WSIS FORUM 2023
13-17 March 2023

WSIS Forum 2023

هيئة الحكومة الرقمية
Digital Government Authority

DigitalGov Hack

Advancing the Digital Economy by leveraging Emerging Technologies

[23rd of October – 4th of December 2022]

Project Title: CHURNTURN

TRACK :Productivity in public workplace

Team: SHRUTI GUPTA

Country: INDIA

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Reimagine Future Of Work

"If you want to build a ship
Don't drum up the people
To gather wood, divide the
Work, give orders.
Instead, teach them to yearn
For the vast and endless sea" - Saint Exupery

By: Shruti Gupta

Data Engineer
Barclays Investment Bank

Table Of Contents:

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Problem Statement :
PRODUCTIVITY IN PUBLIC WORKPLACE

SOLUTION:

Human Capital POTENTIAL improvement...

The solution statement is to build a predictive model for PRODUCTIVITY OF AN EMPLOYEE which will help the government in better resource planning and improve the employee experience.

Take employee surveys and map them into placing employees correctly based on their inherent talent, motivation and education

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HighLights :
What we think vs What it is

Employee productivity also includes

Lateral Job Offers before exits

Employee :Job Profiling Match

Improved transparency

Lead's Test

Improved male-female ratio

Keeper's Test

Work - Life Balance

Innovation / Entrepreneur Opportunities

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Opportunity

Improving HR Analytics...

- A lot of performance analyses occur at an aggregate level such as productivity rates. But few analyses concentrate on trying to identify exactly which individuals might be needing help on patterns that might be present in existing data.
- Machine learning algorithms often showcase customer churn examples for telcos or product marketing .Those algorithms equally apply to employee productivity enhancement .
- Use Random Forest Algorithm to see current level of productivity in employees.

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Impact of the solution

Domains the solution can address...

- Bad Productivity means costly expenditure on departures
- A supportive employer knows employee goals
- Succession planning to minimize costs
- Planning for movement of an employee within verticals and the relative costs associated well ahead of time.
- The beneficiaries include government organizations and employees.
- A healthy work environment for all mainstreaming *"work with a purpose"*

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Link For The Prototype:

Website : https://digitalhackshruti.tiiny.site/

AI Model:

https://www.kaggle.com/code/shruti0920/employee-productivity

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Replicability and Scalability

Improving HR Analytics...

- Currently for the project we've made a poc but to scale we plan to use cloud services.
- Using AWS Cloud services to use the correct tech stack to ensure project solution is deployed in different office locations and a centralised database manages inputs and predicts employees productivity
- Detailed Cloud Diagram in slide : 23
- Detailed Tech Details in slide : 26
- Model Usage and AI in slide: 20

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Obstacles and Mitigating Risks

*A recent survey by the Society of Human Resource Management (SHRM) found that the average **cost** per hire is just over $4,000. This number is the average across all the **companies** SHRM surveyed.*
Sometimes that can be the cost to retain an employee, with the additional benefit that you retain someone with not only domain knowledge but one who understands your company jargon and workings !

- By calculating employee productivity and cost-to-hire into the planning we will need to calculate accurate costs to maintain a certain position.
- We can also identify with the given model which team needs to ramp up their efforts in keeping members and start taking actions accordingly..
- All analytics will come with actionable items to take measures to improve productivity and belongify employees to their workplace !

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Link For The Pitch:

https://vimeo.com/777873981/f9cd5d46ac

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Implementation Plan

Improving HR Analytics...

- 0-3 months :
  - Collect employee surveys about their current job situation. This will include various questionnaires and surveys
  - Access employee personality types
  - Select a single function and try to improve performance of that particular function with respect to employee
- 4-6 months :
  - Build AI model to correlate both and build a predictive model
  - Match employees to relevant jobs if their satisfaction index is below a certain range
- 6-9 months :
  - Deploy project in various departments and locations
  - Collect actionable insights for higher management to improve satisfaction score for the government
- 9-12 months:
  - Deploy improvements in models and see sections for getting wider in scope and function

Business Model

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Model Details - Attrition Cost

Attrition cost is pre-calculated based on employee Grade, Current Cost To Company (CTC), Present performance rating, Years at the gov organisation, etc.

Employee Grade	Hiring Cost (Consultant / Hiring process)	Probation Period	Poor Performance Cost (based on 2 parameters)
Grade 1 (Junior Level)	10% of CTC	1 Month (10% of CTC)	20% of CTC
Grade 2 (Mid Level)	20% of CTC	3 Months (10% of CTC)	30% of CTC
Grade 3 (Sr. Level)	30% of CTC	4-6 Months (40% of CTC)	70% of CTC

Table depicting the calculation for poor performance cost based on 2 parameters as an example

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Model Details - Risk Assessment

- Based on job satisfaction questionnaires, employees are placed into 3 buckets on the employee productivity scale - High, Medium & Low
- The sumproduct of the probabilities and the attrition cost of employees gives **Most Probable Productivity Cost (MPPC)** to the government
- The MPPC is calculated at a department level, regional level, grade level and organization level
- On further data analysis, the areas / departments with greater high risk employees or higher percentage of **MPPC / CTC** are analysed and corrective action is suggested based on findings from attrition reasoning & team demographics

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Model Details - Measurable results

- Indices like MPPC and MPPC / CTC ratio point to the direction of maximum risk
- The model then suggest the common issues among high risk employees for the management to take corrective actions
- The model also suggests the budget that can be spent for these corrective by means of calculative analysis of the cost of reducing the attrition cost
- This targeted preventive action towards slowing the productivity rate & save a company a major chunk of the cost, and ofcourse, its employee base

About Presenter

Shruti Gupta

Data Engineer at Barclays

Developer by profession having hands on experience in handling a project from idea to development along with maintenance. Worked as a full stack developer gaining knowledge in front and back end technologies.

Interested in Intrepreneurship, worked for many startups.

Tech Stack: AngularJS, Python-Django, PostgreSQL

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Phone No: 9654633539 / 9354264948

ADDITIONAL TECH DETAILS

Governments Managing Employees Like It's Still the Industrial Revolution :
It just won't work !

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Flowchart for productivity prediction

Data Preparation Load, Clean and Format

To take a peek into categorical/object values we need to bind them with a numeric variable and then see their relevance to the dataset or replace the categorical variable with dummies.Replace categorical variables with dummy values and convert the data in numerical format.

The variables are correlated if they are, we might want to avoid those in model building process.Slide No 8

Missing values check

Understand data and the importance of different parameters.

Split data into 70-30 ratio.For training and testing data.Apply Random Forest.X are all the parameters contributing to the attrition rate .Y is the probability.

Predict the productivity result. Given a result of parameters. Comprehend result

Show a dashboard of company performance given - Slide 13

Apply Random Forest Algo made in the previous step for testing data and apply the same on training data and look for accuracy.

For this we can use AWS stack. A detailed diagram in slide no 14

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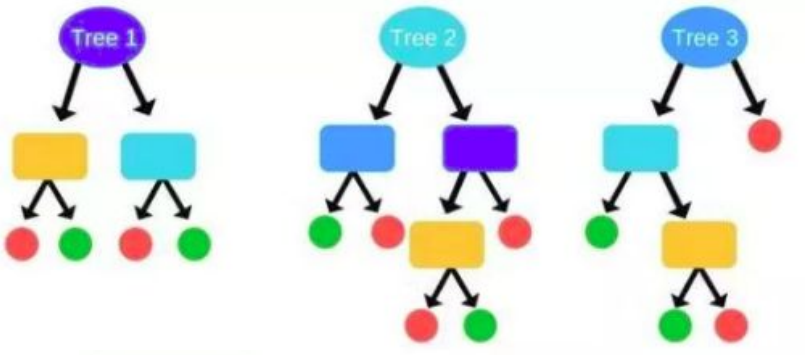
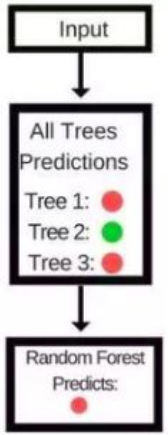


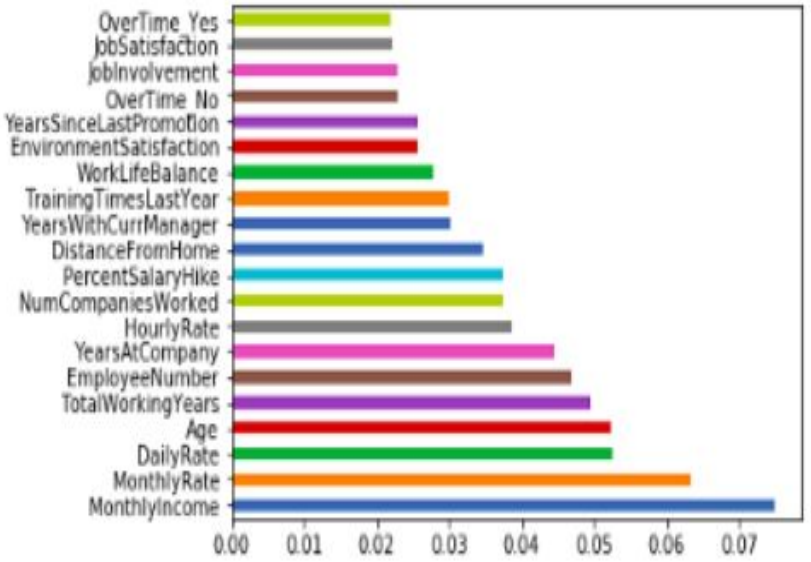


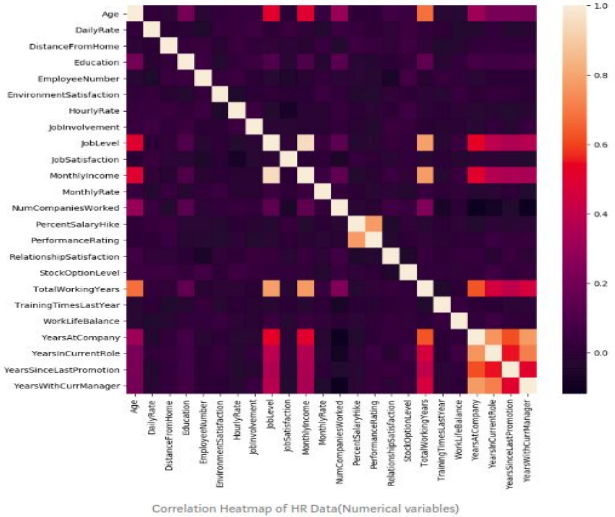
Solution using Random Forest Classifier

The Random forest works on Bagging principle. It is an ensemble of Decision Trees. The bagging method is used to increases the overall results by combining weak models. In the case of Classification problem it takes the mode of the classes, predicted in the bagging process.The random forest works quite well even with the default parameters. Random forest also doesn't over fit easily because of its randomness feature.

Correlation model

One of the advantages of using Random forest model has- it provides the importance of variables/features in the data/model. For this HR Analytics problem, we are interested in knowing which feature/factor contribute the most in the Attrition and RF's one function can give us this information.





Correlation Heatmap of HR Data(Numerical variables)

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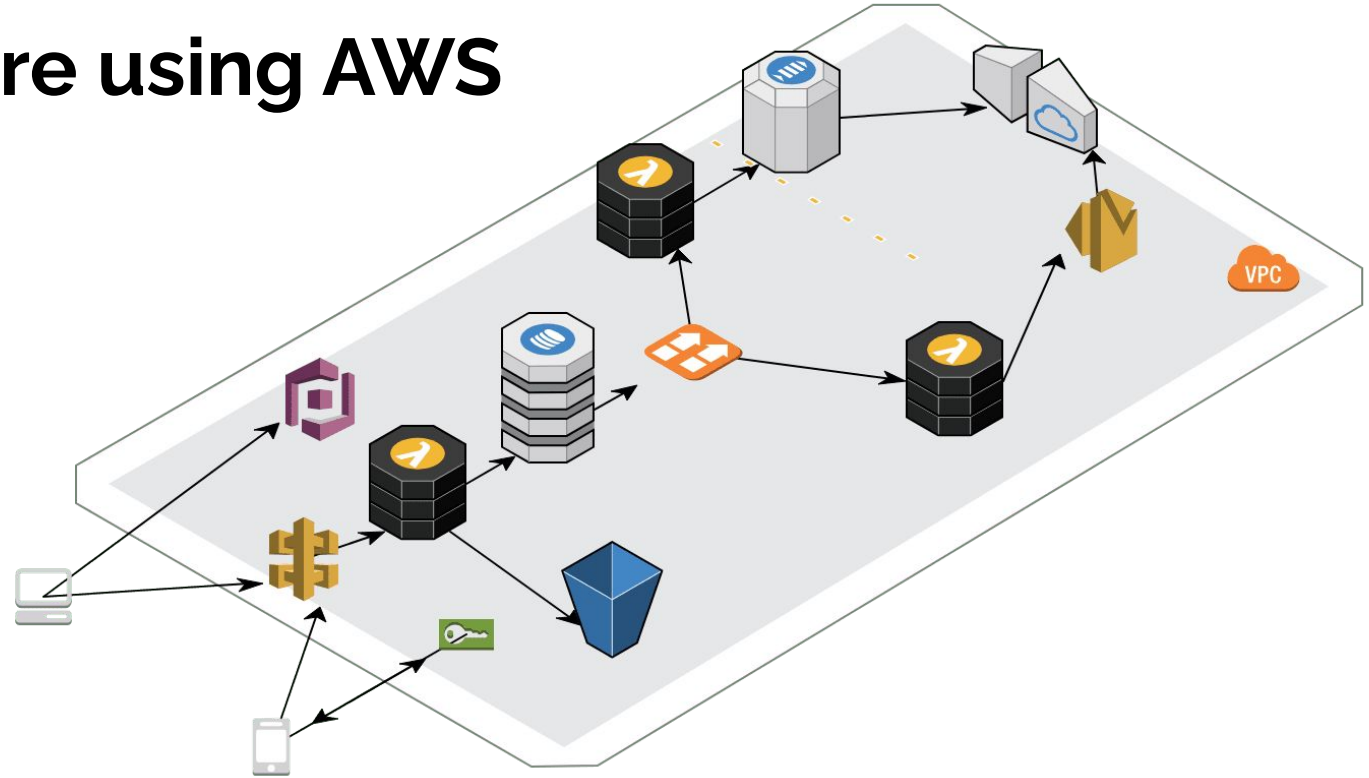
Architecture using AWS



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Tech Stack

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Teach Stack and Libraries:

- Jupyter Notebook
- Python
- Bootstrap
- Pandas
- Numpy
- Scikit Learn

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TENTATIVE MODEL

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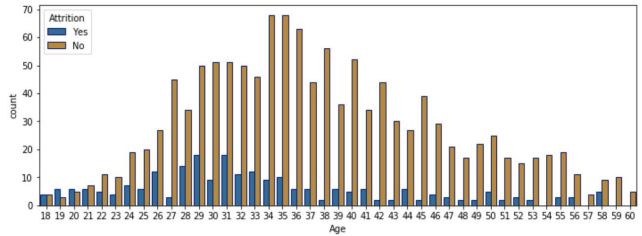
```
# Show the number of employees that left and stayed by age
import matplotlib.pyplot as plt
fig_dims = (12, 4)
fig, ax = plt.subplots(figsize=fig_dims)
# ax = axis
sns.countplot(x='Age', hue='Attrition', data=hr_data, palette="colorblind", ax=ax,
              edgecolor=sns.color_palette("dark", n_colors=1));
```

```
<Figure size 1000x1000 with 0 Axes>
```



In [28]:
```
hr_data['Attrition'].value_counts()
attrition_count = pd.DataFrame(hr_data['Attrition'].value_counts())
attrition_count
plt.pie(attrition_count['Attrition'] , labels = ['No' , 'Yes'] , explode = (0.2,0))
```

Out[28]:
```
([<matplotlib.patches.Wedge at 0x10dddeb10>,
  <matplotlib.patches.Wedge at 0x10dde8110>],
 [Text(-1.13678,0.630657,'No'), Text(0.961892,-0.533633,'Yes')])
```

In [29]:
```
sns.countplot(hr_data['Attrition'])
```

Out[29]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x10dde8ed0>
```

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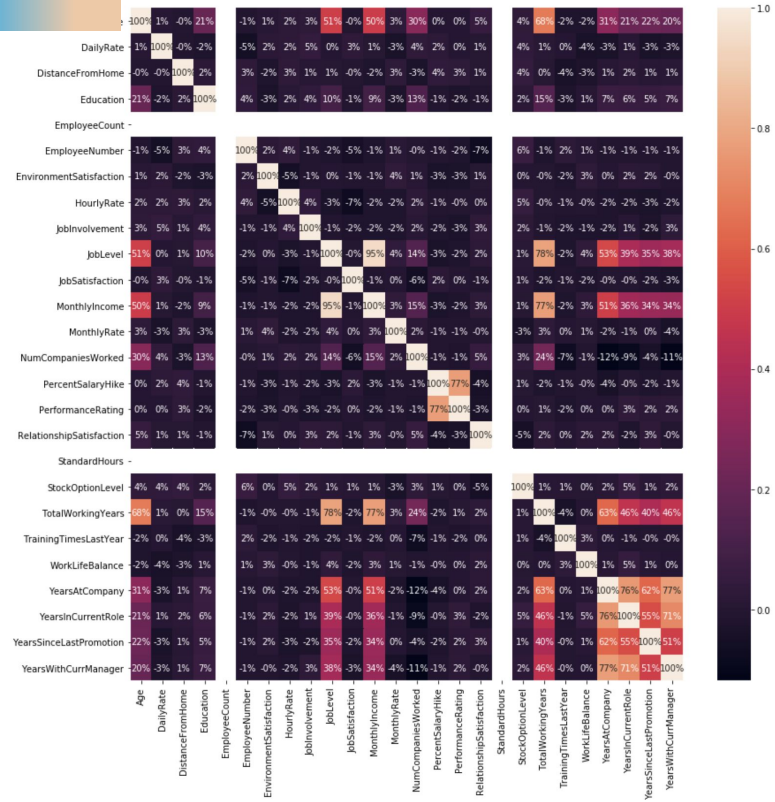
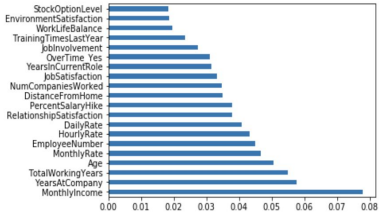


In [45]:
```
# Return the feature importances (the higher, the more important the feature).
feat_importances = pd.Series(model.feature_importances_, index=features.columns)
feat_importances = feat_importances.nlargest(20)
feat_importances
```

Out[45]:
```
Age                      0.066037
MonthlyIncome            0.063231
DailyRate                0.053201
DistanceFromHome         0.049256
NumCompaniesWorked       0.048662
TotalWorkingYears        0.045702
EmployeeNumber           0.045079
MonthlyRate              0.042149
YearsWithCurrManager     0.035629
YearsAtCompany           0.035596
PercentSalaryHike        0.034850
JobSatisfaction          0.034214
OverTime_Yes             0.032096
TrainingTimesLastYear    0.025812
HourlyRate               0.025021
StockOptionLevel         0.022960
Education                0.022595
YearsInCurrentRole       0.022483
WorkLifeBalance          0.022108
JobInvolvement           0.021895
dtype: float64
```

In [35]:
```
feat_importances.plot(kind='barh')
warnings.filterwarnings("ignore")
```



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```
----------------Accuracy----------------: 0.8367346938775511
AxesSubplot(0.125,0.11;0.62x0.77)
TotalWorkingYears            0.084445
DailyRate                    0.054148
MonthlyIncome                0.053127
EmployeeNumber               0.052535
DistanceFromHome             0.042786
HourlyRate                   0.042424
Age                          0.038544
YearsAtCompany               0.038133
OverTime_No                  0.036051
PercentSalaryHike            0.035392
MonthlyRate                  0.034145
NumCompaniesWorked           0.032535
JobSatisfaction              0.031952
Education                    0.027851
YearsWithCurrManager         0.027206
YearsInCurrentRole           0.025920
JobLevel                     0.025815
StockOptionLevel             0.022093
EnvironmentSatisfaction      0.021248
TrainingTimesLastYear        0.020180
dtype: float64
```

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UI/UX Design

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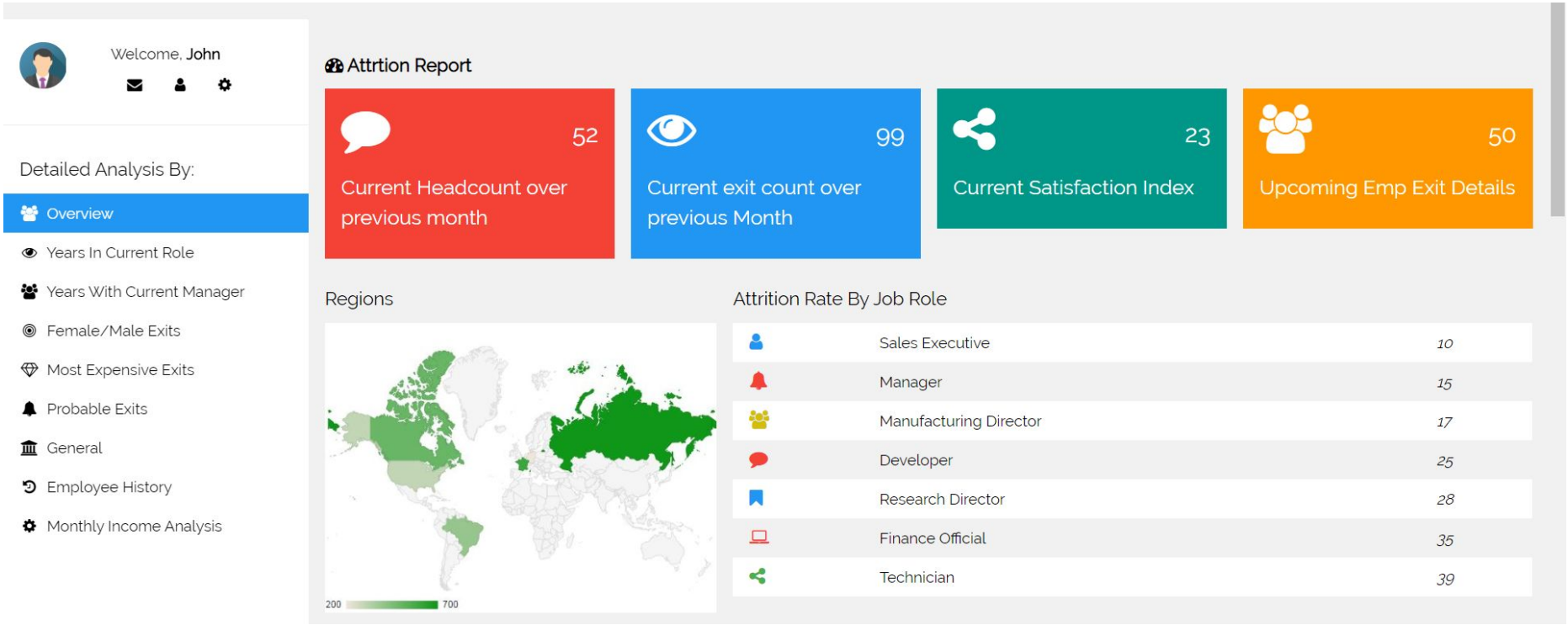
Screen 1



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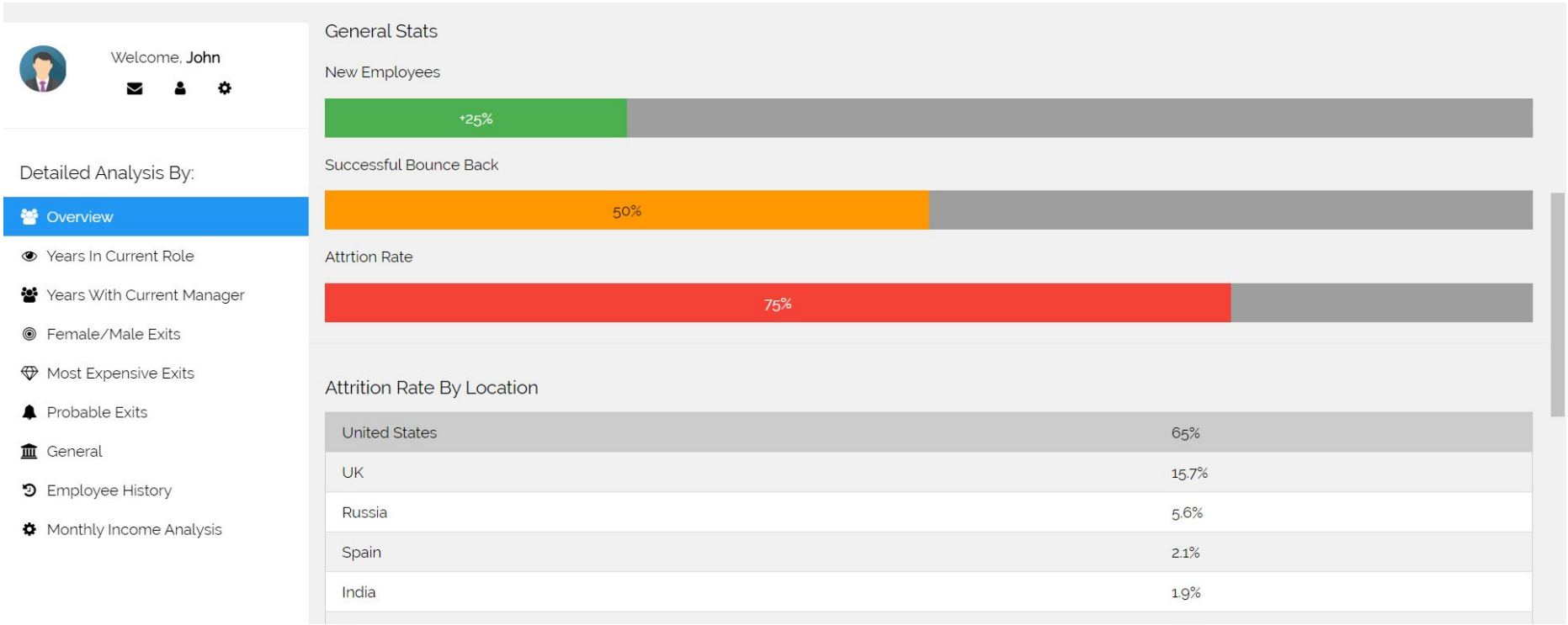
Screen 2



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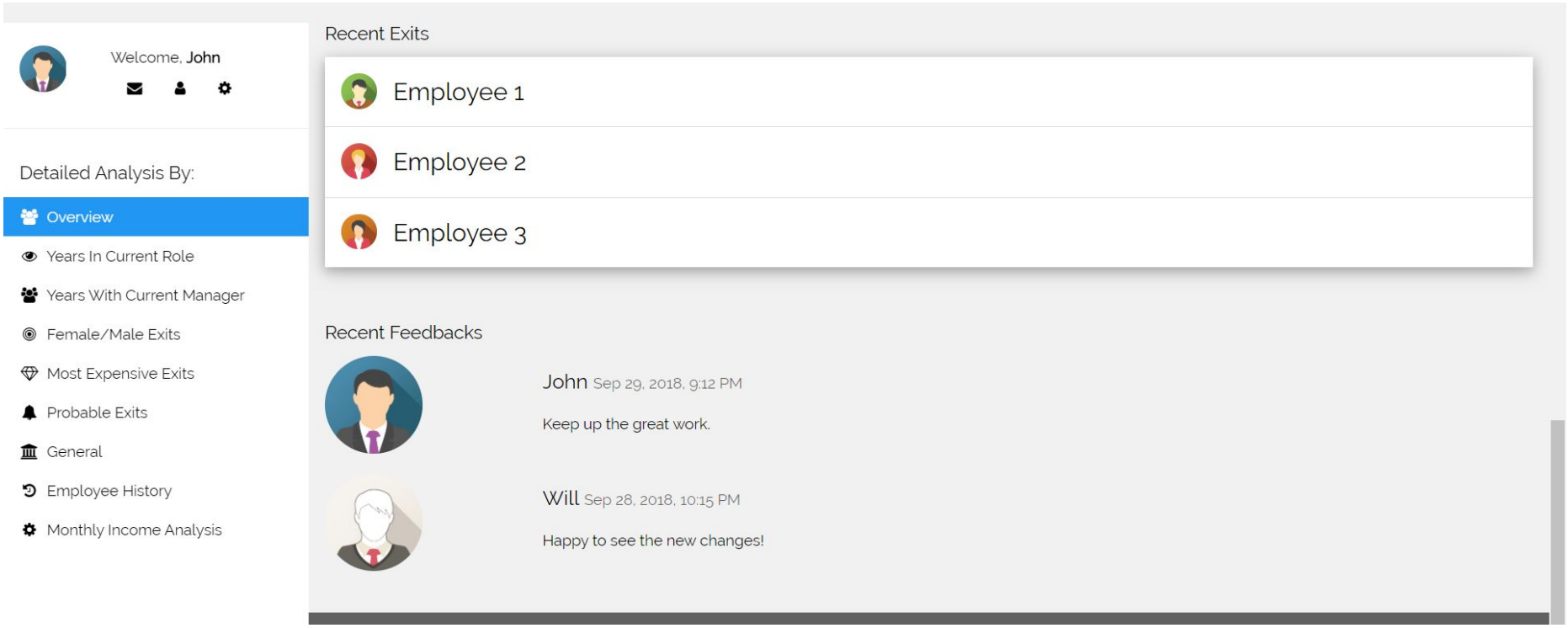
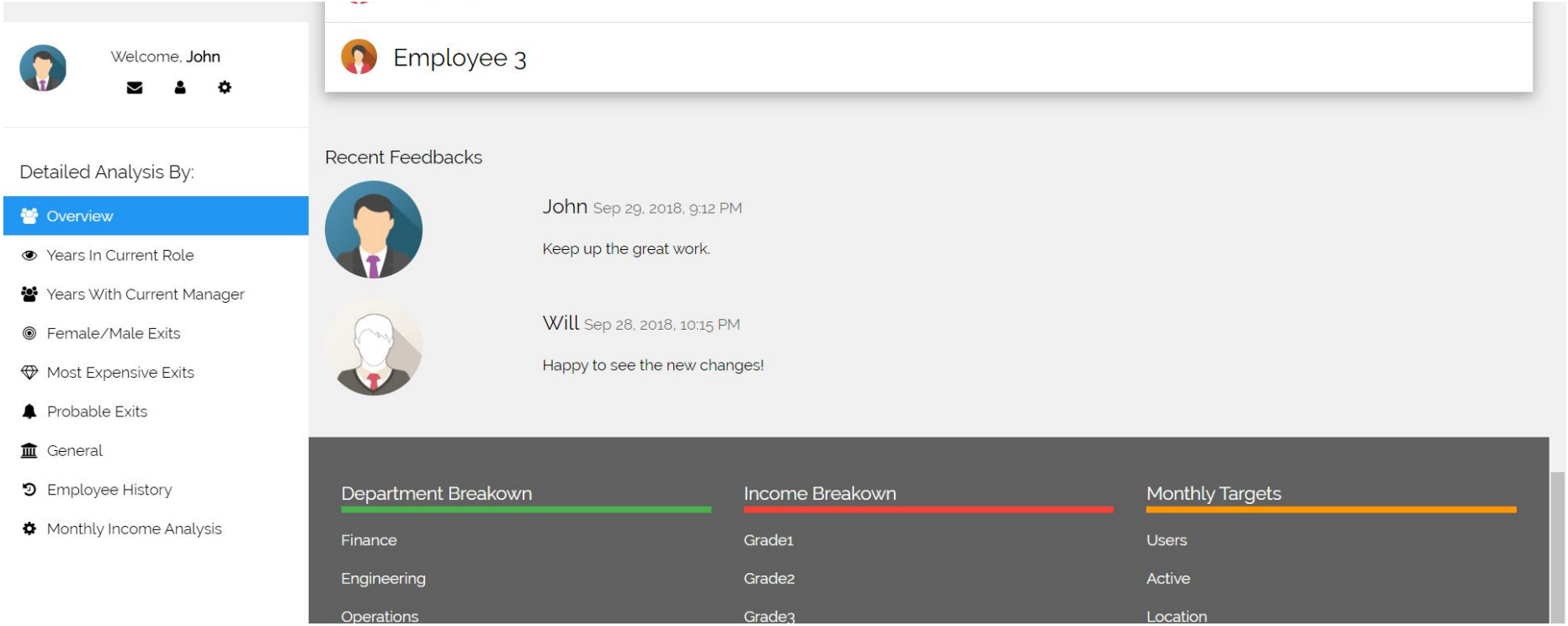
Screen 3



Screen 4


Welcome, John
Detailed Analysis By:
Overview
Years In Current Role
Years With Current Manager
Female/Male Exits
Most Expensive Exits
Probable Exits
General
Employee History
Monthly Income Analysis
Employee 3
Recent Feedbacks
John Sep 29, 2018, 9:12 PM
Keep up the great work.
Will Sep 28, 2018, 10:15 PM
Happy to see the new changes!
Department Breakown
Finance
Engineering
Operations
Income Breakown
Grade1
Grade2
Grade3
Monthly Targets
Users
Active
Location

ADDITIONAL ANALYSIS

Companies Managing Employees Like It's Still the Industrial Revolution :
It just won't work !

HR Analytics

Human resource analytics (HR analytics) is an area in the field of analytics that refers to applying analytic processes to the human resource department of an organization in the hope of improving employee performance and therefore getting a better return on investment. HR analytics does not just deal with gathering data on employee efficiency. Instead, it aims to provide insight into each process by gathering data and then using it to make relevant decisions about how to improve these processes.

Performance affecting Organizations and Governments

- A major problem in high employee productivity is its cost to an organization.
- Job postings, hiring processes, paperwork and new hire training are some of the common expenses of losing employees productivity and replacing them.
- This is especially concerning if your business is customer facing, as customers often prefer to interact with familiar people.
- Errors and issues are more likely if you constantly have bad workers.

In a age where the markets are so volatile , providing jobs with a purpose and financial security from a workplace has become crucial.

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Actionable Insights

Talent Density

- Improve Talent Density across verticals
- Fortify talent with top of market pay
- Set processes for HR to counter offer roles to star employees that request exits in other departments.

Candour / Feedback

- Improve Feedback with positive intent and Candour
- Train HR's with EQ and understand pain points.
- Retrospective and Personal Goals
- Discover the team members with the following traits
    - Think-tanks- Help to innovate, Outliers - who help find chinks in the processes, Executors, Time trackers, All hats
    - Recognize Generalists / Specialists.
    - When employees outgrow their current role this will help to shift them from one domain based on these traits.
    - When retaining employees this helps better to map them to other roles where they can outshine.
- Manager's Test :
    - Micromanagement
    - Knowledge Base
    - Mentorship
- Keeper Test :
    - Will the manager fight for the person in his/her team should he decide to leave.
    - Helps a company understand the value an individual employee brings to the table

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Actionable Insights

Control And Innovation

- Release Control
  - Vacation policy
    - Work-Life balance : It's not important, It's crucial
    - Taking Leaves to be Encouraged
  - Travel and Expense Approvals : Eradicate with trust in leadership
  - Timesheets/ Tracking Screens/ Clocking company hours
    - Imagine if employees started doing that . They might not end up serving the last minute work and weekend work .
    - Millennials especially hate it and they are an integral part of the future that is yet to be shaped.
- Result Oriented Work over Hard Work
- Break Decision Making Pyramid, Adopt tree methodology
  - Don't seek to please boss, seek what's right for the company.
  - People thrive when given more control over their projects, more ownership their feel motivated to do their best
- Hackathons
  - Fire up employees with the most pestering problems the company is facing .
  - You might have an itching entrepreneur sitting right in between. Might as well leverage one.
  - With the digital erra fast forwarded in pandemic we'll have many more and that's a good thing
- Freedom
  - Nobody should feel entitled to marry , have kids, pursue hobbies , go for experiences that go beyond work, more importantly being told how they should manage their time. These are life experiences and an employee should never be threatened to choose between these and work ! .
  - As long as they get the work done.

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Female Leadership

Often in teams to improve female to male ratio we recruit female employees.
But how often do we see them taking key decisions .
How often do we see employees interviewed by females.
Big questions to ponder over ?

- Open leadership positions : Often females end up thinking I'm not ready for a leadership roles. Promote thinking that if they want to they'll learn by doing it. Just like others.
- Take surveys of female employees who want to.
- Get nursing staff/financial assistance for pregnant women, this helps them come more confident returning to offices.
- Seek areas with noticeable salary differences between the two.
- Seek to hire on top of pyramid , the same would trickle down

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Company Size and Attrition Links

Small Size Emerging startups.

- Pain Points
  - Work Life Balance unavailable
  - Can't offer huge ctc
  - No processes
- Solutions
  - Equity, ESOPS make employee part of the bigger picture
- Eg : Flutura, Vitra.AI

Medium Size

- Pain Points : Combination of top and bottom
  - Processes not streamlined ()
- Solutions
  - Retain employees , retain company knowledge
- Eg: Paytm, Delhivery

Large Size

- Pain Points
  - Redundant processes, still going by rules of industrial revolution
- Solutions
  - Mainstream Innovation
  - Leverage the wide forum to expose employees to newer ventures
  - Leverage energy of millennials to percolate up the ladder
- Eg: Accenture, Barclays

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Future Add Ons

- Place Keeper's Test on dashboard
- Leader's Test on dashboard
- Employee Pulse Rate : Track motivation and learning on monthly basis
- Employee Personality Test : During exit suggest positions within company in line to the test
- Calculate cost savings from retains . Promote behaviour across verticals

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Model Example

Attrition Cost Index on CTC			70%	40%	20%			
Employee Grade	**Avg CTC**	**Avg Attrition Cost**	**High Risk Frequency**	**Medium Risk Frequency**	**Low Risk Frequency**		**MPAC**	**MPAC / CTC**
Level 1	₹ 600,000	₹ 120,000	30	10	20	120,000*(30*70+10*40+20*20)	₹ 3,480,000	5.8
Level 2	₹ 1,200,000	₹ 360,000	3	5	7	360,000*(30*70+10*40+20*20)	₹ 1,980,000	1.7
Level 3	₹ 2,400,000	₹ 1,440,000	2	3	1	2,40,000*(30*70+10*40+20*20)	₹ 4,032,000	1.7

Employee Grade	**Avg CTC**	**Attrition Cost**	**High Risk Frequency**	**Medium Risk Frequency**	**Low Risk Frequency**		**MPAC**	**MPAC / CTC**
Level 1	₹ 600,000	₹ 120,000	0	5	55		₹ 1,560,000	2.6
Level 2	₹ 1,200,000	₹ 360,000	12	2	1		₹ 3,384,000	2.8
Level 3	₹ 2,400,000	₹ 1,440,000	2	3	1		₹ 4,032,000	1.7

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