments recently, he has taken a good number of assignments, but he was not that effective to generate a good amount of money from his assignments. Employee E009 has not taken any assignments recently, he has not taken many assignments but could generate a moderate amount of money out of his assignments. Hence, by categorizing the employees based on their RFM score, the company can find out which category needs what HR strategy, like – training, motivation, counseling, mentoring, coaching, etc. The employees are segmented as follows:

<i>Employee Category</i>	<i>RFM Score</i>	<i>HR Strategy</i>
Champions	555	• Retain them • Give incentive • Give a more challenging assignment
Loyal Employee	55(1/2/3/4/5)	Based on Monetary Value (1/2/3/4/5), HR strategy is to be formulated
Potential Loyalists	444	• Motivate them to take new assignments • Give incentive • Give challenging job assignments
Recent Achievers	44(1/2/3/4/5)	Based on Monetary Value (1/2/3/4/5), HR strategy is to be formulated
Promising	333	• Coach them to take new assignments • Give incentive • Give new job assignments

Employee Needing Attention	33(1/2/3/4/5)	Based on Monetary Value (1/2/3/4/5), HR strategy is to be formulated
About to Sleep	11(1/2/3/4/5)	Counsel them
At Risk	111	• Counsel them • Change their job roles
Can't Lose Them	515	• Mentor them to take new assignments • Give incentive • Give challenging job assignments
Hibernating	111	• Counsel them • Change their job roles

Table 7.5: HR Strategy Related to the Result of RFM Analysis

7.5 Structural Equation Modelling

Structural Equation Modelling (SEM) has a wide range of applications in the field of Behavioral Science. This statistical tool is used to measure and analyze the relationships between observed and latent variables. Let's consider the following example:

- A. Work-related Attitude depends on ideas, values, beliefs, perceptions, understanding of the job role, etc.
- B. Employee Performance depends on Work-related Attitude, Skillset, Potential, Training assistance provided, Work culture, etc.
- C. The productivity of the company depends on employee performance, strategy implementation, correct market analysis, Stakeholders' support, and other factors.

With SEM, the linear casual relationships among the variables are identified and simultaneously the measuring errors are also taken into consideration. Hence, in this example, how *Work-related Attitude* depends on parameters like *ideas*, *values*, etc. is identified and the inter-relationship among the independent parameters is also checked. The same applies to *Employee Performance* and *Productivity of the organization*. Thus, the structural relationship between *Work-Related Attitude* and other impactful parameters with *Employee Performance* is examined and the structural relationship between *Employee Performance* and the other impactful parameters with the *Productivity of the organization* is evaluated. SEM does the adjustments with the non-impactful parameters and establishes a structural model of the considered parameters. Following is the pictorial representation of the above-explained SEM approach:

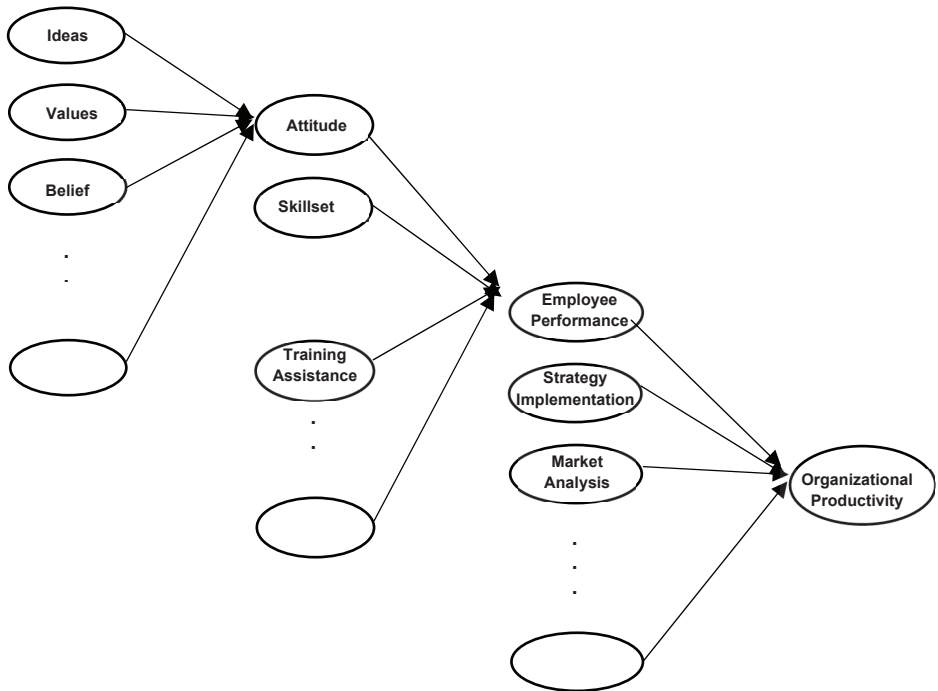
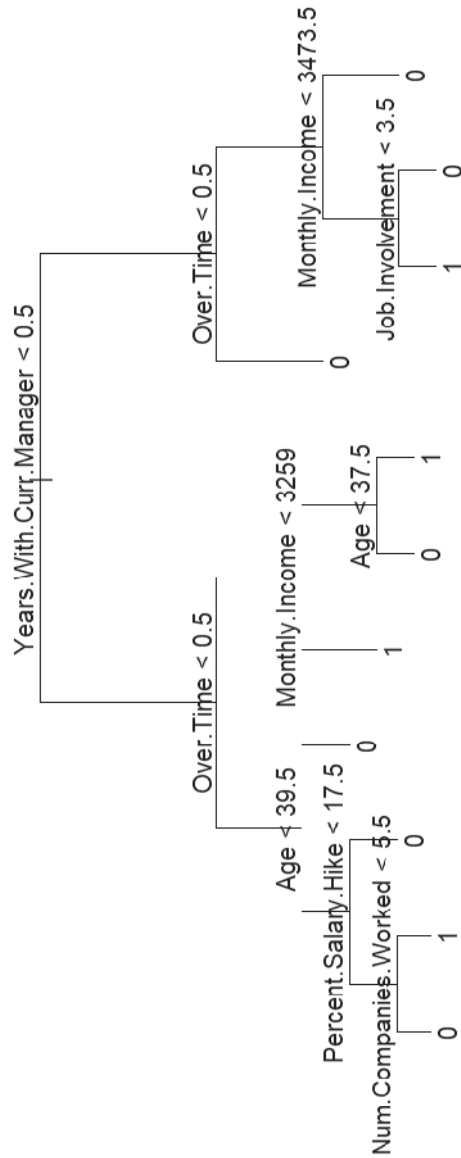


Figure 7.2: Example of SEM Application

7.6 Decision Tree Analysis

The decision Tree applies to situations where both the values of dependent and independent variables are known. Decision Tree analysis can be used to view the HR dataset split into two classes in terms of the response variables (Alao & Adeyemo, 2013). Say, Attrition is **Yes** or **No**. Hence, if employee attrition is analyzed in terms of variables like – age, distance from home, years since last promotion, years in the current role, years with current manager, job satisfaction, job involvement, overtime, percent salary hike, monthly income, etc. and is quite difficult to identify which one of them may have the potential to predict employee attrition, in such a case Decision Tree may be executed. The Decision Tree model is executed in R Studio on the HR Attrition dataset* and below are some of the pictorial representations:



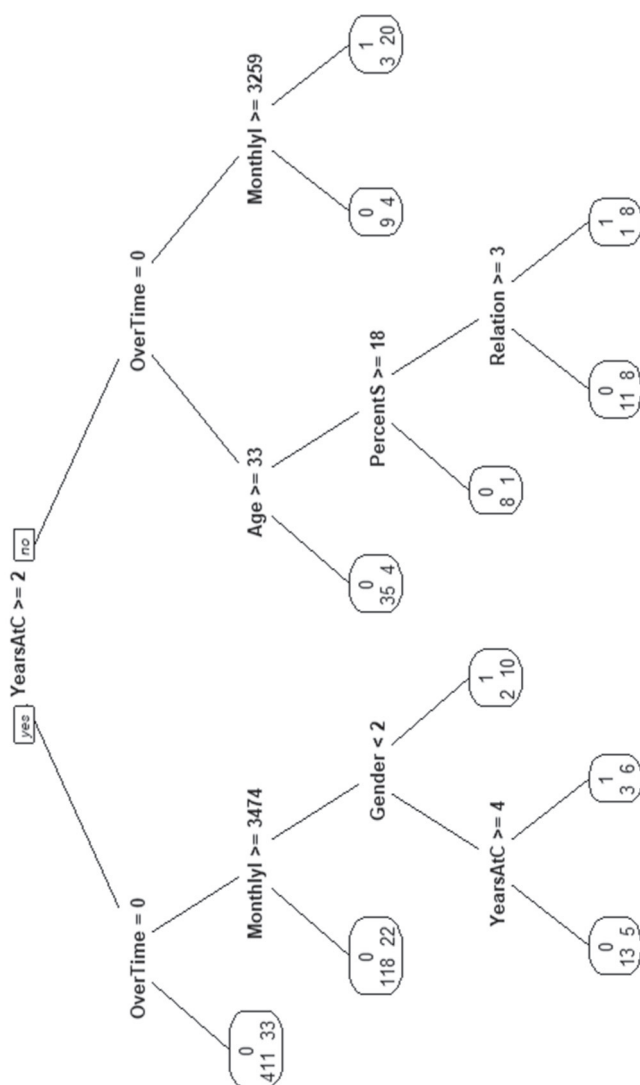


Figure 7.3(b): Decision Tree (Years at Company)

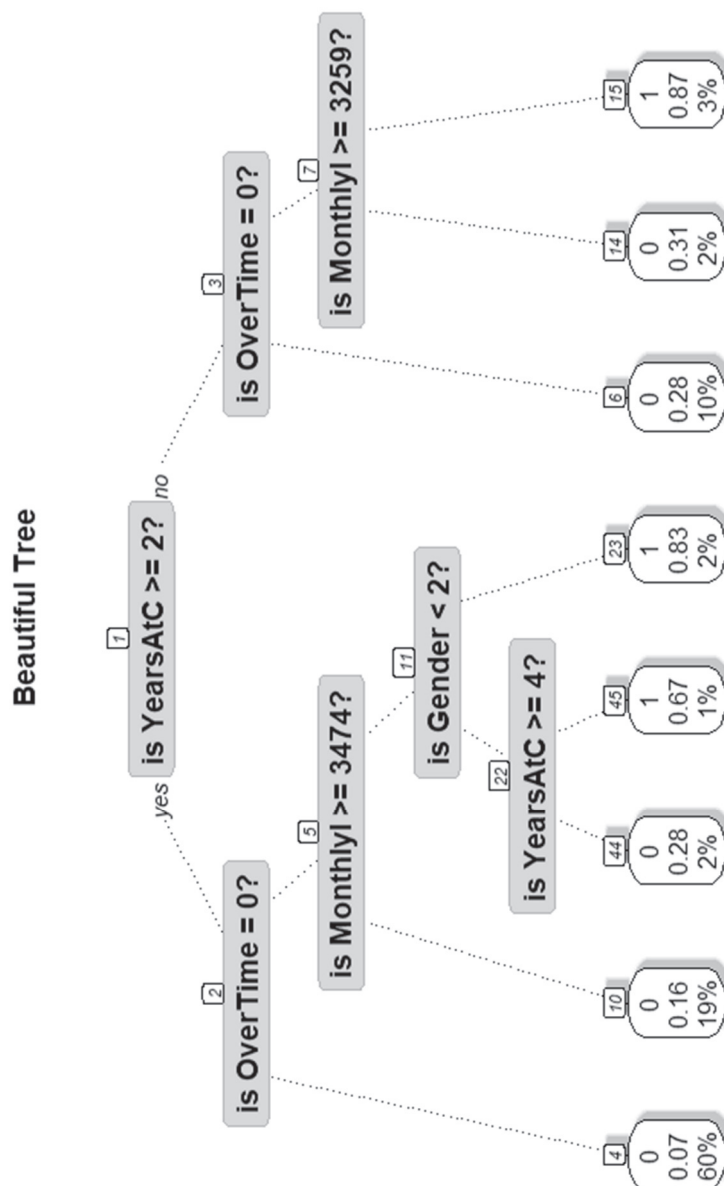


Figure 7.3(c): Beautiful Tree (Years at Company)

**The Attrition Dataset and R code for Decision Tree is uploaded to GitHub for reference (Attrition Dataset - <https://github.com/kankana1976/HR-Analytics/blob/main/Attrition%20Dataset.xlsx> & R Code - https://github.com/kankana1976/HR-Analytics/blob/main/DecisionTree_R.txt)*

7.7 Logistic Regression Analysis

This tool is used in classification problems. Every company is highly concerned about ‘Employee Attrition’ and wants to predict “Who is next?”. In the HR Attrition dataset* attrition appears in terms of “Yes” or “No”, i.e., in the form of a categorical variable. When the predicted variable is categorical and not continuous, logistic regression is used to predict the output effectively (I, Suprihanto, Nugraha, & Hutahaean, 2020). Suppose there are several independent variables and “Attrition” is the dependent one which is categorical, logistic regression model is used to accommodate the significant variables out of the bunch of considered variables in predicting employee attrition. Some of the visual representations of the Logistic Regression model executed in R Studio with the Attrition dataset* are given below:

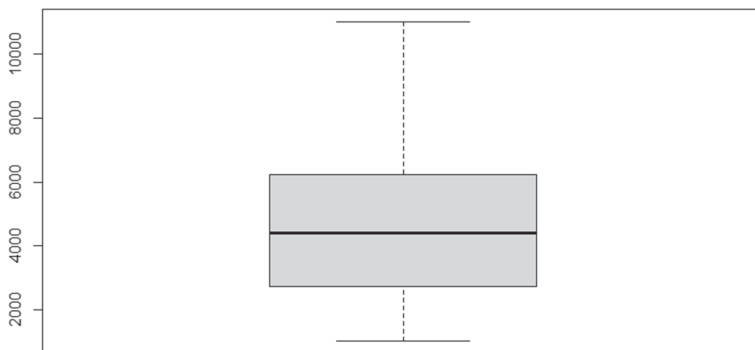


Figure 7.4(a): Boxplot (to see the outliers)

The Confusion Matrix shown below indicates that out of 225 cases, 149 are predicted successfully.

```
> Confusion
```

	Actual	
Predicted	0	1
0	707	76
1	323	149

Figure 7.4(b): Confusion Matrix

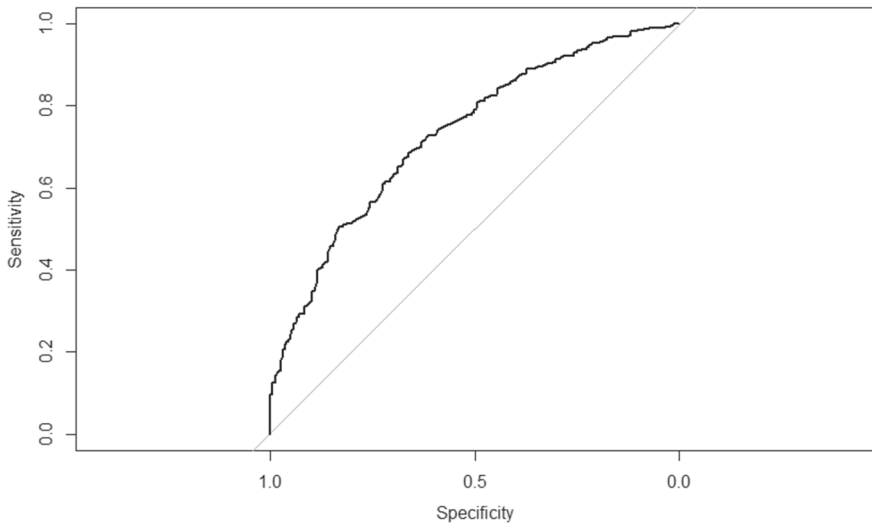


Figure 7.4(c): ROC Curve

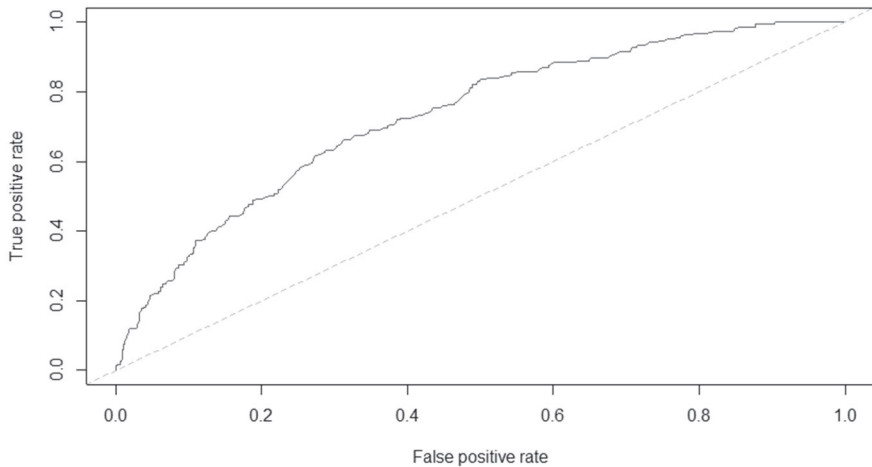


Figure 7.4(d): Performance Plot

**The Attrition Dataset and R code for Logistic Regression are uploaded to GitHub for reference (Attrition Dataset - <https://github.com/kankana1976/HR-Analytics/blob/main/Attrition%20Dataset.xlsx> & R Code - https://github.com/kankana1976/HR-Analytics/blob/main/LogisticRegression_R.txt)*

7.8 Association Analysis

Association analysis is done to find the degree of relatedness among the individual employees. Suppose out of 5 employees a team needs to be formed of 3 employees, it is to check the extent each employee can relate well with others. This is essential for team formation since non-associated team members lead to ineffective performance. This is also called basket analysis. The degree of relatedness can be checked as follows:

	Employee A	Employee B	Employee C	Employee D	Employee E
Employee A		3	4	2	1
Employee B	3		3	4	2
Employee C	4	3		4	3
Employee D	2	4	4		4
Employee E	1	2	3	4	
Total	10	12	14	14	10

Figure 7.5: Association Analysis

There is no point in checking the degree of relatedness between the employee and himself. The ‘Degree of Relatedness’ is considered on a five-point scale (1 to 5), from the above figure the total scores of degrees of relatedness of the 5 employees can be understood, Employees B, C, and D can form an effective team.

7.9 Text Analytics/Sentiment Analysis

Text analytics is performed to analyze a large volume of unstructured text with no pre-defined format to derive meaningful inferences with the help of a combination of statistical tools, machine learning algorithms, and linguistic interventions (Gelbard, et al., 2018).

For example, suppose, in an organizational climate survey, some open-ended questions are asked to the employees and the responses are generally unstructured. It is very difficult to derive meaningful insights from such unstructured answers. But, with text analytics and by looking at a certain pattern of responses like, positive, negative, and neutral, employees’ mindsets and sentiments are analyzed to effectively implement the right HR strategies to address their areas of dissatisfaction (Hans & Mnkandla, 2017). Suppose the survey comments are as below:

Survey Comments
Excellent colleagues and a great work atmosphere
Provides a good learning platform for fresh graduates
Fabulous benefits
Horrible boss
Compensation is low, but the bonus is good
Long hours, endless work, inconsiderate boss
Excellent colleagues and a great work atmosphere
Provides a good learning platform for fresh graduates

Figure 7.6: Survey Comments for Sentiment Analysis

With the help of Azure Machine Learning Add-in, Sentiment Analysis can be performed in MS Excel. From this, we understand that after conducting a sentiment analysis of the employees, the following results can be derived:

Survey Comments	Sentiment	Score	Sentiment	Percent age
Excellent colleagues and a great work atmosphere	Positive	90%	negative	15.44%
Provides a good learning platform for fresh graduates	Positive	87%	neutral	21.33%
Fabulous benefits	Positive	71%	positive	63.23%
Horrible boss	Positive	63%		
Compensation is low, but the bonus is good	Neutral	57%		
Long hours, endless work, inconsiderate boss	Neutral	48%		
Long working hours, lousy bonus, no pay increase	Negative	44%		
Extremely horrible company, don't join them	Negative	32%		

Figure 7.7: Sentiment Analysis

The observation is overall sentiment of the employees about the company is positive.

7.10 AHP (Analytic Hierarchy Process) Analysis

This method is used to analyze the alternative ways to achieve the pre-defined goals by assessing the relative value or priority of each decision criterion using mathematical and psychological interventions. For example, if a company is expanding its business and it requires skilled manpower, the management wants to analyze the four alternative options: whether to recruit, promote or train or go for consultancy, or to outsource. The same can be done based on the following criteria:

	<i>Decision Criteria</i> ↓		
<i>Options</i> ↓	Strategies	Cost	Availability
<i>Recruit</i>	- Internal Recruitment - External Recruitment	Recruitment Cost	Availability of resources in the market with the right skill set
<i>Promote after Training</i>	- Internal Training - External Training	Training Cost	Availability of promotable candidates
<i>Consultancy</i>	- Internal Consultancy - External Consultancy	Consultancy Cost	Availability of Consultancies
<i>Outsource</i>	- Previous Source - Different Source	Outsource Cost	Availability of Outsourcing options

Figure 7.8: AHP Analysis Layout

These above-mentioned decision-making criteria are then analyzed with the help of mathematical and psychological interventions and the best option is identified to make the best data-driven decision.

7.11 DEMATEL (Decision Making Trial and Evaluation Laboratory) Analysis

This method is used to evaluate the cause-effect chain component of a complex system. For example, the management wants to check the impact of promotion on employee performance and the impact of employee performance on productivity. DEMATEL is used in that case. Unlike AHP, DEMATEL considers all the decision-making criteria to be mutually dependent and are influencing other criteria. Hence, a Direct Relation Matrix is implemented as follows:

	<i>Promotion</i> ➔	<i>Performance</i> ➔	Productivity
<i>Promotion</i> ↓	0		
<i>Performance</i> ↓		0	
<i>Productivity</i>			0

Figure 7.9: DEMATEL Analysis Layout

Since ‘Promotion’ or any other parameter does not influence itself, hence, all the diagonal values are 0. In case there are several respondents, the average value of their perception related to the degree of influence of one parameter over the other is considered. Thus, the cause-effect chain component is analyzed to take the right HR strategy.

promotion ➡ performance ➡ productivity

7.12 TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution)

This is a part of the multi-criteria decision-making technique. With this, out of the preferred alternatives, the closest to the ideal solution is identified. This technique is used for selecting the right employee out of alternatives. For 5 candidates TOPSIS appears as follows:

	<i>Qualification</i>	<i>Experience</i>	<i>Feedback from the previous employers</i>	<i>Past performance</i>	<i>Critical incidence</i>
<i>Candidate 1</i>					
<i>Candidate 2</i>					
<i>Candidate 3</i>					
<i>Candidate 4</i>					
<i>Candidate 5</i>					

Figure 7.10: TOPSIS Analysis Layout

Based on these above-mentioned comparison criteria in which some are quantitative, and others are qualitative, TOPSIS can be applied to select the right candidate.

7.13 VIKOR (Multi-Criteria Optimization and Compromise Solution)

This is helpful in situations when the decision-maker cannot express his opinion to make compromised decisions. This is also a part of the multi-

criteria decision-making technique which focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. VIKOR is used to measure employee performance. Let's take the following example:

	<i>Positive Attitude</i>	<i>Individualistic Approach</i>	<i>Sharing and Empathetic</i>	<i>Leadership ability</i>	<i>Conflict</i>
<i>Employee 1</i>					
<i>Employee 2</i>					
<i>Employee 3</i>					
<i>Employee 4</i>					
<i>Employee 5</i>					

Figure 7.11: *VIKOR Analysis Layout*

For example, suppose employees' performance is measured based on these above-mentioned behavioral criteria in which some are 'beneficial' and some are 'non-beneficial'. Let us consider, positive attitude, sharing and empathy, and leadership ability are 'beneficial' parameters, and individualistic approach, and conflict is 'non-beneficial' parameters. If for the sake of simplicity, it is considered that all the parameters are considered on the same 1 to 5-point scale (1 – lowest, 5 – highest), the highest total value of the 'beneficial' parameters is the best and the lowest total value of the 'non-beneficial' parameters is the best. Hence, in a situation when a manager is unable to decide and chose the good performers because of conflicting performance criteria, VIKOR solves the problem and helps the manager in taking data-driven decisions.

7.14 Naïve Bayesian Classifier

It is a supervised learning algorithm, based on Bayes Theorem and is used to solve a classification problem (Valle, A., Varas, & Ruz, 9939–45). Employees in an organization can be classified in terms of the following:

- Performance (the way they are performing now)
- Potential (their ability to perform superior to others now and in the future)
- Job Satisfaction
- Job Involvement
- Career aspirations
- Satisfaction with leadership etc.

From the above-mentioned points, we can relate that most of them are predictors of employees' departure from the organization.

Let's consider Naïve Bayesian Classifier in employee attrition prediction with the following dataset:

No.	Age	Income	Job Satisfaction	Performance	Active
1	<=30	High	No	Fair	No
2	<=30	High	No	Excellent	No
3	31 to 40	High	No	Fair	Yes
4	>40	Medium	No	Fair	Yes
5	>40	Low	Yes	Fair	Yes
6	>40	Low	Yes	Excellent	No
7	31 to 40	Low	Yes	Excellent	Yes
8	<=30	Medium	No	Fair	No
9	<=30	Low	Yes	Fair	Yes

10	>40	Medium	Yes	Fair	Yes
11	<=30	Medium	Yes	Excellent	Yes
12	31 to 40	Medium	No	Excellent	Yes
13	31 to 40	High	Yes	Fair	Yes
14	>40	Medium	No	Excellent	No
15	<=30	Medium	Yes	Fair	?

Table 7.6: Sample Dataset for Naïve Bayesian Classifier

A simple dataset is taken to predict if the employee of the 15th record will leave the company. Bayes' Theorem gives the probability of an "event" based on the given information. In simple terms, the explanation is –

For two events A and B, Bayes Theorem allows us to find $p(A|B)$ means the probability that Event A occurs given Condition B is written as:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

We know that probability is the chance of occurrence of an event. Here we need to find out the probability of occurrence of 'Active' for the 15th record (Age <=30, Income = Medium, Job Satisfaction = Yes, Performance = Fair) given (Active = Yes) and the probability of occurrence of 'Active' for the 15th record (Age <=30, Income = Medium, Job Satisfaction = Yes, Performance = Fair) given (Active = No). Hence, in this case, the formula takes the shape of the following:

Equation 1

$p(\text{Active} = \text{Yes} \mid \text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair}) = p(\text{Active} = \text{Yes}) \times p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair} \mid \text{Active} = \text{Yes}) / p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair})$ and

Equation 2

$$p(\text{Active} = \text{No} \mid \text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair}) = p(\text{Active} = \text{No}) \times p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair} \mid \text{Active} = \text{No}) / p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair})$$

Wherein, B is (Active = Yes) and A is (Age ≤ 30, Income = Medium, Job Satisfaction = Yes, Performance = Fair)

In that case, the denominators $p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair})$ of both equations cut each other.

So, we have to find out $p(\text{Active} = \text{Yes} \mid \text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair})$ and $p(\text{Active} = \text{No} \mid \text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair})$ and check which one is higher and that will be the prediction.

According to the Naïve Bayesian theorem,

$$p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair} \mid \text{Active} = \text{Yes}) = p(\text{Age} \leq 30 \mid \text{Active} = \text{Yes}) * p(\text{Medium} \mid \text{Active} = \text{Yes}) * p(\text{Yes} \mid \text{Active} = \text{Yes}) * p(\text{Fair} \mid \text{Active} = \text{Yes}) \text{ and}$$

$$p(\text{Age} \leq 30, \text{Income} = \text{Medium}, \text{Job Satisfaction} = \text{Yes}, \text{Performance} = \text{Fair} \mid \text{Active} = \text{No}) = p(\text{Age} \leq 30 \mid \text{Active} = \text{No}) * p(\text{Medium} \mid \text{Active} = \text{No}) * p(\text{Yes} \mid \text{Active} = \text{No}) * p(\text{Fair} \mid \text{Active} = \text{No})$$

So, the probabilities are calculated as follows:

Age			
	<=30	31 to 40	>40
No	3	0	2
Yes	2	4	3

Income			
	High	Low	Medium
No	2	1	2
Yes	2	3	4

Job Satisfaction		
	No	Yes
No	4	1
Yes	3	6

Performance		
	Fair	Excellent
No	2	3
Yes	6	3

Age (Probability)			
	<=30	31 to 40	>40
No	0.6	0	0.4
Yes	0.222222	0.444444	0.333333

Income (Probability)			
	High	Low	Medium
No	0.4	0.2	0.4
Yes	0.222222	0.333333	0.444444

Job Satisfaction (Probability)		
	No	Yes
No	1	0
Yes	0.333333	0.666667

Performance (Probability)		
	Fair	Excellent
No	0.666667	0.333333
Yes	0.4	0.6

Active	No	Yes
	5	9

Prob - Active	No	Yes
	0.4	0.6

Prob - (<=30, Medium, Yes, Fair)	No	Yes
	0.006857	0.028219

Prediction
Yes

Figure 7.12: Interpretation of Naïve Bayesian Classifier using Excel

Thus, based on the test data the prediction is made for the 15th record. By observing the pattern of employees in terms of Age, Income, Job Satisfaction, and Performance, employees can be classified as Active and Inactive.

BIBLIOGRAPHY

Chapter 1 HR

- Essenberg, Wouter van. "How HR Can Boost Its Business Impact." INSEAD Knowledge, March 9, 2017.
<https://knowledge.insead.edu/career/how-hr-can-boost-its-business-impact>.
- Frangos, Cassandra A. "Aligning Human Capital with Business Strategy: Perspectives from Thought Leaders." Harvard Business Publishing Education, May 15, 2002. <https://hbsp.harvard.edu/product/B0205D-PDF-ENG>.
- Grant, Robert M. "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation." *Knowledge and Strategy* 33, no. 3 (2009): 15–36. <https://doi.org/10.4324/9780080509778-6>.
- Mukhopadhyay, Kankana, Jaya Sil, and N.R. Banerjee. "A Competency Based Management System for Sustainable Development by Innovative Organizations." *Vision: The Journal of Business Perspective* 15, no. 2 (2011): 153–62. <https://doi.org/10.1177/097226291101500206>.
- Mukhopadhyay, Kankana. "360-Degree Appraisal – A Performance Assessment Tool." *The Vision – Journal of Management & Allied Sciences* 2, no. 2 (2006): 19–25.
- Nyberg, Anthony. "Retaining Your High Performers: Moderators of the Performance–Job Satisfaction–Voluntary Turnover Relationship." *Journal of Applied Psychology* 95, no. 3 (2010): 440–53.
<https://doi.org/10.1037/a0018869>.
- Uppal, Nishant. *Human Resource Analytics: Strategic Decision Making*. Pearson, 2021.
- Vulpen, Erik van. "You Searched for the HR Value Chain: An Essential Tool for Adding Value to HR." AIHR, April 30, 2018.
<https://www.aihr.com/?s=The+HR+Value+Chain%3A+An+Essential+tool+for+Adding+Value+to+HR>.

Chapter 2 Why is Analytics Important?

- Kumar, K., Radna Chebolu, and S. Babu. “Know Your Talent at Risk – a Tripolaire Envisaging Archetype.” *Journal of Management* 6, no. 1 (2016): 151–80.
- Chaturvedi, Vijit. “Talent Analytics as an Indispensable Tool and an Emerging Facet of HR for Organization Building.” *FIIB Business Review* 5, no. 3 (2016): 13–20.
<https://doi.org/10.1177/2455265820160302>.
- Soundararajan, Ramesh, and Kuldeep Singh. *Winning on HR analytics: Leveraging data for competitive advantage*. Los Angeles, CA: Sage, 2017.
- Suri, Neha, and Pooja Lakhanpal. “People Analytics Enabling HR Strategic Partnership: A Review.” *South Asian Journal of Human Resources Management*, 2022, 232209372211195.
<https://doi.org/10.1177/23220937221119599>.

Chapter 3 Employee Life Cycle and HR Analytics

- Divatia, Aditi S., Jyoti Tikoria, and Sunil Lakdawala. “Analysis of Maturity Models for Business Intelligence and Analytics.” In: 2nd International Conference on Evidence Based Management, 17/18 March 2017, Rajasthan. New Dehli: Excellent Publishing House, 195–201.
- Tursunbayeva, Aizhan, Stefano Di Lauro, and Claudia Pagliari. “People Analytics—a Scoping Review of Conceptual Boundaries and Value Propositions.” *International Journal of Information Management* 43 (2018): 224–47. <https://doi.org/10.1016/j.ijinfomgt.2018.08.002>.
- Yadav, Radha, Ashu Khanna, Priyanka Panday, and Sudipta Dasmohapatra. “An Analytical Study of Quality of Work Life & Organisational Commitment and Their Relation with Revenue per Employee of Major IT Companies in India.” *Journal of Human Resource and Sustainability Studies* 7, no. 2 (2019): 284–301.
<https://doi.org/10.4236/jhrss.2019.72018>.

Chapter 4 HR Analytics Maturity Model

- Baesens, Bart, Sophie De Winne, and Luc Sels. "Is Your Company Ready for HR Analytics?" *MIT Sloan Management Review* 58, no. 2 (2017): 20. <https://doi.org/10.7551/mitpress/11633.003.0011>.
- Fitz-enz, Jac, and John R. Mattox. *Predictive analytics for human resources*. Hoboken, NJ: Wiley, 2014.
- Lismont, Jasmien, Jan Vanthienen, Bart Baesens, and Wilfried Lemahieu. "Defining Analytics Maturity Indicators: A Survey Approach." *International Journal of Information Management* 37, no. 3 (2017): 114–24. <https://doi.org/10.1016/j.ijinfomgt.2016.12.003>.

Chapter 5 HR Metrics

- Weiss, David S., Richard Finn. "HR Metrics that Count: Aligning Human Capital Management to Business Results." *Human Resource Planning* 28, no. 1 (2005): 33.
- Boudreau, John. "Hr must make people analytics more user-friendly." *Harvard Business Review* (2017).
- Beatty, Richard W., Mark A. Huselid, and Craig Eric Schneider. "New HR Metrics: Scoring on the Business Scorecard." *Organizational Dynamics* 32, no. 2 (2003): 107–21. [https://doi.org/10.1016/s0090-2616\(03\)00013-5](https://doi.org/10.1016/s0090-2616(03)00013-5).
- Dulebohn, James H., and Richard D. Johnson. "Human Resource Metrics and Decision Support: A Classification Framework." *Human Resource Management Review* 23, no. 1 (2013): 71–83. <https://doi.org/10.1016/j.hrmr.2012.06.005>.
- Hans, Robert T., and Ernest Mnkandla. "A Descriptive Analytics Tool for Improving Project Human Resource Management: The Importance of Discerning a Project Team Member's Sentiments." *2017 IEEE AFRICON*, 2017, 72–76. <https://doi.org/10.1109/afrcon.2017.8095458>.
- Marler, Janet H., and John W. Boudreau. "An Evidence-Based Review of HR Analytics." *The International Journal of Human Resource Management* 28, no. 1 (2016): 3–26. <https://doi.org/10.1080/09585192.2016.1244699>.

Chapter 6 Creating HR Dashboard using Microsoft Excel, TABLEAU, Power BI, and Looker Studio

Berglund, Christopher, and Amar Tenic. “Dashboard Design and Its Relation to Kpis: a *Qualitative Case Study on a Software Company*.” DIVA, June 22, 2020.

<https://lnu.diva-portal.org/smash/record.jsf?pid=diva2%3A1442199>.

Caughlin, David E., and Talya N. Bauer. “Chapter 3 Data Visualizations and Human Resource Management: The State of Science and Practice.” *Research in Personnel and Human Resources Management*, 2019, 89–132. <https://doi.org/10.1108/s0742-730120190000037004>.

Chapter 7 Applications of Machine Learning Tools in HR Problems

Alao, D., and AB Adeyemo. “Analyzing employee attrition using decision tree algorithms”. *Computing, Information Systems & Development Informatics* 4, no. 1 (2013): 17-28.

Garg, Swati, Shuchi Sinha, Arpan Kumar Kar, and Mauricio Mani. “A Review of Machine Learning Applications in Human Resource Management.” *International Journal of Productivity and Performance Management* 71, no. 5 (2021): 1590–1610.

<https://doi.org/10.1108/ijppm-08-2020-0427>.

Gelbard, Roy, Roni Ramon-Gonen, Abraham Carmeli, Ran M. Bittmann, and Roman Talyansky. “Sentiment Analysis in Organizational Work: Towards an Ontology of People Analytics.” *Expert Systems* 35, no. 5 (2018): 12289. <https://doi.org/10.1111/exsy.12289>.

Kakulapati, V., Kalluri Krishna Chaitanya, Kolli Vamsi Chaitanya, and Ponugoti Akshay. “Predictive Analytics of HR - A Machine Learning Approach.” *Journal of Statistics and Management Systems* 23, no. 6 (2020): 959–69. <https://doi.org/10.1080/09720510.2020.1799497>.

Setiawan, I, S Suprihanto, A C Nugraha, and J Hutahaean. “HR Analytics: Employee Attrition Analysis Using Logistic Regression.” *IOP Conference Series: Materials Science and Engineering* 830, no. 3 (2020): 032001. <https://doi.org/10.1088/1757-899x/830/3/032001>.

- Valle, Mauricio A., Samuel Varas, and Gonzalo A. Ruz. "Job Performance Prediction in a Call Center Using a Naive Bayes Classifier." *Expert Systems with Applications* 39, no. 11 (2012): 9939–45.
<https://doi.org/10.1016/j.eswa.2011.11.126>.

INDEX

A

analytic maturity, xiv, 19, 27
analytical culture, 27
analytics, xiv, 8, 9, 10, 19, 23, 27,
28, 29, 30, 144
attrition, xiii, xix, 16, 17, 20, 22, 27,
28, 32, 33, 34, 51, 86, 99, 125,
136, 140, 150, 157

C

career path, 49
cognitive analytics, 23
competencies, 9, 41
critical roles, 20, 22, 39
cross-function, 49, 50, 68

D

dashboard, xiv, 28, 108, 109, 111,
114, 115, 116, 118, 119, 120,
121, 122, 123, 157
data maturity, 27
demographic, 38
descriptive analytics, 19, 20, 22
development cost, 18
diagnostic analytics, 19, 22
dimensions, xix, 4, 27, 77, 118

E

ecosystem, 33
employee commitment, 97, 98
employee engagement, xiii, 5, 9, 16,
17, 51
employee ownership, 41, 42
employee referral, 48, 58, 59, 60,
61, 110
employee turnover, xiv, 94, 96
employment brand, 46, 47
employment brand strength, 46, 47
exit interview, 34

H

hiring cost, 17, 18
human resources, xiv, xvii, xix, 1, 2,
3, 8, 105
Human Resources, xxi, 1, 155, 157

I

integrated analytics, 25
involuntary turnover, 95, 97

K

key performance indicators, 15, 108

L

lateral, 49, 51
leadership, 7, 10, 16, 39, 40, 50, 69,
149, 150

M

machine learning, xiii, xiv, xv, xx,
15, 30, 124, 145, 157
metrics, xiv, xviii, 20, 21, 28, 29,
30, 31, 32, 34, 38, 41, 44, 45,
46, 50, 51, 55, 61, 64, 65, 68,
69, 74, 76, 81, 83, 85, 88, 89,
94, 95, 98, 102, 103

O

offer-fit, 99
organizational effectiveness, 103

P

performance advantages, xix, 2, 9
predictive analytics, 19, 22, 23
prescriptive analytics, 19, 23
process analytics, 25
productivity, 39, 40, 42, 47, 48, 103,
147, 148

R

rare, 40
recruitment funnel, 54
regression, xv, 8, 125, 126, 140, 142
rehire, 46, 48
renege, xiv, 9, 15, 29, 35, 56, 125
renege cost, 13, 17, 55
retention, xiv, xix, 5, 32, 48, 94,
104, 126, 128

S

sentiment analysis, 144, 145
span of control, 41, 42, 45
statistical models, 21
strategic impact, 1
succession pipeline, 10
successor pool, 16, 71
survival, 126, 127
sustained competitive advantage, 1,
2

T

talent, 1, 18, 39
termination cost, 30
training cost, 16, 146
turnover cost, 18

V

valuable, xvi, xx, 8, 106
visualization, xiv, xix, 108, 109,
116, 118, 120, 122
voluntary turnover, 97

W

workforce, xix, xx, 2, 3, 5, 8, 9, 13,
20, 28, 29, 32, 37, 38, 39, 40,
41, 42, 43, 44, 47, 51, 63, 67,
70, 75, 77, 79, 81, 85, 86, 87,
90, 106, 111, 112, 113, 115,
117, 120
workforce generations, 38