Predictive Analytics in HR: A Primer
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Abstract

With recent advances in data-driven analytics, and the resultant improved capabilities in working with huge datasets, strategic planning has become more complex for business units, and subsequently for the human resource (HR) function. Most business units have already adopted predictive analytics to guide their decision-making and strategy development processes. The new opportunities offered by predictive analytics are applicable to all core HR processes such as talent acquisition, attrition risk management, employee sentiment analysis, and capacity planning.

This paper emphasizes how analytics can help HR leaders scrutinize the problems inherent to these processes. It also highlights how some key HR challenges can be addressed by using predictive analytics.
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Introduction

The new generation of HR executives is moving from making reactive decisions solely based on reports and dashboards towards correlating business data and human resource data to predict future outcomes. Predictive analytics for HR is based on establishing a data-driven statistical relationship between the goals and initiatives of the HR function and the success or failure of an organization in achieving strategic goals. This relationship can help HR executives assess the results of their decisions and devise a long-term strategy. While this requires a significant shift in the function and use of data, the good news is that most organizations already have the required data for this purpose.

Significant Challenges Faced by HR

Every business function has to reduce costs, increase revenue, maximize operational efficiency, and focus on strategic initiatives to stay profitable, sustain agility, and grow. Whether in developed or emerging markets, HR leaders often struggle to support the business with the skilled workforce it needs, due to budget and time constraints. One of the biggest challenges a company faces when it plans to launch a new line of services or products is recruiting the right people for the job in time for execution. Similarly, businesses bear explicit and implicit costs when talent exits the organization. It is worse when employees quit soon after participating in an expensive training program sponsored by the organization. Is there a way to predict such risks and reduce the costs associated with them?

Other such questions to be addressed by HR leaders include:

**Talent acquisition and resource management**
- How can we acquire the right talent? How can we decide which profiles are right for the job description?
- How can we extract high-employee value?
- How can we retain and engage our top talent?

**Workforce administration**
- How can we manage capacity optimally?
- How can we reduce employee fraud risk to protect our brand image?
- How can we leverage social network data to ensure employee-centric human resources operations?

**Performance and learning**
- How can we gain greater value from our training programs?
- How do we select the right employees for training?
Applying Predictive Analytics in HR

Several organizations have proactively adopted predictive analytics for their business functions such as finance and risk, customer relationship management, marketing and sales, and manufacturing. This enables them to make informed decisions across a range of activities such as customer retention, sales forecasting, insurance pricing, campaign management, supply chain optimization, credit scoring, and market research.

For instance, by predicting what each customer likes, the sales and marketing function is able to make effective decisions on product recommendations. Likewise, finance teams draw upon predictive modeling and visualization for effective cash analysis, which helps to reduce financial risk.

Companies are exploring new possibilities for appropriately utilizing the ever-increasing large volumes of data. Companies can mine forward-looking data related to turnover, benefits of investing in training programs, quality of hires, and other critical aspects of HR management. This can be used to create statistical models that estimate probabilities and predict future behavior and trends across key HR areas.

To adopt predictive analytics, HR leaders require a structured data source that is aligned with the business. While HR processes such as recruitment and resourcing, workforce administration, performance and learning, payroll, and time management often use structured data sources, these are only integrated with each other. The key to leveraging predictive analytics and realizing maximum benefits from the HR data lies in tying the data source to strategic business outcomes.

The HR function also needs expertise to use analytical tools to effectively manage talent and recruitment data. HR personnel must be trained sufficiently to play a strategic role in business growth by efficiently leveraging analytics. HR leaders need to ensure that analytics and its outcomes are aligned with business objectives.

Key Areas Where Predictive Analytics Can Create Value

Some key applications of predictive modeling in HR are:

**Employee Profiling and Segmentation**

Predictive analytics can be leveraged for effective talent management by accurately profiling and segmenting employees. Segmenting the existing employee base can help management understand the workforce better. The lessons from this segmentation process can be applied to effectively classifying employees in the future.
Learning algorithms (supervised or unsupervised) can help predict the impact of HR initiatives and tailor the programs accordingly for better outcomes. Predictive analytics helps identify employees with particular training needs as well as detect trends in areas such as program enrollment, diversity, and so on.

Employee data such as demographics, skills, educational background, experience, and designation can be combined with information on roles and responsibilities to create such segments. Companies can achieve higher employee satisfaction score and better relationship with employees by selecting relevant programs for segments that are likely to benefit the most from these initiatives.

Predictive analytics techniques can be further applied to these segments to predict the readiness of each employee to capitalize on learning opportunities or take on new projects—both at the individual as well as segment level. Based on this, the HR department can design learning programs or new opportunities for these groups. Training objectives should be aligned with specific goals to help measure the impact of HR initiatives and plan for the future. Figure 1 illustrates how employees can be selected for training programs based on the performance band and their competencies.

**Employee Attrition and Loyalty Analysis**

The attrition risk score of individual employees can be estimated with predictive models of attrition. This can help organizations prevent the potential attrition of high performing employees, ensure business continuation, and identify loyal employees.

Employee demographic data, performance, compensation and benefits data, market data, rewards and recognition data, training data, behavioral data, and employee survey scores can be used for this analysis. Managers can identify the key reasons for attrition and thereby reduce its occurrence. Figure 2 illustrates the results of such an analysis.
At an individual employee level, predictive risk models can be utilized to generate triggers to warn the HR function about the potential loss of the employee. These alarms can be set at different thresholds for each employee based on the organization's needs.

By associating attrition risk scores with employee performance data, as shown in Figure 3, the HR department can identify high-performing employees who are at a greater risk of attrition and focus retention efforts on them. Performing this exercise periodically can help the organization reduce potential attrition.

**Figure 2: Identifying high impact reasons for attrition to devise preventive actions**

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**Figure 3: Calculating attrition risk scores to ensure focus on the right employees**
Forecasting of HR Capacity and Recruitment Needs

By predicting requirements for HR capacity and recruitment, organizations can optimize resource utilization and sustain appropriate growth and margins. HR managers can develop plans for recruitment, training, and infrastructure development.

Accurate forecasting also enables effective staffing. Future requirements and the number of remaining employees can be estimated based on predicted attrition rates and business growth forecasts for each department or unit. Requirements (calculated as net requirement = forecasted requirement - expected attrition) can be estimated accurately for each time period. The in-flows (new recruits) and the out-flows (exits) in the current quarter can help predict the expected number of employees in the next quarter. Factors such as attrition risk scores, business growth forecast and pipelines, number of employees in each department, productivity level, and past performance of each employee can be incorporated to enrich the predictive models.

Managers can understand the actual requirement by computing the difference between [projected requirement] and [expected number of loyal employees]. For instance, let’s say a business unit with 50 people needs 60 people in the next quarter. The average attrition risk score for six of these people is 50 percent, so there is a very high probability that three of them will leave the organization.

Therefore, the actual requirement can be calculated as: 60 - 50 + 3 = 13

Forecasting analysis can help predict the total requirement from quarter to quarter. It also helps minimize the gap between ‘how many to recruit’ and ‘how many on staff’ as much as possible to prevent revenue leakage. Controlling the number of new hires and deploying retention plans for existing staff with high attrition risk scores enable HR to effectively address recruitment needs without encountering overstaffing or understaffing issues.

Figures 4 and 5 show the forecasting processes that can help HR managers estimate recruitment needs accurately and guide business leaders in aligning recruitment plans with their project targets to achieve operational effectiveness. For instance, in Figure 5, forecasting analysis helps match the needs of the business closely with expected attrition and recruitment. This gives the business the operational advantage needed for ensuring sustained growth.
Appropriate Recruitment Profile Selection

Attrition in roles associated with high costs of hiring leads to significant losses for the organization. By analyzing the data for current employees, including performance and productivity indices, attrition details, and life-time value, HR can arrive at the right profile for each potential employee.

A statistical relationship between employee value and profile variables such as education and experience enables HR to identify the most suitable profiles. This helps increase quality, productivity, and customer satisfaction scores, and reduce recruitment cost substantially, creating sustainable value for the organization.

Figure 5: Required workforce vs the actual and the forecasts for the right recruitment need

Figure 6: Predicting the employee life-time value
While the employee value is estimated by correlating the business unit performance and employee performance through a predictive model, the net value can be calculated at a profile level as shown in Figure 6. While net value also incorporates the cost factor for each profile, employee value is evaluated by factoring in the predicted tenure and monetized performance. The profiles are then compared using two types of prediction models and a framework for final evaluation.

Attrition records, profile data, productivity, performance data, output from employee’s life-time value analysis, compensation and benefits data, and hiring cost data can be used for this analysis. In Figure 6, profiles 1, 4, 6, and 11 are not expected to break even (positive net value) within the expected tenure, and can therefore be eliminated. This predicted tenure can be evaluated by predicting the attrition risk for each profile. Table 1 indicates key aspects of the different profiles and their hypothetical tenure value.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>Supervisor</td>
<td>Supervisor</td>
<td>Supervisor</td>
</tr>
<tr>
<td>Relevant Experience</td>
<td>3-5 years</td>
<td>3-5 years</td>
<td>3-5 years</td>
</tr>
<tr>
<td>Home Town</td>
<td>Same as Work Location</td>
<td>Same as Work Location</td>
<td>Same as Work Location</td>
</tr>
<tr>
<td>Highest Education</td>
<td>Under Graduate</td>
<td>Post Graduate</td>
<td>Under Graduate</td>
</tr>
<tr>
<td>Cost to the Company</td>
<td>$180,000</td>
<td>$219,000</td>
<td>$185,000</td>
</tr>
<tr>
<td>Specialized Skills</td>
<td>A</td>
<td>A and B</td>
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</tr>
<tr>
<td>Value</td>
<td>$125,000</td>
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<tr>
<td>Net Value</td>
<td>-$55,000</td>
<td>$106,000</td>
<td>$34,000</td>
</tr>
</tbody>
</table>

Table 1: Analyzing employee profiles to estimate value

Source: TCS Analysis
Employee Sentiment Analysis

HR professionals should capitalize on structured and unstructured information from multiple sources to create, improve, or redesign their initiatives. Employee sentiment analysis is more effective than annual employee surveys in getting honest, useful feedback. This process involves tracking, analyzing, and dissecting key topics that are most relevant to employee sentiments over a period, and can later be extended to a near real-time process.

Such information can promote understanding of how an HR initiative, policy, organizational change, or event is being received by employees. A net ‘promoter’ score can be evaluated for this purpose.

Internal data related to the respective HR initiatives or change, as well as data from external social media such as Facebook, Twitter, and LinkedIn, can be used for this analysis. Business insights from employee sentiment data can provide a clear measure of the impact of various organizational factors on productivity, business growth, or other objectives. Figure 7 shows the possible results of an employee sentiment analysis.

![Figure 7: Understanding the impact of HR initiatives on employee engagement and sentiment](source: TCS Analysis)

Employee Fraud Risk Management

Predictive analytics helps strengthen internal fraud risk management by enabling an organization to identify employees who are at high risk of non-compliance with the organization’s security policy or other rules and regulations. Organizations can create a fraud risk score by analyzing employee activity data and incident data using statistical modeling techniques. Once employees at high risk are identified as shown in Figure 8, proactive actions can be taken. This can help protect the company’s brand image and reputation, and prevent possible financial loss.
Information relating to employee activity, profiles, demographics, network and social information, privileged access data, and rules and policy data can be associated with incident risk in the predictive model. The risk scores can help segment the employee base and identify segments for targeted actions, as shown in Figure 9.

**Figure 8: Segmentation of employees that need awareness training**

**Figure 9: Segmentation of employees to identify high risk behavior**
Conclusion

To play a more relevant and strategic role in the organization, the HR function needs to move beyond mere reporting to accurate prediction. Instead of just generating reactive reports, it needs to embrace advanced analytics and predictive techniques that support strategic organizational goals.

Application of predictive analytics in HR entails utilizing relevant data to solve specific business problems. Predictive analytics helps organizations contain HR-related costs while developing a high performing workforce. The insights derived can help improve business performance as well as employee engagement and satisfaction.

Predictive analytics might be uncharted territory for HR, therefore to fully realize its benefits, HR personnel need to collaborate with other business units and customer-facing functions to understand how they leverage data and analytics to create value. By doing so, HR departments can facilitate superlative employee experiences that lead to sustained long-term benefits for the organization. For instance, the customer relationship management group predicts key parameters such as customer lifetime value, customer churn risk, and so on to enable the organization to improve its customer service. Similarly the human resources organization (HRO) can adapt these type of analytical techniques to superimpose on their data to gain foresight.
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