**Predictive HR Analytics - A Game changer**

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1. **Introduction**

Predictive Analytics is a new trend in HR. It is HR’ s new normal. In the present scenario Business organisations are facing some of the issues and challenges such as gross margin falls, Employee turnover, rise in turnover, increased absenteeism etc., Organisation’s can collect the employee’s data to forecast their future behaviour to take different decisions regarding the employees to increase the performance of the company. Predictive Analytics helps to forecast the future by estimating current and historical data. The future events and behaviour of employees can be predicted by various techniques and models of Predictive analytics. The Predictive Analytics model gives a score for every event. A highest score implies the higher likelihood of occurrence of an event and a lowest score implies that the lower likelihood of occurrence of an event. Transactional and historical data are considered by these models to estimate the solutions for various issues in business related to human resources. These models are helpful in identifying the opportunities and risk of each employee and helps with respect to individual customer, or manager of a company. The Predictive Analytics models have dominated in the field of HR due to increased attention towards decision support solutions.

However, only few companies have succeeded to use Predictive analytics models for HR. Statistics according to [Deloitte’s 2018 People Analytics Maturity Model](https://www.forbes.com/sites/joshbersin/2017/12/16/people-analytics-here-with-a-vengeance/#27af2ada32a1) shows that, only 17% of the companies all over the world have accessible and utilized HR data. This has increased from 8% in 2015 and 4% in 2014. This chapter highlights the importance of using Predictive Analytics in different domains and HR in specific.

1. **Predictive Analytics**

Predictive analytics is a branch of advanced analytics that makes predictions about future outcomes using historical data combined with statistical modelling, data mining techniques and [machine learning](https://www.ibm.com/in-en/cloud/learn/machine-learning). Companies use predictive analytics to estimate patterns in this data to identify risks and opportunities.

Predictive analytics is associated with big data and [data science](https://www.ibm.com/in-en/analytics/data-science). Today organisation have information that resides across transactional databases, equipment log files, images, video, sensors or other data sources. To know insights from this data, data scientists use [deep learning](https://www.ibm.com/in-en/cloud/learn/deep-learning) and machine learning algorithms to estimate different patterns and make predictions on future events. These include linear and nonlinear regression, [neural networks](https://www.ibm.com/in-en/cloud/learn/neural-networks), support vector machines and decision trees. Learnings happened through predictive analytics can then be used further within [prescriptive analytics](https://www.ibm.com/in-en/analytics/prescriptive-analytics) to drive actions based on predictive insights.

Predictive Analytics helps to predict what will happen in future by using historical data, machine learning and artificial intelligence. The historical data is concerted into mathematical model that considers key trends and patterns in the data. The model is then applied to current data to forecast what will happen in future.

The information from predictive analytics will help organizations- business applications- suggest actions that affect positive operational changes. Predictive Analytics can be used by Analysts to determine if a change will help them to lower risks, improve operations and increases the profit.

Predictive Analytics promptly provides the solution for the question, what is most likely to happen in future based on current data, and what can be done to change the result?

1. **Predictive HR Analytics**

**Predictive HR analytics** is a tech device that HR utilizes to examine historical and current data to estimate future results.

Predictive HR analytics helps to extract, dissect, and categorize data and then recognize patterns, irregularities, and correlations. All through numerical assessment and analytical modelling, allows data-driven decisions considering the functions of HR.

Predictive HR analytics systems are like an earthworm. The earthworm intakes natural waste and deposit and expels nutrient-rich, fertile soil material. Likewise, Predictive HR analytics also intakes unused, fresh information to convert it into appropriate and meaningful information that helps to make clever decisions in business.

1. **Need of Predictive HR analytics for HR Leaders**

Predictive HR analytics supports companies in foreseeing challenges so they can:

* Avoid risk factor
* Decrease human error
* Estimate the distinctive employee profile that will bloom in the organization
* Improve recruitment practices
* Encourage ideal work performance

Finally, predictive HR analytics helps HR leaders to make clear decisions to enhance overall profit and increased [employee motivation](https://www.hibob.com/hr-glossary/employee-motivation/), retention, engagement, higher productivity.

## **Predictive Analytics: Benefits to Human Resource Departments**

When Predictive Analytics is used constantly and in a right way there can be various benefits to HR Department and Organisations.

### Appointing the Right People:

Employees in an organisation makes a successful business. Its not only the talented, qualified or experienced employees are the best for the company. The employees who can fit into the culture matters a lot for the business. Predictive Analytics helps the HR leaders to complete the workforce outlook. Advanced analytics helps to identify these employees, checks backgrounds, and even the first few days in the office for more effective candidate.

### Improved Productivity

After appointing the right candidate, the HR manager must maximise the role of the employee in the company. HR managers can focus on the Performance and growth of an employee, as well as their mistakes or errors they make through Predictive Analytics. HR Professionals can use technology which helps identify the interruptions in the workflow, which will help to enhance Productivity and generate cost savings for employees.

### Upskill the Employees

HR Planning to find skill gap that are present currently can be done by using Predictive Analytics. The Mexican government Ministry of Energy presently applies this type of model to find out gaps in the oil and gas industry. To get a solution considers various things which includes adjustable macroeconomic variables which correlate to the supply and demand for skilled worker in the industry.

### Promote Greater Engagement

Satisfaction of employees is always an important factor in ensuring the workforce happiness, but it cannot be measured. Though there are some non numeric datalike survey feedback and facts and figures to suggest that can ensure the engagement among the workers. Some tools that can help to identify and understand employee needs, motivation, morale levels and culture. These thoughts can be used to change how HR leaders engage their employees and communicate

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### Retain Best Talent

Predictive Analytics helps to retain the talent and helps in many ways. Company may incur expenses for finding, recruiting and training the workers and loosing the most talent employees also it may affect the employers brand negatively. Predictive Analytics will help in analysing the historical data to revel possible attrition before the event happens. It also helps in identifying the factors which influence on employees to leave the organisation. HR Managers can then utilise this information and look at these issues before they cause an employee to leave the company.

1. **Predictive Analytics Process**

(Kumar, 2019)(Mishra & Silakari, 2012)

**Predictive Analytics consists of various steps by which data analysts can forecast the future by considering the current and historical data**

1. Requirement Collection: To build a Predictive model, it should be clear with an objective of prediction.

. All through the prediction, the type of knowledge which will be gained must be defined. For example, a pharmaceutical company wants to study the forecast on the sale of a medicine in a specific area to prevent expiry of those medicines. The data analysts discuss with the clients to know the necessity of creating the predictive model and how the client will be benefitted from these predictions. It will be recognized that which information of client will be essential in creating the model.

1. Data Collection: once understanding the requirement of the client company, the analyst will gather the datasets, from various sources, needed in creating the predictive model. The data may be a complete list of buyers who utilize or check the goods of the company. This information may be in the organised form or in unorganised form. The analyst confirms the data collected from the clients at their own site.
2. Data Analysis and Messaging: Analysts analyse the data collected and prepare for analysis to be used in the model. The unorganised data is converted into organised data in this step. Once analysts get a complete organised data set the quality of data will be tested. There may be inaccurate data present in the dataset or there may be values which are missing against their attributes, these things must be carefully analysed. The effectiveness of model depends on the quality of data. This step is converting the raw data into a meaningful data that can be used for analytics.

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1. Statistics Machine Learning:

Predictive Analytics process consists of several statistical and machine learning technique. Most important technique are probability theory and Regression Analysis which are used in Analytics. Likewise, artificial neural networks, decision tree, support vector machines are the tools of machine learning which are commonly used in many predictive analytics tasks. All the predictive analytics models are based on statistical and/or machine learning techniques. Therefore, the analysts apply the concepts of statistics and machine learning in order to develop predictive models.

1. Predictive Modelling: In this step model is created based on statistical and machine learning techniques. After creating the model, it is tested on the test dataset which is a major part of the data collected to check the validity of the model. Once it is valid and fitted, the model makes exact predictions on the new information entered as input to the software. In many applications, the multi-model solution is opted for a problem.
2. Prediction and Monitoring: After the successful tests in predictions, the model is organised at the client’s site for everyday predictions and decision-making process. The outcomes and reports are created by the model nor managerial process. The model is constantly monitored to confirm whether it is giving the accurate results and making the correct predictions.
3. **Predictive Analytics Techniques**

(Mishra & Silakari, 2012)

1. Decision Tree: A decision tree is an easy and popular technique and is a classification and regression model. It is a tree-like the model with branches representing the choice between the alternatives and their consequences and leaves of the branch representing the decisions. Based on the categories of inputs, subsets are formed and this helps people to apply decision analysis.

1. Regression Model

Regression is one of the most popular statistical techniques which estimates the relationship between variables. It models the relationship between a dependent variable and one or more independent variables. It analyses how the value of the dependent variable changes on changing the values of independent variables in the modeled relation.

There are two types of regression models that are used in predictive analytics for prediction or forecasting, the linear regression model, and the logistic regression model. The linear regression model is applied to model the linear relationship between dependent and independent variables. A linear function is used as a regression function in this model. On the other hand, logistics regression is when there are categories of dependent variables. Through this model, unknown values of discrete variables are predicted based on known values of independent variables. It can assume a limited number of values in prediction.

1. Artificial Neural Network

An artificial neural network, a network of artificial neurons based on biological neurons, simulates the human nervous system's capabilities of processing the input signals and producing the outputs. This is a sophisticated model that can model extremely complex relations. Artificial neural networks are used in predictive analytics applications as a powerful tool for learning from the example datasets and making a prediction on the new data. Through the input layer of the network, an input pattern of the training data is applied for the processing and it is passed to the hidden layer which is a vector of neurons. Various types of activation functions are used at neurons depending upon the requirement of output. The output of one neuron is transferred to the neurons of the next layer. At the output layer, out is collected that may be the prediction on new data. There are various models of artificial neural networks and each model uses a different algorithm. Backpropagation is a popular algorithm that is used dominantly in many supervised learning problems.

1. Bayesian Statistics

This technique belongs to statistics which takes parameters as random variables and uses the term “degree of belief” to define the probability of occurrence of an event. Bayesian statistics is based on Bayes’ theorem which terms the events prior and posterior. In conditional probability, the approach is to find out the probability of a posteriori event given that priori has occurred. On the other hand, Bayes’ theorem finds the probability of priori event given that posteriori has already occurred.

1. Ensemble Learning

It belongs to the category of supervised learning algorithms in the branch of machine learning. These models are developed by training several similar types models and finally combining their results on prediction. In this way, the accuracy of the model is improved. Development in this way reduces the bias and reduce the variance of the model. It helps in identifying the best model to be used with new data.

1. Gradient Boost Model

This technique is used in predictive analytics as a machine learning technique. It is mainly used in classification and regression-based applications. It is like an ensemble model that ensembles the predictions of weak predictive models that are decision trees. It is a boosting approach in which resamples the dataset many times and generates results as a weighted average of the resampled datasets. It has the advantage that it is less prone to overfitting which is the limitation of many machines learning models. The use of decision trees in this model helps in fitting the data fairly and the boosting improves the fitting of data.

1. Support Vector Machine

It is a type of machine learning technique widely used in predictive analytics. With associative learning algorithms, it analyses the data for classification and regression. However, it is mostly used in classification applications. It is a discriminative classifier that is defined by a hyperplane to classify examples. It is the representation of examples in a plane such that the examples are separated into categories with a clear gap. The new examples are then predicted to belong to a class as to which side of the gap they fall

1. Time Series Analysis

Time series analysis is a statistical technique that uses time series data that is collected over a period at a regular interval. Data mining techniques and forecasting is combined in time series analysis. It is divided into frequency domain and the time domain which predicts the future of a variable at future time intervals based on the analysis of values at past time intervals.

1. **Cases of application of Predictive Analytics in HR**

(*Predictive Analytics in Human Resources - AIHR*, n.d.)

1. **Predicting and preventing turnover at HP**

Hewlett-Packard (HP) is a pioneer company with over 300,000 employees in the HR predictive analytics field. P encountered a high level of employee turnover. Turnover rates were around 20% was not uncommon in some of its sales divisions. This meant that employees stayed for 4-5 years at an average in HP.

 A high turnover led to high recruitment costs, lost revenue due to productivity loss, loss of knowledge, network, and sometimes even customers with them. It is estimated that the cost of replacing mid-level employees is as high as [150% of their annual salary](http://www.eremedia.com/tlnt/what-was-leadership-thinking-the-shockingly-high-cost-of-employee-turnover/). This cost HP millions of dollars.

 By using predictive analytics models, they generated a “Flight Risk” score which predicted the likelihood of leaving each of HP’s 300,000 plus employees. The findings also revealed that higher pay, promotions, and better performance ratings were, for instance, negatively related to “Flight Risk”. However, there was an intricate relationship between those findings. For instance, when someone received a promotion but did not get a considerable raise, this person would still be more likely to quit.

Key Managers with the support of the decision support systems could identify the risk factors of employee attrition. And accordingly, develop strategies to retain their staff. The Flight Risk scores acted as an early warning system. It provoked

managers to intervene before it is too late. Or, when it was inevitable for an employee to quit it helped the managers to react accordingly. HP saved around $300 million by applying predictive analytics to calculate this flight risk.

**2. Case of predicting hire success at Google**

Laszlo Bock, Senior Vice President of People Operations (HRM) at Google, writes in his book [Work Rules!](https://www.amazon.com/Work-Rules-Insights-Inside-Transform/dp/1455554790), that the most important instrument of Google’s People Operations is statistics. The whole recruitment is highly advanced with fully automated, computer-generated, and fine-tuned questions to find the best candidate.

Above this, Google evaluates the probability of employees leaving the company by applying HR predictive analysis. One of Google’s findings in the Sales Department is that the sales executives, who do not get a promotion within four years, are more prone to leave the company.

**3. Case of predicting revenue using engagement numbers**

Employee engagement is the key factor of HR. Engaged employees work hard, ensure better quality, have fewer absences, and are less likely to leave the organization.

Best Buy, which is an electronics retailer, used predictive analytics to check if employee engagement would impact the sales in the stores. They wanted to know if engagement impacted the sales in their stores. Scores of Predictive analytics revealed that a 0.1 percentage point increase in engagement would increase the revenue by $100,000 per store.

After finding this amazing effect, Best Buy decided to measure engagement several times a year. This also aided them to measure the drivers of engagement. This helped to come up with HR interventions to increase employee engagement and, in turn, stock revenue.

4. **Case of Predicting attrition of employees**

In a data analytics firm- Nielsen, retention of employees was a big challenge. After applying predictive analytics- financial impact analysis it was understood that a one percent reduction of employee attrition saved $5 million. The Predictive analytics team could identify that 120 key individuals were at risk of leaving the organization. A most important finding was the zero attrition in the first six months of lateral moves of 40% of the employees. Thereafter it was concluded that with various retention initiatives, for every one percent decrease in attrition, there was a decreased cost of $ 5 million. This was later implemented in seven other countries.

**5. Case of toxic people in the organization**

This case is of Cornerstone company about its noxious employees. Noxious employees are those who engage in fraud, alcoholic drinks, drugs, and sexual harassment. Such employees damage the company, spoil the general work environment, and decrease team productivity. Previous research says that team productivity reduces by 30% to 40% by these noxious employees. More alarming is that the good employees quit the organization if they have noxious employees in their teams.

The company picked a database of 63000 employees of cornerstone and identified the employees who were terminated from the work for their toxic behaviors. This constituted around 4 % of the employees. The key toxic behaviors were self-proclaimed rule-following, low attendance, and decreased service orientation. Though a high level, of productivity loss, was not identified, they were found to be contagious. Non-toxic employees eventually quit their job if they had to work with these toxic employees. Additionally, it was noticed that these employees create long-term stress and burnout among employees. Cornerstone witnessed that hiring the noxious employees’ costs $12800 on an average

Against $4000 for non-toxic employees excluding the long-term productivity loss, burnout, and other negative effects.

The company finetuned their recruitment process to prevent hiring toxic candidates so that a healthier work environment can be created.

1. **Conclusion:**

The application of predictive analytics in HR shows surprising results. The HR department can proactively save a great amount for the company. Predictive analytics helps executives and top management officials to take better decisions based on the results of predictive analytics and using the various HR matrices.

The scope of predictive analytics as explained in the above cases proves its significance in the field of business. Predictive Analytics is a game changer that enables HR to assess employees and their behavior. HR can revise or form people policies for both the employees and the business.

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