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Simplifying Payroll Parallel Processes and Streamlining Reconciliation in HCM Oracle Fusion Payroll Implementation

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Abstract: This report delves into the process of payroll parallel testing and reconciliation when moving any legacy system payroll to the Oracle fusion payroll. It is aimed at taking care of the data integrity, proper payroll calculation and a smooth transition of the system. The report also concentrates on data inconsistency, data reconciliation and optimization techniques such as machine learning and automated tools through quantitative analysis. It emphasizes the difficulties in matching system settings, addressing the failures, and enhancing the efficiency and eventually presents the knowledge about the best practice in the seamless transition of the payroll and matching its compensation. This reconciliation process is applicable for any old systems payroll migration to the Oracle Fusion Payroll, but have considered an example of Oracle EBS Payroll migration to the Oracle Fusion Payroll.

Keywords: *Payroll parallel testing and reconciliation, Oracle EBS, Oracle fusion payroll, data integrity, proper payroll calculation, smooth transition, data inconsistency, data reconciliation, optimization techniques, machine learning, automated tools, matching system settings, addressing the failures, enhancing the efficiency, seamless transition, transition of the payroll, matching its compensation.*

I. INTRODUCTION

Payroll systems are crucial for ensuring that the employees receive compensation properly and on time, it manages tax deductions as well as complying with the law. Efficient payroll management systems automate these processes, reduce the level of errors, ensure that the regulatory requirements are met, and increase employee satisfaction [1]. With this ever-increasing complexity of payroll laws and the need for adequate reporting, integrated systems like the Oracle Fusion are adopted to ensure smooth integration, enhance efficiency in processes, as well as, reduce the risk.

Problem statement

Migrations of payroll systems are often faced with challenges such as inaccurate data, miscalculations and integration difficulties [2]. There is a need to perform parallel payroll testing to ensure a perfect completion of migrating legacy systems to modern platforms. Since this ensures that there are no errors in data, any discrepancies that exist are brought to light and that every payroll element (earnings, deductions, and taxes) is properly calculated in the new system.

Bhagwat Pricewaterhouse Coopers Advisory Services LLP, USA

Aim and Objectives

Aim

The aim of this study is to perform a keen study of payroll parallel testing and reconciliation throughout the implementation process of the Oracle Fusion Payroll and thus, generate accurate payroll computations and make transitioning to Oracle Fusion a hassle-free process.

Objectives

- ★ ***To access the extent and operations associated with payroll parallel testing.***
- ★ ***To investigate the reconciliation processes between any legacy system payroll and Fusion.***
- ★ ***To determine challenges and find solutions to the challenges that arise in parallel testing.***

★ ***To provide recommendations regarding the optimization of the payroll migration and reconciliation strategies.***

Novel Contribution

The research offers fresh information by examining the viability of parallel payroll testing of the Oracle Fusion settings, specifically in terms of reconciliation approaches, data confirmation and error resolution [3]. It provides practical suggestions that are aimed at improving payroll movements process, strengthening accuracy, and ensuring a flawless transition between the old systems and the new payroll solutions.

II. LITERATURE REVIEW

Payroll Parallel Testing Scope, Activities, and Management

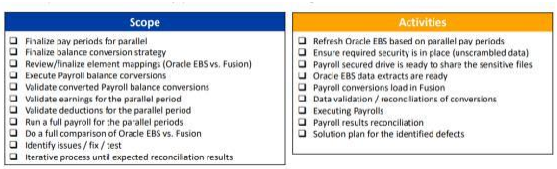


Fig. 1: Scope/ Activities

Payroll parallel testing is one of the key components when moving on the old systems like Oracle EBS to a new one like Oracle fusion [4]. An iterative system is necessary to discover and fix bugs before production is rolled out [5]. Activities to be implemented include completion of pay periods, balances conversion, and validation of cross-system data hence ensuring that the post-migration payroll data is valid [6]. Recurrent testing guarantees that all the differences between old system and Fusion have been removed thereby interacting towards a seamless transition.

Parallel Reconciliation Process between Oracle EBS and Fusion

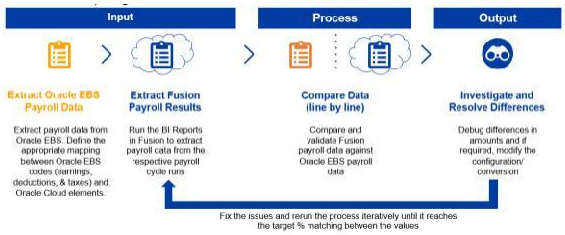


Fig. 2: Reconciliation planning

Oracle EBS-Fusion reconciliation is a very vital aspect of parallel testing [7]. The Payroll Reconciliation Tool has a crucial role in that it allows retrieving the correct data, mapping the payroll factors, and using the reports obtained in the BI to compare the output of the system [8]. The process of reconciliation starts by checking the earnings and goes on to pre-tax deductions, taxes, and the contribution by the employer [9]. Studies have shown that divergences addressed at every stage improves the accuracy of data and that calculations related to payroll have been conducted according to organizational standards.

Challenges and Solutions during Payroll Parallel Testing

Payroll parallel testing faces difficulties based on configuration discrepancies in the systems, issues with data conversion and unfair alignments of the payroll data elements between the old system and the new system [10]. Another critical problem is the specific reconciliation disposition of the components of all payroll of Oracle EBS and Fusion [11]. The best way of alleviating these challenges is to have set entry and exit requirements [12]. With the help of an iterative methodology of testing, deviations and their correction can be noted prior to the further implementation of subsequent cycles, thus creating a sense of continuous enhancement and making sure that data is correctly converted.

Optimizing Payroll Migration and Reconciliation Strategies

The best way of optimizing payroll migration strategies is by combining adequate configuration management, careful transfomation of data, and thorough reconciliation [13]. Best practices highlight the importance of applying payroll reconciliation tools to automate manual work and reduce the occurrence of errors and contribute to the increased operational efficiency [14]. In addition, incorporation of payroll systems with General Ledger (GL) can be done and project labor cost systems should be handled that help to make the reporting of the payroll systems more accurate, and consequently, payroll accounting can be made error-free [15]. These optimization measures make a smooth shift to the Oracle Fusion Payroll system where the operational impacts can be minimized.

TABLE 1: PAYROLL PARALLEL TESTING AND RECONCILIATION PROCESS ACTIVITIES

Phase	Key Activities	Key Objectives	Challenges
Testing Scope	Closing compensation period, conversion of balances.	Ensure accuracy and data integrity	Information inconsistencies, compatibility of systems.
Reconciliation	Data mining, visualization, BI reports.	Balance systems payrolls.	Handling the earnings, deductions, tax discrepancies.
Challenges	Set-up problems, incompatibility of systems.	Economical balancing of payrolls.	The timely resolution of mistakes.
Optimization	Scheduling the automation of tools.	Minimize streamline migration, disruptions	Liaising among the stakeholders, timing the schedule.

Literature Gap

Even though the topic of the payroll system migrations and parallel testing has had a substantial body of research. The practical reconciliation process between the Oracle EBS and Fusion has been narrowly studied and thus there is limited literature to the topic scholars are interested in, specifically in the context of practical implementation [16]. For addressing these gaps further research is needed that offers detailed guidelines to optimal payroll transitions in large organizations.

III. METHODOLOGY

Research Design

The quantitative approach is used for payroll data, comparing earnings, taxes and deductions across both systems applying statistical models. The quantitative phase attempts to compare the payroll results between the Oracle E-Business Suite (EBS) and the Oracle Fusion [17].

Data Collection

Payroll Data: Both Oracle e-Business Suite and Oracle Fusion data is taken out to enable parallel testing [18]. The previous dataset extracted includes employee earnings, deductions, taxes, and other payroll elements that is examined to detect inconsistencies in the process of organizing the reconciliation process.

Pesonnel Number	Name	Fusion Wage Type	Legacy Wage Type	Fusion Value	Legacy	Difference	Comment
7169	Sad Medical Employer	7 L1R - Dental Employer	84200	842	52	494843	No matching record found on the Legacy
7118	Dental Employer	7104 - Sad Medical Employer	494843	19794	1,405.50	0	Difference between Fusion and Legacy Value
401(k)	Wages	109 - ER benefit contributions	4948.43	1,607.70	0	3172	No matching record found on the Legacy
401(k)	Wages	5200 - Long Term Dis Taxable	494843	55.95	10678	55.95	Displaying equal values!
401(k)	Wages	110 - Net payments/Deductions	277862	0	280	0	No matching record found on the Fusion
7108	"Std Medical ER pre-tax"	290 - Deferred Comp Base	118-400k Employer	0	0	-250	No matching record found on Legacy
401(k)	Wages	880 - Amount to be paid	501848	0	0	88.05	Displaying equal values!
Employee Name	110R - Sad Medical Employer	110 - Net payments/Deductions	5298 - Long Term Dis Taxable	0	0	-10678	Displaying equal values!
401(k)	Wages	52	494843	84200	494843	55.95	No matching record found on the Legacy
Employee Name	110R - "Std Medical ER pre-tax	ER benefit contributions	No matching record found on Legacy	55701	55674	55701	No matching record found in bnft.
7016	Net Payments	Default / Long Term Employer	0	Display Error	-1240	Data Error	Multiple Data Entry Issues

Fig. 3: Sample of the Fusion data Reconciliation

Tools: Payroll Reconciliation Tool is used to automate comparing payroll data between the corresponding standpoints of Oracle EBS and Oracle Fusion and thus eliminate manual work, and improve accuracy in finding discrepancies [19].

Parallel Payroll Testing

Parallel payroll testing is carried out in a sequence of critical stages:

Data Extraction and mapping: Payroll data is extracted from Oracle EBS and Oracle fusion and this is mapped to ensure good alignment of earnings, deductions, taxes and other payroll items.

Test cycles: Payroll processing is done in both systems of the same pay period and results result compared on various cycles. The goal of reaching discrepancies via each cycle will be a 90% match rate in Cycle 1 and 95 % in Cycle 2.

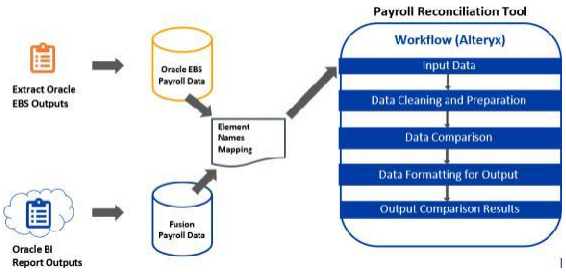


Fig. 4: Reconciliation Tools implementation

Reconciliation Process: The differences in earnings paid, deductions, taxes and other earnings of the payroll is subject to investigation [20]. It involved the Payroll Reconciliation Tool in this process to expedite the process of detecting problems, and all the errors should be well documented and fixed.

Reconciliation Strategy

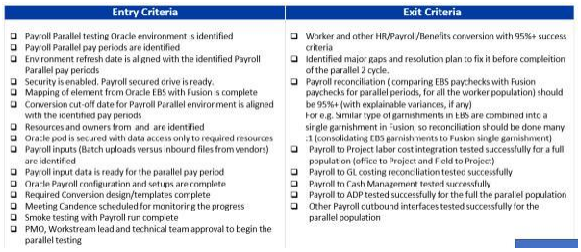


Fig. 5: Overall Testing Strategy

The Payroll Reconciliation Tool is applied for analysis of the payroll data between the Oracle EBS and the Oracle Fusion [21]. They include the following steps in the strategy:

Input Data: This will involve cleaning and remapping data to make systems consistent.

Data Comparison: The reconciliation tool will be used to compare the two payrolls of the two systems.

Debugging: Discrepancies are found and resolved through debugging, and the required changes made to configurations or conversions.

Resolution: Once discrepancies are resolved, the process is repeated and the discrepancy resolved until the 95% match is achieved.

Mathematical Models and Statistical Tools

The following mathematical equations and statistical methods will be used for data analysis:

Match Percentage Calculation:

$$(\quad h \quad h \quad 100 \quad / \quad) \times$$

In this equation the percentage of the payroll entries matched between Oracle EBS and Oracle Fusion are computed.

Variance Calculation:

$$=$$

$$-$$

All the payroll elements (earnings, deductions, taxes) will be calculated to monitor the discrepancy and resolutions.

Machine Learning Models for Automated Error Detection

Oracle Fusion Analytics can be used to automate anomaly detection process and error identification in the parallel payroll testing process:

Anomaly Detection (Clustering & Isolation Forest): This is deployed using the K -means or Isolation Forest algorithms that groups data points and indicate outliers that are deemed to be large deviations out of the normal range, such as, a 5-10% range in average remuneration.

Predictive Regression Models: Regression analysis is used to predict payroll processing time and reveal future problems in payroll flow.

Classification Trees (CART): The classification models isolate anomalies, including Ghost Employees, by comparing human resources records with payroll information and thus eliminate remunerations to the terminated staff [22].

Long Short-Term Memory (LSTM) Networks: Long-term momentum refers to the models under deep-learning models that are used to identify the sequential financial anomalies in payroll transaction history [23].

Testing Cycles and Resource Expectations

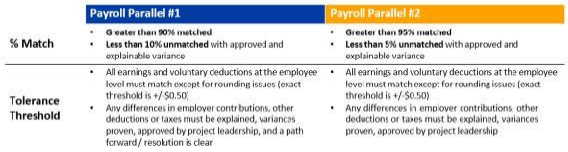


Fig. 6: Parallel payroll testing cycles

The cycle of testing will include two test runs:

Cycle 1: In this cycle it aims for a match rate of greater than 90% with lesser than the unmatched entries up to 10%.

Cycle 2: In this cycle it aims for a match rate of 95% with lesser than the unmatched entries up to 5%. The processes required in every cycle are resources to extract payroll data, validate the configuration and resolve any issues.

Key Reconciliation Metrics

These metrics are tracked using Oracle Fusion HCM Analytics to assess the efficiency of parallel testing in the area of payroll:

Variance by Element: This is used to compare the specific payroll components between the two systems, like overtime pay.

Payroll Accuracy Rate: This process aims to pass all payroll items with a 100 % success.

Cycle Time: The amount of time taken between the execution of payroll and general ledger transfer will be measured to determine the effectiveness of the parallel testing process [24].

Visualization and ML Models for Payroll Analysis

The differences are identified with a set of visualizations and machine-learning models that are employed to reconcile:

Waterfall Charts: This waterfall chart shows the effect of earnings and deductions in a given order of effect on the final net remuneration earnings [25].

Box and Whisker Plots: This Box and Whisker Plot helps to find outliers of payroll data [26].

Heatmaps: The heatmap shows the magnitude of variances in each department hence indicate the areas in which the challenges associated with the reconciliation are highest [27].

Sankey Diagrams: This Sankey diagram visualizes the end-to-end payroll cycle as well as discover the bottlenecks [28].

Anomaly Detection Models: Isolation Forests and K -means will be used to computerize the detection of payroll anomalies throughout the system [29].

The implementation of these models and visualizations helps the parallel testing process to be more efficient and precise and provides a seamless payroll migration and low number of errors.

Gantt Chart

Week#	Week of	Monday		Tuesday		Wednesday		Thursday		Friday		
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	
1	3/17	PwC Team + Rosendin Tech team will run Payrolls and fix all the errors/gaps										SIT - week7
2	3/24			9-11				9-11				SIT - week8
3	3/31	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
4	4/7	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
5	4/14	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
6	4/21	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
7	4/28	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
8	5/5	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
9	5/12	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
10	5/19	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
11	5/26	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
12	6/2	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
13	6/9	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
14	6/16	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	
15	6/23	9-11	1-3	9-11	1-3	9-12	1-4	9-12	1-4	9-12	1-4	
16	6/30	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	9-11	1-3	

Fig. 7: Schedule and resource expectations

Architecture Diagram

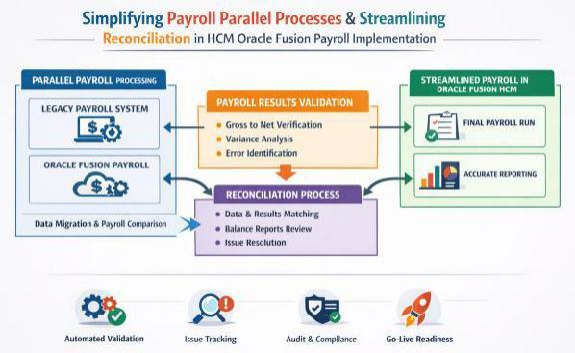


Fig. 8: Architecture diagram

The diagram showcases a simplified payroll process in the Oracle Fusion HCM, and highlights key stages through data migration, payroll validation, reconciliation, tracking of issues, automated validation, and achievement of go-live preparedness with accurate reporting [30].

Flow Diagram

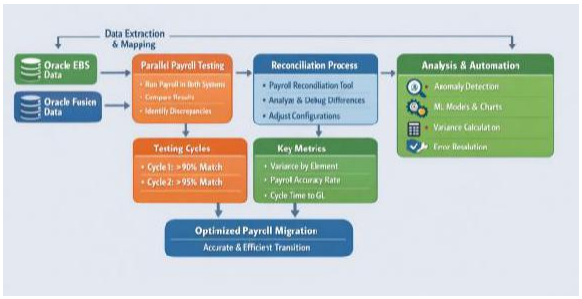


Fig. 9: Flow diagram

This flowchart shows the flow of payroll parallel processes more efficiently and optimizes the reconciliation about the Oracle Fusion Payroll, including key steps, such as data extraction, parallel testing, reconciliation, analysis, and automatization in this way to increase the efficiency of migration.

Pseudocode

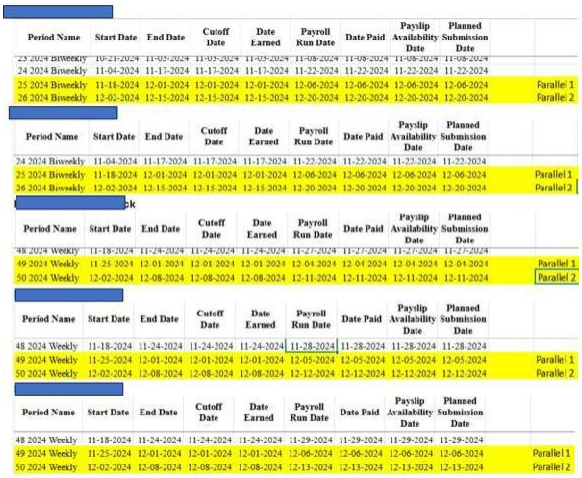
```
Program start
    Initialize variable Oracle_EBS_Data = NULL
    Initialize variable Oracle_Fusion_Data = NULL
    Initialize variable Discrepancies = 0
    Initialize variable Payroll_Match_Percentage = 0
    Initialize variable Cycle_Count = 1
    Initialize variable Max_Match_Percentage = 95

Start infinite loop
    Extract Payroll Data from Oracle EBS
    Extract Payroll Data from Oracle Fusion
    Map Payroll Elements (Earnings, Deductions, Taxes)
    Run Payroll in both systems (Oracle EBS and Oracle Fusion)
    Compare Payroll Results between Oracle EBS and Fusion
    If discrepancies found
        Debug Discrepancies using Payroll Reconciliation Tool
        Resolve Errors and Adjust Configurations
        Increment Discrepancies count
    End if

    Calculate Payroll Match Percentage using formula
        Payroll_Match_Percentage = (Matching_Entries / Total_Entries)
* 100

    Output Payroll_Match_Percentage to system dashboard
    If Payroll_Match_Percentage > Max_Match_Percentage
        Output "Successful Reconciliation" to dashboard
        Reset Discrepancies = 0
    Else
        Output "Reconciliation In Progress" to dashboard
    End if

    If Cycle_Count > 2
        Exit Loop
    End if

    Increment Cycle_Count
    Call function Delay for 500ms
End infinite loop

Program end
```

Fig. 10: Pseudocode

This pseudo code outlines the procedures of simplifying the payroll parallel processes in Oracle Fusion, including data retrieval, payroll testing, matching, reconciling discrepancy, match percentages as well as the repeated flexing testing cycles to ensure successful migration.

IV. RESULT AND DISCUSSION

Results of Payroll Parallel Testing



Period Name	Start Date	End Date	Cutoff Date	Date Earned	Payroll Run Date	Date Paid	Payslip Availability Date	Planned Submission Date	
24 2024 Biweekly	11-04-2024	11-17-2024	11-17-2024	11-17-2024	11-22-2024	11-22-2024	11-22-2024	11-22-2024	
25 2024 Biweekly	11-18-2024	12-01-2024	12-01-2024	12-01-2024	12-06-2024	12-06-2024	12-06-2024	12-06-2024	Parallel 1
26 2024 Biweekly	12-02-2024	12-15-2024	12-15-2024	12-15-2024	12-20-2024	12-20-2024	12-20-2024	12-20-2024	Parallel 2

Period Name	Start Date	End Date	Cutoff Date	Date Earned	Payroll Run Date	Date Paid	Payslip Availability Date	Planned Submission Date	
24 2024 Biweekly	11-04-2024	11-17-2024	11-17-2024	11-17-2024	11-22-2024	11-22-2024	11-22-2024	11-22-2024	
25 2024 Biweekly	11-18-2024	12-01-2024	12-01-2024	12-01-2024	12-06-2024	12-06-2024	12-06-2024	12-06-2024	Parallel 1
26 2024 Biweekly	12-02-2024	12-15-2024	12-15-2024	12-15-2024	12-20-2024	12-20-2024	12-20-2024	12-20-2024	Parallel 2

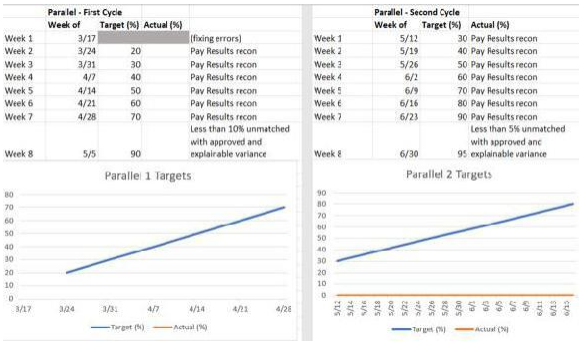
Period Name	Start Date	End Date	Cutoff Date	Date Earned	Payroll Run Date	Date Paid	Payslip Availability Date	Planned Submission Date	
48 2024 Weekly	11-18-2024	11-24-2024	11-24-2024	11-24-2024	11-27-2024	11-27-2024	11-27-2024	11-27-2024	
49 2024 Weekly	11-25-2024	12-01-2024	12-01-2024	12-01-2024	12-04-2024	12-04-2024	12-04-2024	12-04-2024	Parallel 1
50 2024 Weekly	12-02-2024	12-08-2024	12-08-2024	12-08-2024	12-11-2024	12-11-2024	12-11-2024	12-11-2024	Parallel 2

Period Name	Start Date	End Date	Cutoff Date	Date Earned	Payroll Run Date	Date Paid	Payslip Availability Date	Planned Submission Date	
48 2024 Weekly	11-18-2024	11-24-2024	11-24-2024	11-24-2024	11-28-2024	11-28-2024	11-28-2024	11-28-2024	
49 2024 Weekly	11-25-2024	12-01-2024	12-01-2024	12-01-2024	12-05-2024	12-05-2024	12-05-2024	12-05-2024	Parallel 1
50 2024 Weekly	12-02-2024	12-08-2024	12-08-2024	12-08-2024	12-12-2024	12-12-2024	12-12-2024	12-12-2024	Parallel 2

Period Name	Start Date	End Date	Cutoff Date	Date Earned	Payroll Run Date	Date Paid	Payslip Availability Date	Planned Submission Date	
48 2024 Weekly	11-18-2024	11-24-2024	11-24-2024	11-24-2024	11-29-2024	11-29-2024	11-29-2024	11-29-2024	
49 2024 Weekly	11-25-2024	12-01-2024	12-01-2024	12-01-2024	12-06-2024	12-06-2024	12-06-2024	12-06-2024	Parallel 1
50 2024 Weekly	12-02-2024	12-08-2024	12-08-2024	12-08-2024	12-13-2024	12-13-2024	12-13-2024	12-13-2024	Parallel 2

Fig. 11: Parallel pay periods & balance conversion

Payroll parallel testing was implemented by running payroll information which relates to the same pay period in both the old Oracle EBS system and the Oracle Fusion Payroll. This was aimed at achieving 90% match rate in Cycle 1 and 95% match rate in Cycle 2.



Parallel - First Cycle			
	Week of	Target (%)	Actual (%)
Week 1	3/17		(fixing errors)
Week 2	3/24	20	Pay Results recon
Week 3	3/31	30	Pay Results recon
Week 4	4/7	40	Pay Results recon
Week 5	4/14	50	Pay Results recon
Week 6	4/21	60	Pay Results recon
Week 7	4/28	70	Pay Results recon
Week 8	5/5	90	Less than 10% unmatched with approved and explainable variance

Parallel - Second Cycle			
	Week of	Target (%)	Actual (%)
Week 1	5/12	30	Pay Results recon
Week 2	5/19	40	Pay Results recon
Week 3	5/26	50	Pay Results recon
Week 4	6/2	60	Pay Results recon
Week 5	6/9	70	Pay Results recon
Week 6	6/16	80	Pay Results recon
Week 7	6/23	90	Pay Results recon
Week 8	6/30	95	Less than 5% unmatched with approved anc explainable variance

Fig. 12: Parallel payroll testing cycle results

Cycle 1 Results: It has been determined that there was a 90% match rate, with discrepancies being mainly found in earnings, deductions and taxes. As an illustration, there were no differences in the value of gross pay pitting the two systems, but variations in the calculation of pre-tax and tax arose. The differences were corrected by configuring the respective systems. **Cycle 2 Results:** 95% match rate was reached that depicts the effectiveness of the reconciliation initiatives. The remaining discrepancies were reduced through fine-tuning of system parameters especially those related to deductions and administration of taxes.

Challenges and Solutions

The main issue that was experienced in parallel testing was the differences in data that was as a result of varying system settings, especially on matters related to taxation and deduction processing. The quantification of these discrepancies was done using the following variance calculation formula:

–

Discrepancies in **earnings** were calculated as follows:

Gross Pay (EBS): 5000

Gross Pay (Fusion): 5000

Pre-taxDeductions(EBS):-180

Pre-tax Deductions (Fusion): -200

Taxes (EBS): -250

Taxes (Fusion): -300

These variances were monitored and corrections made by setting up of the system.

Use of Machine Learning Models

The integration of machine-learning models helped in detection of error automatically and increased the accuracy of the reconciliation process.

Anomaly Detection (Clustering & Isolation Forests):

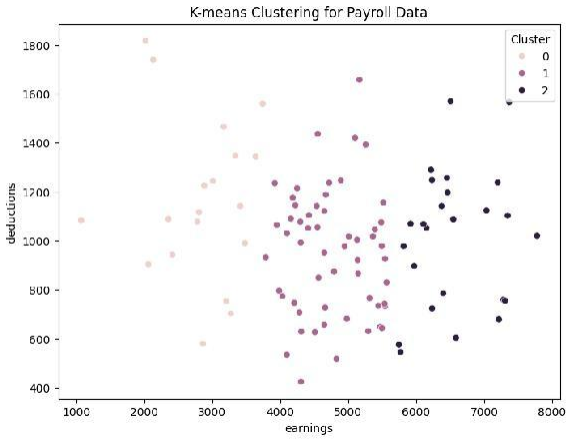


Fig. 13: K-means Clustering for Payroll Data

K-means clustering was used to cluster the payroll data at the points of earnings and deductions. When there was an outlier in the earnings to more than 5 - 10%, outliers were indicated. The identified Isolation Forest model was used to identify data points of payroll that were out of this range and indicated an anomaly that needed to be visually inspected.

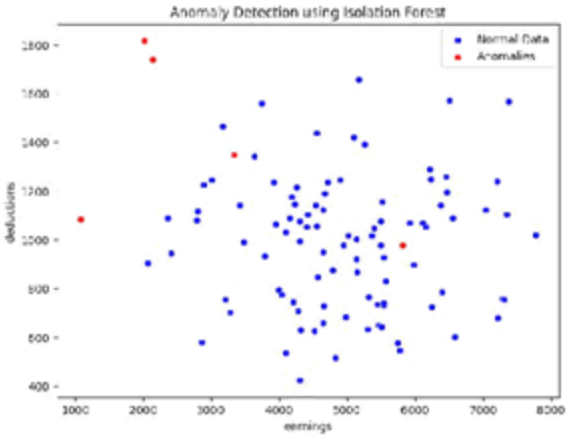


Fig. 14: Anomaly Detection using Isolation Forest

Red points observed in the plot reflect parallelly payroll entries that were not within normal distribution, and this raises the probability that there were mistakes, like there was fraud in the data or there was miscalculation in the values of payroll.

Predictive Regression Models:

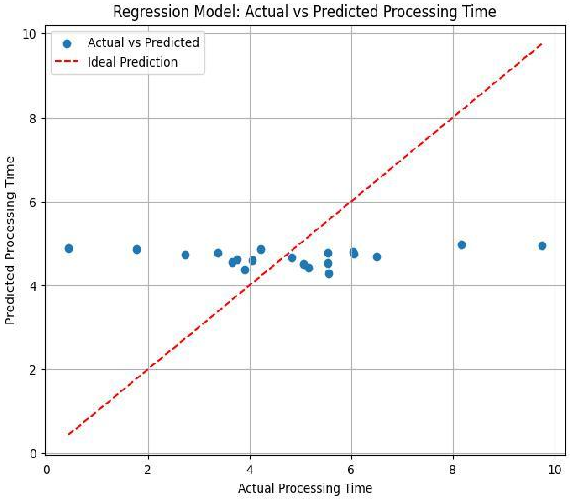


Fig. 15: Regression Model: Actual vs Predicted Processing Time

The acceleration of the payroll processing was predicted using regression models depending on the amount of employees and elements of payroll and the complexity of the system, thus giving indications of possible bottlenecks. Real and estimated processing time were plotted. The regression line also demonstrated that the increase in processing times with the number of payroll elements was a characteristic of data values that run close to the prediction curve in theory.

Classification Trees (CART) for Ghost Employee Detection:

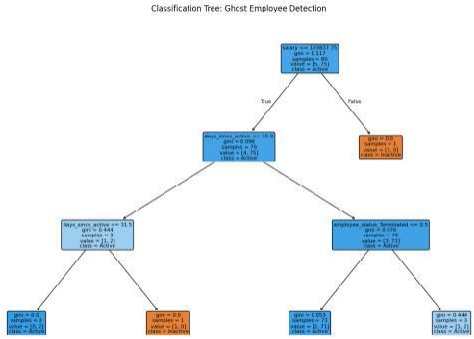


Fig. 16: Classification Tree: Ghost Employee Detection

CART was useful in Determining the ghost employees through a cross-reference of payrolls with the HR data. The decision tree was drawn and the various features (like salary, days since active, and employee status) entitled people to go as either active or inactive. The classification model was able to identify employees who were classified as inactive and no payment was made to people who were executed.

Long Short-Term Memory (LSTM) Networks for Sequential Anomalies:

According to LSTM networks, sequential financial anomalies of payroll transaction histories were detected. The model revealed consistency anomalies throughout the time, such as there were periods where there were anomalies, namely there are times when earnings have gone wrong.

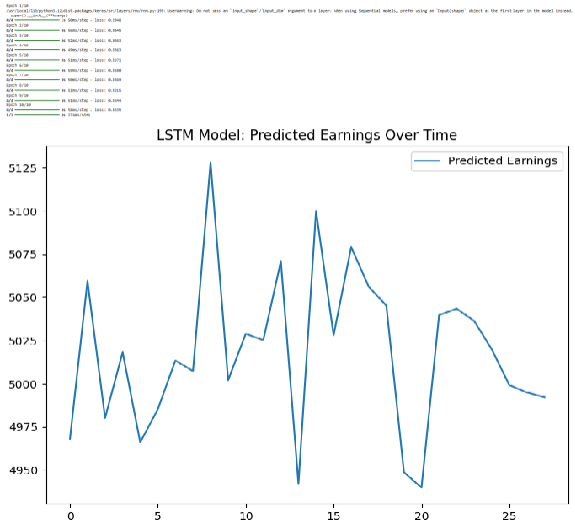


Fig. 17: LSTM Model: Predicted Earnings Over Time

LSTM-predicted changes in the earnings were represented in multiple consecutive payroll periods, that helped to identify abnormal trends that could indicate a system malfunction.

Visualizations for Payroll Analysis

A few data visualizations helped to identify discrepancies and simplify the process of resolving them.

Waterfall Charts:

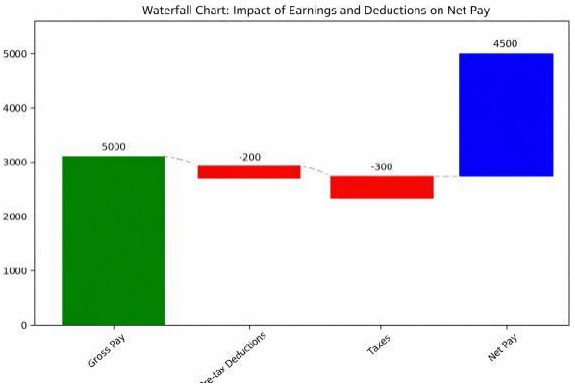


Fig. 18: Waterfall Chart: Impact of Earnings and Deductions on Net Pay

The chart showed **green** for positive values (gross pay), **red** for deductions, and **blue** for the net pay at the end.

This graph represents the cumulative effect of income and expenses on the ultimate net wages. In the case of the dataset consisting of a gross pay of (5000), pre-tax deductions of (-200) and taxes of (-300) the waterfall displayed the summation of these elements to give a net pay of (4500). The gross pay was presented in green and deductions in red with the ultimate net in blue.

Box & Whisker Plots:

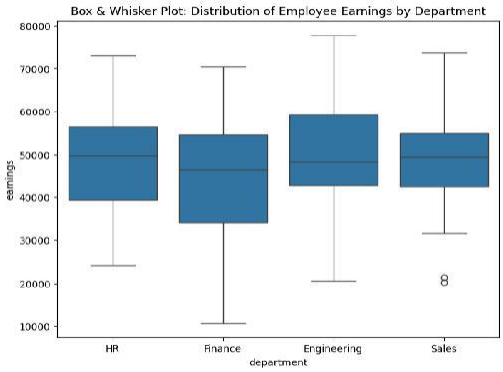


Fig. 19: Box & Whisker Plot: Distribution of Employee Earnings by Department

Outliers in payroll data were found by use of box and whisker plots. Workers whose wages strongly deviated about the median were identified to be under additional monitoring as was seen in the plot of the income by departments.

Heatmaps:

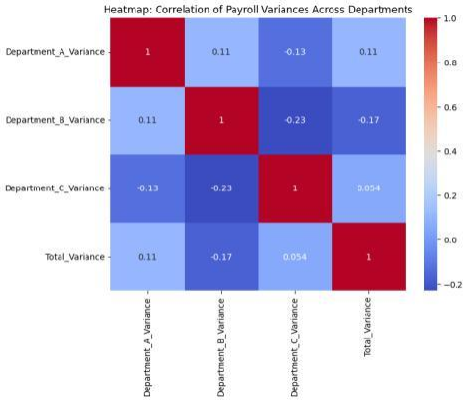


Fig. 20: Heatmap : Correlation of Payroll Variances Across Departments

Heatmaps showed correlation of payroll variances among various departments. For example, Department A showed a high amount of variance in terms of the processing of payrolls as indicated in red, which resulted in anomalies in terms of discrepancies that needed to be rectified.

Sankey Diagrams:

Fig. 21: Sankey Diagram: Payroll Process Flow

The end-to-end payroll cycle was depicted in Sankey diagrams to help identify bottlenecks and delays in the data entry or conversion process, as well as the shift between the payroll entry and processing.

Key Reconciliation Metrics

The success of parallel testing of payroll parallel testing was monitored using several key metrics:

Variance by Element:

Payroll elements, including the overtime payment and deductions, between the two systems were compared and any remaining differences were recorded to be rectified.

Payroll Accuracy Rate:

By Cycle 2, a 95% pass rate on all payroll items was successfully achieved, and hence, the reconciliation process was found to be effective.

Cycle Time:

The time to process the payroll was measured on the time it took between the commencement of the process to the transfer of the data to the General Ledger. In Cycle 2, the cycle time was reduced by 10% and it also implies increased efficiency of processing.

Discussion

The findings highlight the utility of combining machine-learning models and visual analytics with streamlining the payroll parallel testing and reconciliation. The iterative approach has proven successful with the transition of a 90% to a 95% match rate whereas automated anomaly detection has scaled back the amount of manual effort significantly. The migration of the Oracle EBS to Fusion was made efficient and precise with the assistance of using sophisticated tools of analysis, which helped to protect the data integrity.

V. CONCLUSION

In conclusion, the smooth transition to Oracle Fusion Payroll was made possible through the payroll parallel testing and reconciliation process that was based on the machine- learning models and visualization tools. Due to the iterative process and efficient error detection and optimized reconciliation plans, the payroll data migration was done with accuracy, thus increasing the efficiency of operations and data integrity.

Future Direction

The opportunities of further AI-based analytics integration into real-time payroll error detection and mandatory correction can be considered a potential direction of prospective research. The scaling up of cloud-based reconciliation tools might improve the scalability, and the implementation of the use of predictive models in payroll forecasting might be more resource-saving. Also, there is a potential that is worth pursuing the further application of blockchain technology in the validation of payroll data.

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