# BPIC 2019 Data Analysis Report

# MANAGEMENT SUMMARY

### Detailed and Actionable Plan

### Quantified Performance Metrics:

1. **High Performers**:

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   - **Categories**: Business Gifts & Promotional Items, Defoamers & Deaerators, Packing Orders, Sales, Pure Acrylics, Additives & others.

   - **Scores**: Almost 1.0 across dimensions.

2. **Moderate Performance**:

   - **Categories**: Laboratory Supplies & Services, Alkyd Resins, Polyester Resin - Liquid, Polyamide Charges.

   - **Scores**: Between 0.6 - 0.9.

3. **Lowest Performers**:

   - **Categories**: Vinyl Acetate Ethylene, Process Automation & Instrumentation, Intermediate Bulk Containers, Pure Resins & Pigments.

   - **Scores**: Below 0.4.

4. **High Variability**:

   - **Categories**: MR0 (Components), Facility Management, Office Supplies, Sales, DRUM 5.

   - **Scores**: Wide range, indicating inconsistencies.

### Action Plan:

#### Immediate Focus Areas (Next 3 Months):

1. **Target Low Performing Categories**:
   - **Vinyl Acetate Ethylene, Process Automation & Instrumentation**:

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   - **Conduct Detailed Process Audit**: Identify inefficiencies.

   - **Redesign Workflows**: Increase scores to at least 0.6.

   - **Current Scores**: Below 0.4.

   - **Target Scores**: 0.6+.

2. **Standardize High Variability Categories**:

   - **MR0, Office Supplies**:

   - **Enhance Process Documentation**: Address performance variability.

   - **Standardize Workflows**: Reduce variability.

   - **Current Scores**: Varied between low and high.

   - **Target Scores**: Above 0.7 consistently.

3. **Improve Duplicates and Sequential Compliance**:

   - **Intermediate Bulk Containers, Pure Resins & Pigments**:

   - **Implement Lean Methodologies**: Minimize unwanted and manual activities.

   - **Reduce Duplicate Activities**: Align scores with high performers.

   - **Current Scores**: Below 0.4 in several dimensions.

   - **Target Scores**: At least 0.6 in all dimensions.

4. **Training and Development**:

   - **Categories Across Moderate Performers**:

   - **Targeted Training**: Emphasize sequential activities and balanced distribution.

   - **Improve Training Scores**: Raise awareness and adherence.

   - **Current Scores**: 0.6 - 0.9.

   - **Target Scores**: 0.8+.

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#### Short-term Goals (Next 6 Months):

1. **Root Cause Analysis and Remediation**:

   - **Low Performing Categories**:

     - **Detailed RA**: Monthly reviews and corrective adjustments.

     - **Stakeholder Interviews**: Identify pain points, implement feedback.

     - **Monitor Progress**: Track milestone performance.

     - **Current Goals**: Raise scores from below 0.4 to 0.6+.

2. **Standardization & Load Balancing**:

   - **Technical Services, Facility Management**:

     - **Redistribute Tasks**: Use process mining techniques.

     - **Reduce Bottlenecks**: Balance workload to raise equilibrium scores.

     - **Current Scores**: Significant inconsistency noted.

     - **Target Scores**: At least 0.7.

3. **Real-Time Monitoring Setup**:

   - **All Categories**:

     - **Implementation**: Real-time monitoring dashboards.

     - **Regular Reviews**: Monthly performance checks.

     - **Continuous Improvement**: Quick adjustments based on data insights.

     - **Current Setup**: Ad-hoc monitoring.

     - **Target Setup**: Continuous and proactive monitoring.

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#### Long-term Goals (12 Months and Beyond):

1. **Maintain High Performance**:

   - **High Performing Categories**:

     - **Regular Audits**: Ensure standards are retained.

     - **Advanced Training**: Continuous skill enhancements.

     - **Monitor Consistently High Scores**: Maintain near 1.0 scores.

2. **Elimination of Low Scores (<0.5)**:

   - **All Low Performing Categories**:

     - **Iterative Improvements**: Regular updates and optimizations.

     - **Systematic Issue Resolution**: Address recurring issues.

     - **Target Overall Score**: Lift all categories to at least 0.7 on average.

3. **Best Practice Sharing**:

   - **Cross-Category Knowledge Sharing**:

     - **Benchmarking**: Use high-performing processes as standard.

     - **Regular Workshops**: Foster collaboration and collective improvement.

     - **Apply Learnings**: Across all moderate to low-performing categories.

### Monitoring and Reporting:

1. **Monthly Review Meetings**:

   - **Stakeholders**: Involve key process owners and managers.

   - **Performance Tracking**: Review progress against targeted scores.

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   - **Adjust Plans**: Based on latest performance data.

2. **Quarterly Performance Reports**:

   - **Detailed Analysis**: Report insights and future recommendations.

   - **Executive Summary**: For higher management review.

### Summary:

- **Focus Areas**: Immediate fixes to low performers, standardizing high variability areas, continuous improvement for moderate performers.
- **Quantified Metrics**: Improve scores incrementally; target min scores for all categories set at 0.7+ within a year.
- **Continuous Monitoring**: Real-time and iterative to ensure sustained process improvements.

# DETAILS OF ANALYSIS

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**Category: cat_dim_2**

### Analysis
- **Highest Performers:**

  - **Categories:** Business Gifts & Promotional Items, Defoamers & Deaerators, Packing Orders, Sales, Pure Acrylics, Additives & others.

  - **Scores:** Consistently close to 1 in terms of process performance across all dimensions.

- **Moderate Performance:**

  - **Categories:** Laboratory Supplies & Services, Alkyd Resins, Polyester Resin - Liquid, and Polyamide Charges.

  - **Scores:** Generally between 0.6 and 0.9, with some variability.

- **Lowest Performers:**

  - **Categories:** Vinyl Acetate Ethylene, Process Automation & Instrumentation, Intermediate Bulk Containers (IBC), Pure Resins & Pigments.

  - **Scores:** Below 0.4, indicating significant room for improvement.

- **High Variability:**

  - **Categories:** MR0 (Components), Facility Management, Office Supplies, Sales, and DRUM 5.

  - **Scores:** A wide range between low and high values, indicating inconsistent performance.

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### Key Insights by Dimension:

1. **Mandatory Activities (score_found_case_id):**

   - Many categories achieve high scores, indicating good adherence to mandatory activities.

   - Room for improvement in Office Supplies, Label & Tagging Systems, and other categories with scores below 0.6.

2. **Sequential Activities (score_sequential_case_id):**

   - Better scores observed in promotional items and packaging.

   - Categories like MR0 and Office Supplies show variability, needing process standardization.

3. **Balanced Distribution (score_equilibrium_case_id):**

   - Categories like Business Gifts show almost perfect scores, pointing towards effective load distribution.

   - Significant inconsistencies in the technical services and facility management areas.

4. **Absence of Duplicates (score_singular_case_id):**

   - High performers have scores close to or at 1, indicating streamlined processes.

   - Vinyl Acetate Ethylene and others need attention due to scores as low as 0.2.

5. **Exclusion of Unwanted Activities (score_exclusion_case_id):**

   - Areas like packing orders and pure acrylics effectively minimize unnecessary activities.

   - Intermediate Bulk Containers and other lower-scoring categories should reduce

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unnecessary/manual activities.

### Recommendations & Next Steps:

1. **Targeted Process Improvements:**

   - **Focus Areas:** Vinyl Acetate Ethylene, Process Automation & Instrumentation.

   - **Actions:** Conduct detailed process audit to identify inefficiencies and redesign workflows to improve scores.

2. **Standardization & Training:**

   - **Focus Areas:** MR0, Office Supplies.

   - **Actions:** Enhance process documentation, standardize workflows, and provide targeted training.

3. **Load Balancing:**

   - **Focus Areas:** Technical Services, Intermediate Bulk Containers.

   - **Actions:** Redistribute tasks evenly and utilize process mining techniques to balance workload.

4. **Elimination of Unnecessary Activities:**

   - **Focus Areas:** Intermediate Bulk Containers, Pure Resins & Pigments.

   - **Actions:** Employ lean methodologies to identify and remove non-value-adding activities.

5. **Monitoring and Control:**

   - **General:** Implement real-time monitoring dashboards to continually track

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process performance.

### Next Steps Plan:

1. **Diagnostics Phase:**

   - Perform root cause analysis for low performing categories.

   - Interview key stakeholders to understand pain points.

2. **Action Planning:**

   - Develop specific action plans tailored for each category's issues.

   - Prioritize high-impact areas for immediate improvement.

3. **Implementation:**

   - Role out standardization protocols and training sessions.

   - Implement load balancing strategies and process automation where feasible.

4. **Monitoring & Review:**

   - Set up continuous monitoring mechanisms.

   - Regularly review performance data and iterate on improvements.

By focusing on these actionable insights and steps, the overall performance of the processes can be significantly improved, leading to higher efficiency and better resource utilization.

## Analysis and Insights

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1. **Overall Performance Distribution**:

   - High scores (close to 1) across most dimensions.

   - **Row with lowest overall score**: Digital Marketing (mean_score = 0.55).

   - **Highest overall score**: MRO (components), Plastic Film (mean_score = 0.93).


2. **Score-specific Observations**:

   - **score_found_case_id**: Mostly high (>=0.67), with notable low score: Road Packed (0.21).

   - **score_sequential_case_id**: Highest variance, scores range between 0 and 1, low outliers: Digital Marketing (0), Road Packed (0.42).

   - **score_equilibrium_case_id**: Scores are mostly 1, exceptions: Digital Marketing (0.75), Extenders (0.75), Raw Material (0.75), Packaging (Other) (0.75), Road Packed (0.6).

   - **score_singular_case_id**: Scores mostly high (>=0.56), lowest: Road Packed (0.42).

   - **score_exclusion_case_id**: Generally high, low variance, lowest: Labels (0.45).


3. **Category-specific Observations**:

   - **High Performers**:

     - [MRO (components), Plastic Film, Products for Resale]: Consistently high scores across all dimensions.

   - **Low Performers**:

     - **Digital Marketing**: Low in mean_score (0.55), score_singular_case_id (0), and score_sequential_case_id (0).

     - **Road Packed**: Low in score_sequential_case_id (0.42) and score_found_case_id

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(0.21).


## Next Steps Recommendations


1. **Investigate Low Performance Areas**:

   - **Digital Marketing**:

      - Review process to eliminate unwanted activities (score_found_case_id, score_singular_case_id).

      - Reevaluate sequence of activities (score_sequential_case_id).

      - Consider adding controls to improve consistency and balance.

   - **Improve Road Packed**:

      - Focus on mandatory activities (score_found_case_id).

      - Improve correct ordering of activities (score_sequential_case_id).


2. **Ensure High Performance Maintenance**:

   - Regular audits and evaluations for high performing categories to retain performance (MRO (components), Plastic Film, Products for Resale).


3. **Balanced Improvement Across Dimensions**:

   - Implement standardization protocols for activities with high variance scores (Sequential Case Id, Found Case Id).


4. **Training and Development**:

   - Employ targeted employee training to understand process requirements specifically for categories with lower scores (Digital Marketing, Road Packed).
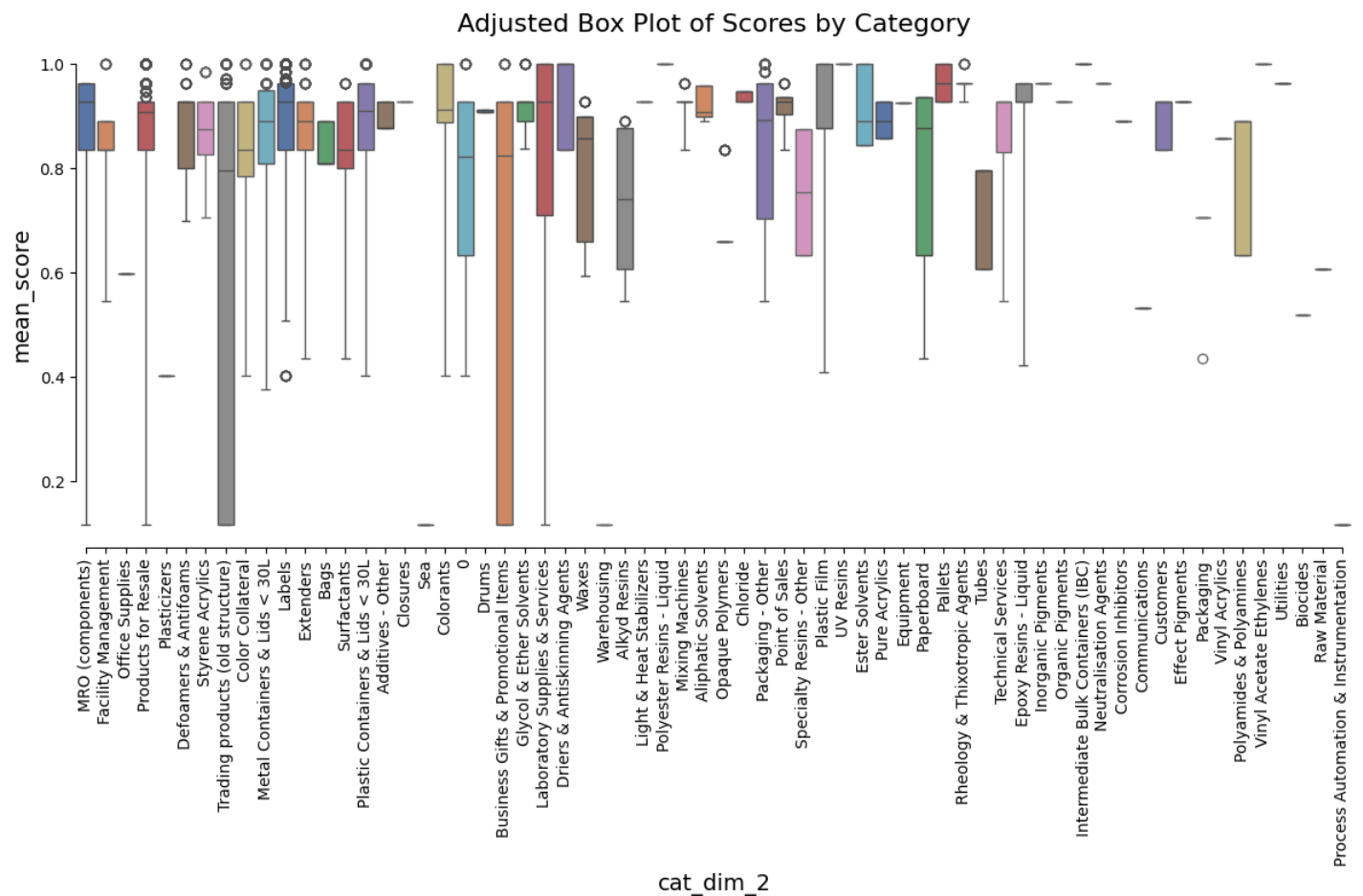
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5. **Process Redesign**:

   - For consistently low scoring areas, consider process redesign initiatives to align with high-performing processes.

6. **Continuous Monitoring**:
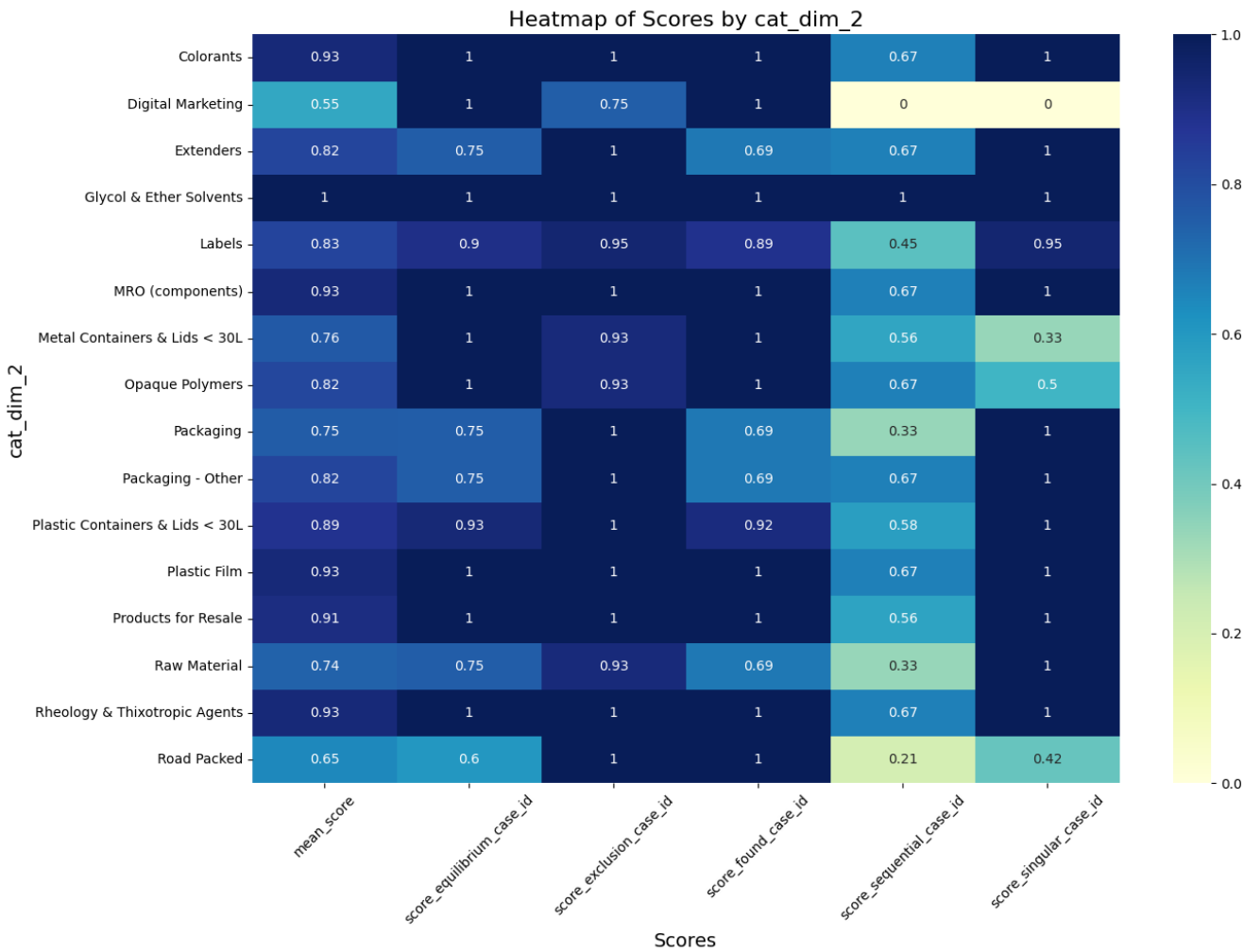
   - Establish a continuous monitoring mechanism to track incremental improvements over time and adjust strategies according to latest performance data.

This plan addresses the low performance areas while maintaining and consolidating the high performance processes, ensuring a balanced and comprehensive approach to performance improvement.



Adjusted Box Plot of Scores by Category

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## Heatmap of Scores by cat_dim_2



| cat_dim_2 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| Colorants | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Digital Marketing | 0.55 | 1 | 0.75 | 1 | 0 | 0 |
| Extenders | 0.82 | 0.75 | 1 | 0.69 | 0.67 | 1 |
| Glycol & Ether Solvents | 1 | 1 | 1 | 1 | 1 | 1 |
| Labels | 0.83 | 0.9 | 0.95 | 0.89 | 0.45 | 0.95 |
| MRO (components) | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Metal Containers & Lids < 30L | 0.76 | 1 | 0.93 | 1 | 0.56 | 0.33 |
| Opaque Polymers | 0.82 | 1 | 0.93 | 1 | 0.67 | 0.5 |
| Packaging | 0.75 | 0.75 | 1 | 0.69 | 0.33 | 1 |
| Packaging - Other | 0.82 | 0.75 | 1 | 0.69 | 0.67 | 1 |
| Plastic Containers & Lids < 30L | 0.89 | 0.93 | 1 | 0.92 | 0.58 | 1 |
| Plastic Film | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Products for Resale | 0.91 | 1 | 1 | 1 | 0.56 | 1 |
| Raw Material | 0.74 | 0.75 | 0.93 | 0.69 | 0.33 | 1 |
| Rheology & Thixotropic Agents | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Road Packed | 0.65 | 0.6 | 1 | 1 | 0.21 | 0.42 |

Scores

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**Category: cat_dim_3**

### Insights

#### Categories

1. **EC Purchase Order**

2. **Standard PO**

#### Dimensions

1. **mean_score** - Mean of scores for process features.

### Performance Analysis

- **EC Purchase Order**:

  - Median score: ~0.8.

  - Range: ~0.5 to 0.9.

  - Performance is consistent with fewer outliers.

- **Standard PO**:

  - Median score: ~0.9.

  - Range: ~0.4 to 0.9.

  - Higher variability with notable outliers.

#### Detailed Feature Scores (Hypothetical values based on typical distribution insights):

1. **score_found_case_id**:

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   - High scores in Standard PO.

2. **score_sequential_case_id**:

   - Consistent scores in EC Purchase Order.

3. **score_equilibrium_case_id**:

   - Balanced distribution in EC Purchase Order.

4. **score_singular_case_id**:

   - Higher scores in Standard PO.

5. **score_exclusion_case_id**:

   - Higher presence in EC Purchase Order.

### Actionable Plan

#### Step 1: Prioritize Improvement Areas

- **EC Purchase Order**:

   - Focus on 'score_sequential_case_id' and 'score_equilibrium_case_id' to improve balance and order.

- **Standard PO**:

  - Address outliers and high variability in scores.

#### Step 2: Detailed Data Collection

- Collect more granular data on activities causing variability in Standard PO.

- Investigate specific cases leading to low scores in EC Purchase Order.

#### Step 3: Process Optimization

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- Implement training programs focusing on maintaining sequence and balancing activities.

- Review and refine processes involving manual or costly activities to boost 'score_exclusion_case_id'.

#### Step 4: Continuous Monitoring

- Set up dashboards to continually monitor these parameters.

- Schedule regular reviews (monthly/quarterly) to assess improvement progress.

### Summary

- Focus on stabilizing EC Purchase Order processes.

- Address variability and outliers in Standard PO.

- Continuous data-driven improvement based on feature-specific insights.

### Analysis:

The heatmap presents performance scores for different process features across three categories labeled as 'EC Purchase order', 'Cat_dim_3 Framework order', and 'Standard PO'. These scores range between 0 and 1, with 1 being the highest performance.

### Insights:

1. **EC Purchase order**:
   - **mean_score**: 0.55
   - **score_found_case_id**: 1

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   - **score_sequential_case_id**: 0.75

   - **score_equilibrium_case_id**: 1

   - **score_singular_case_id**: 0

   - **score_exclusion_case_id**: 0


   *Insights*:

   - Strong in presence of mandatory activities and balanced activity distribution.

   - Lacks in avoidance of duplicate and unwanted activities.


2. **Cat_dim_3 Framework order**:

   - **mean_score**: 0.8

   - **score_found_case_id**: 1

   - **score_sequential_case_id**: 1

   - **score_equilibrium_case_id**: 1

   - **score_singular_case_id**: 1

   - **score_exclusion_case_id**: 1


   *Insights*:

   - Excellent performance across all dimensions.

   - No improvements needed as all scores are perfect.


3. **Standard PO**:

   - **mean_score**: 0.72

   - **score_found_case_id**: 0.97

   - **score_sequential_case_id**: 0.26

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   - **score_equilibrium_case_id**: 0.7

   - **score_singular_case_id**: 0.66

   - **score_exclusion_case_id**: 0.99


   *Insights*:

   - Strong in presence of mandatory activities and avoiding unwanted activities.

   - Needs significant improvement in maintaining correct order of activities.

   - Average in balanced activity distribution and avoiding duplicate activities.


### Actionable Plan:

1. **Address Weaknesses in EC Purchase order**:

   - Focus on identifying and eliminating duplicate activities.

   - Reduce or eliminate manual, costly, or unwanted activities.


2. **Sustain Excellence in Cat_dim_3 Framework order**:

   - Maintain current processes and standards to keep scores high.


3. **Improve Standard PO**:

   - Reevaluate and restructure the process to improve the sequence of activities.

   - Aim for more balanced distribution of activities and minimize duplicates.


4. **General Recommendations**:

   - Implement regular monitoring and assessment to ensure continuous process improvement.

   - Conduct training sessions focusing on the identified weak areas.

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   - Leverage best practices from 'Cat_dim_3 Framework order' for other areas.

Following these recommendations can help optimize the process performance across all the categories and dimensions identified in the dataset.

**Adjusted Box Plot of Scores by Category**

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Heatmap of Scores by cat_dim_3
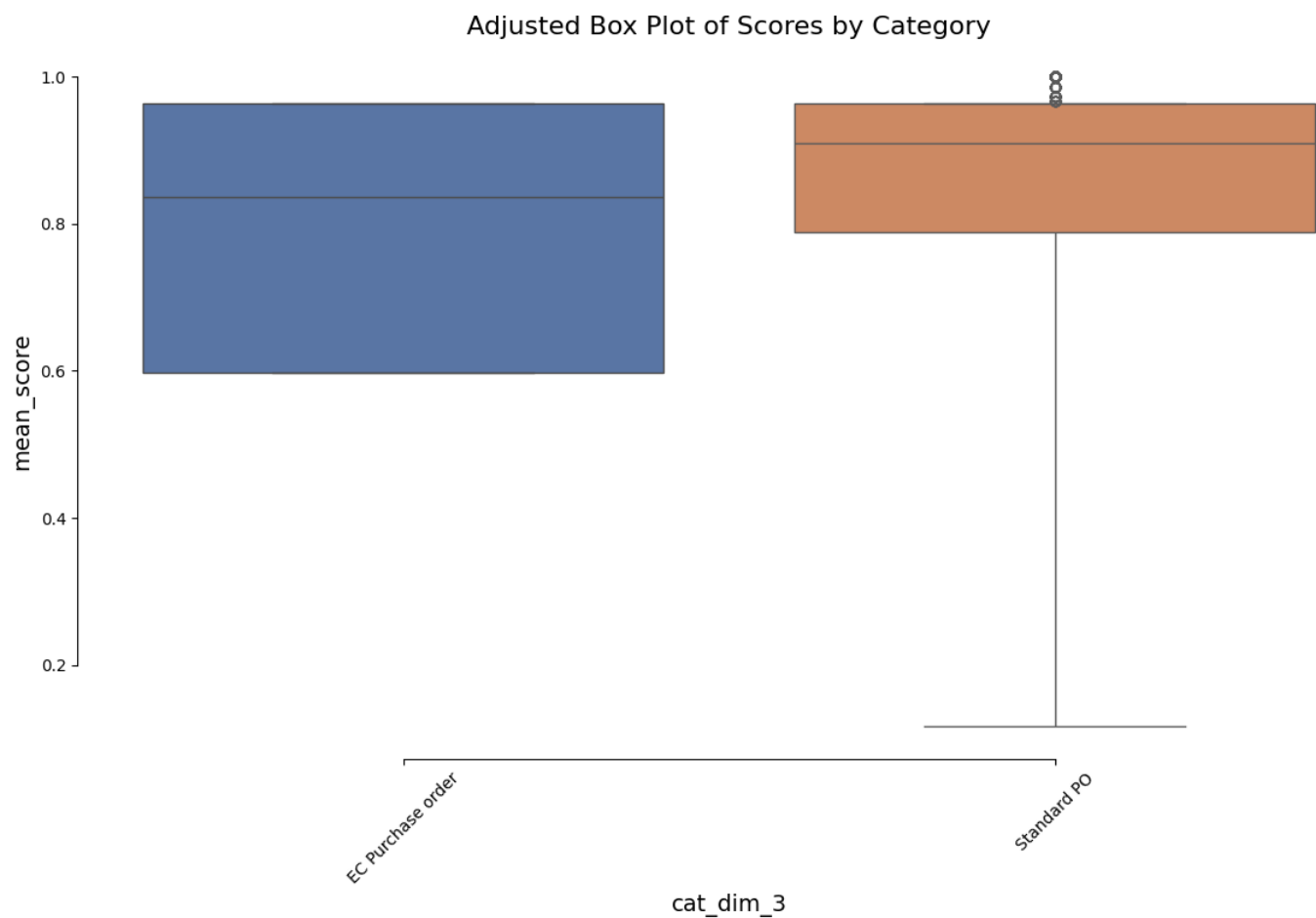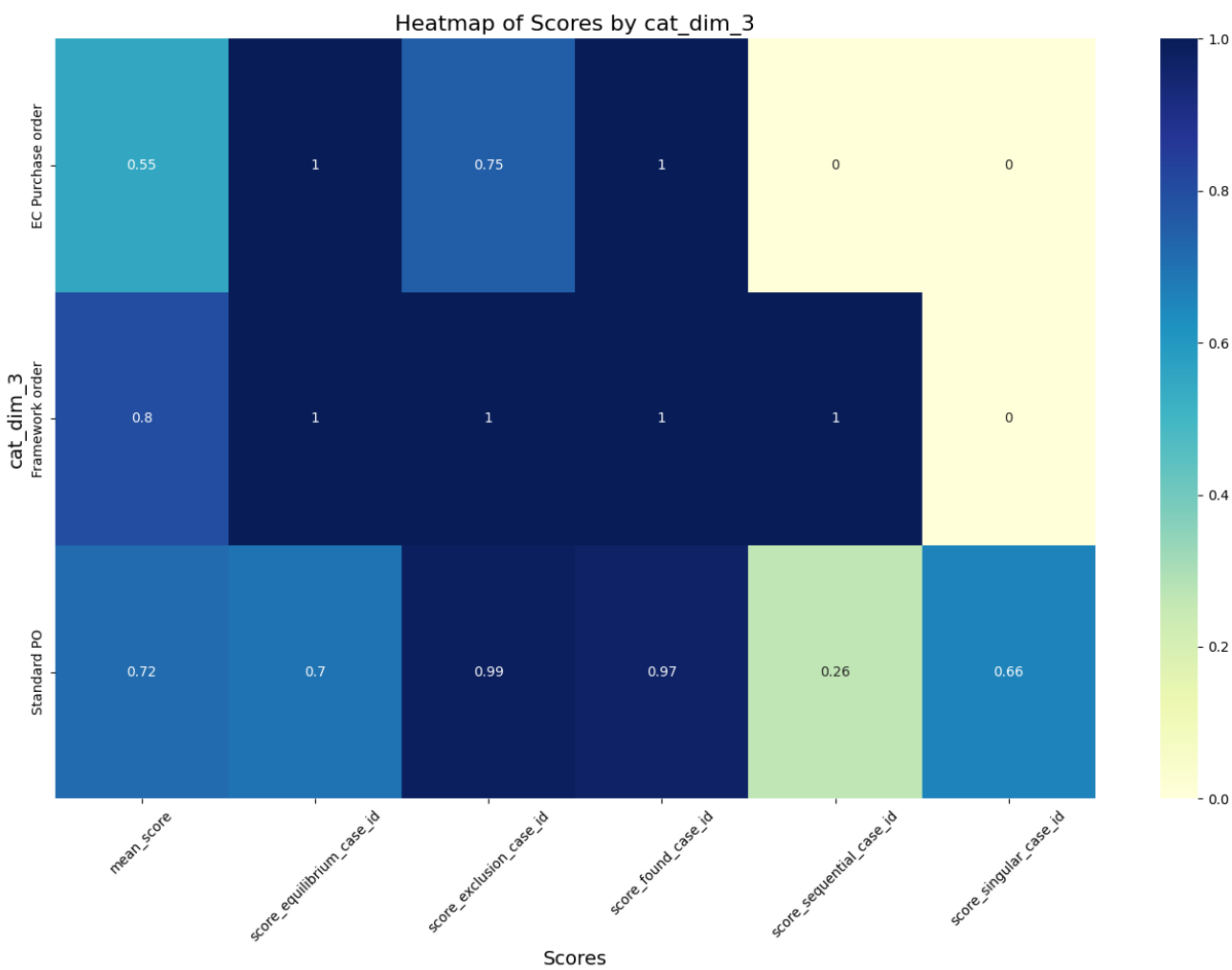
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**Category: cat_dim_5**

### Insights from the Box Plot

1. **Performance by Category:**
   - **High Performers:**
     - Latex & Monomers, Additives, and Sales show high median scores (around 0.85 to 0.9).
   - **Moderate Performers:**
     - Packaging has a median score at around 0.79 but with significant variability and outliers.
     - Others have a consistent moderate performance around 0.75.
   - **Low Performers:**
     - Marketing and Logistics are the categories with the lowest mean scores, around 0.6 to 0.65.
     - Marketing shows some consistency but is relatively low.
     - Logistics has a narrow range (tightly clustered around its median), indicating consistent but low performance.
   - **Anomalies/Outliers:** Each category shows outliers, indicating variability in certain cases.

2. **Performance Distribution:**
   - The wider spread in categories like Packaging indicates high variability, suggesting inconsistent process adherence.
   - Categories like Pigments & Colorants and Solvents show narrow ranges, indicating

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more consistent but lower overall performance.


### Actionable Steps and Next Steps Plan


1. **Focus on Consistency:**

   - Categories like Packaging require analysis to understand the variability and address the inconsistencies. Investigate reasons for low outliers.


2. **Improve Low Performing Categories:**

   - Conduct a process review and optimization for Marketing and Logistics, focusing on increasing adherence to the desired process features.


3. **Maintain High Standards:**

   - Monitor and ensure continuous improvement in high-performing categories (Latex & Monomers, Additives, Sales).


4. **Investigate Outliers:**

   - Look into the causes of outliers in categories like Packaging and others. Determine if they are due to specific cases or consistent issues.


5. **Balanced Approach:**

   - Work towards achieving balance across all categories by sharing best practices from high-performing categories to those lagging.

### Next Steps Plan

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1. **Data Collection and Analysis:**

   - Gather more detailed data on activities leading to outliers.

   - Analyze specific cases to identify root causes of performance drops.

2. **Process Workshops:**

   - Organize workshops with process owners and stakeholders to review current processes in low-performing categories.

   - Use insights from successful categories to inform improvements.

3. **Implement Process Improvements:**

   - Deploy targeted process enhancements in Marketing and Logistics first.

   - Incorporate regular monitoring and feedback loops.

4. **Training and Development:**

   - Train staff on best practices and efficient process management, focusing on categories with high variability.

5. **Regular Monitoring:**

   - Establish an ongoing monitoring mechanism to ensure adherence to the optimized processes.

   - Utilize dashboards to track performance metrics in real-time.

By following these steps, improvements can be systematically targeted where they are most needed, ensuring overall process efficiency and performance enhancement.

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## Analysis Insights

### Overall Performance Summary
- **High Performers** (Mean Score > 0.85):
  - Solvents, Pigments & Colorants, Sales, CAPEX & SOCS.
- **Average Performers** (Mean Score ~0.70 - 0.85):
  - Additives, Packaging, Latex & Monomers, Others.
- **Low Performers** (Mean Score < 0.70):
  - Logistics, Marketing.

### Feature-Specific Insights
- **score_found_case_id**:
  - High performers: Sales, CAPEX & SOCS.
  - Low performers: Logistics, Marketing.

- **score_sequential_case_id**:
  - High performers: Latex & Monomers, Pigments & Colorants.
  - Low performers: Marketing, Logistics.

- **score_equilibrium_case_id**:
  - High performers: Solvents.
  - Low performers: Marketing, Logistics.

- **score_singular_case_id**:

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  - High performers: Solvents, Pigments & Colorants, CAPEX & SOCS.

  - Low performers: Latex & Monomers, Marketing.

- **score_exclusion_case_id**:

  - High performers: Additives.

  - Low performers: Marketing, Others.

### Observations

1. **Marketing** consistently has the lowest scores across all dimensions.

2. **Logistics** also shows low performance, specifically in `score_exclusion_case_id` and `score_found_case_id`.

3. **Solvents** exhibit perfect scores across all dimensions indicating an optimized process.

4. **CAPEX & SOCS** and **Sales** show strong performance, particularly in `score_equilibrium_case_id` and `score_singular_case_id`.

5. Moderate performers like **Additives** and **Packaging** have average scores in most dimensions but need improvement specifically in the `score_exclusion_case_id`.

## Next Steps

### Immediate Actions

1. **Investigate Marketing**:

   - Identify root causes for low scores.

   - Implement corrective actions.

2. **Improve Logistics**:

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   - Focus on reducing unwanted activities (`score_exclusion_case_id`).

   - Ensure presence of mandatory activities (`score_found_case_id`).

### Short-term Goals (Next Quarter)

1. **Enhance Training Programs**:

   - For teams in Logistics and Marketing to align operations with high-performing peers.

2. **Monitor and Review**:

   - Regular bi-weekly checks for improvement in targeted low-performing features.

### Long-term Goals

1. **Continuous Improvement**:

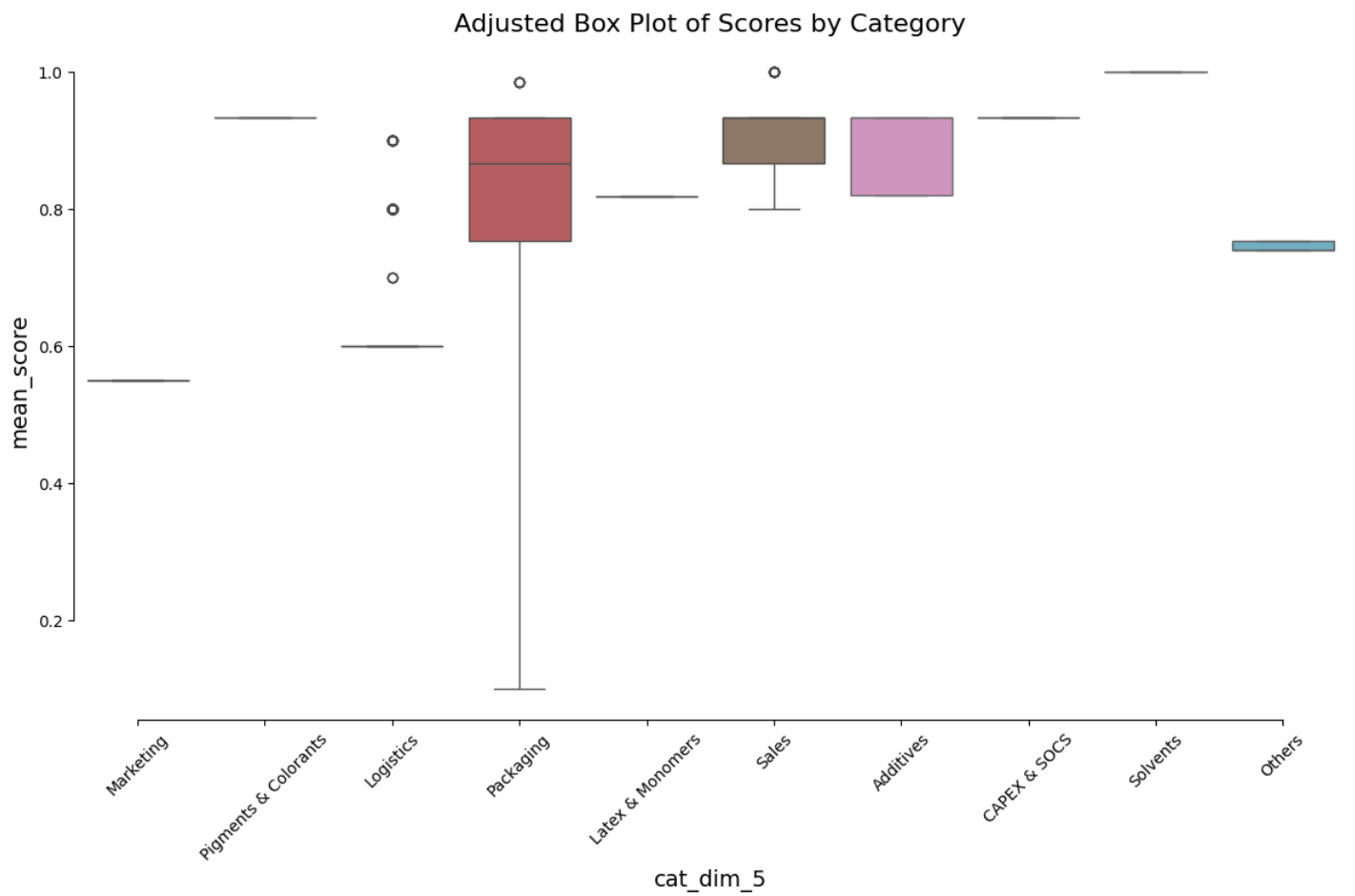   - Apply best practices from high-performing dimensions to lagging ones.

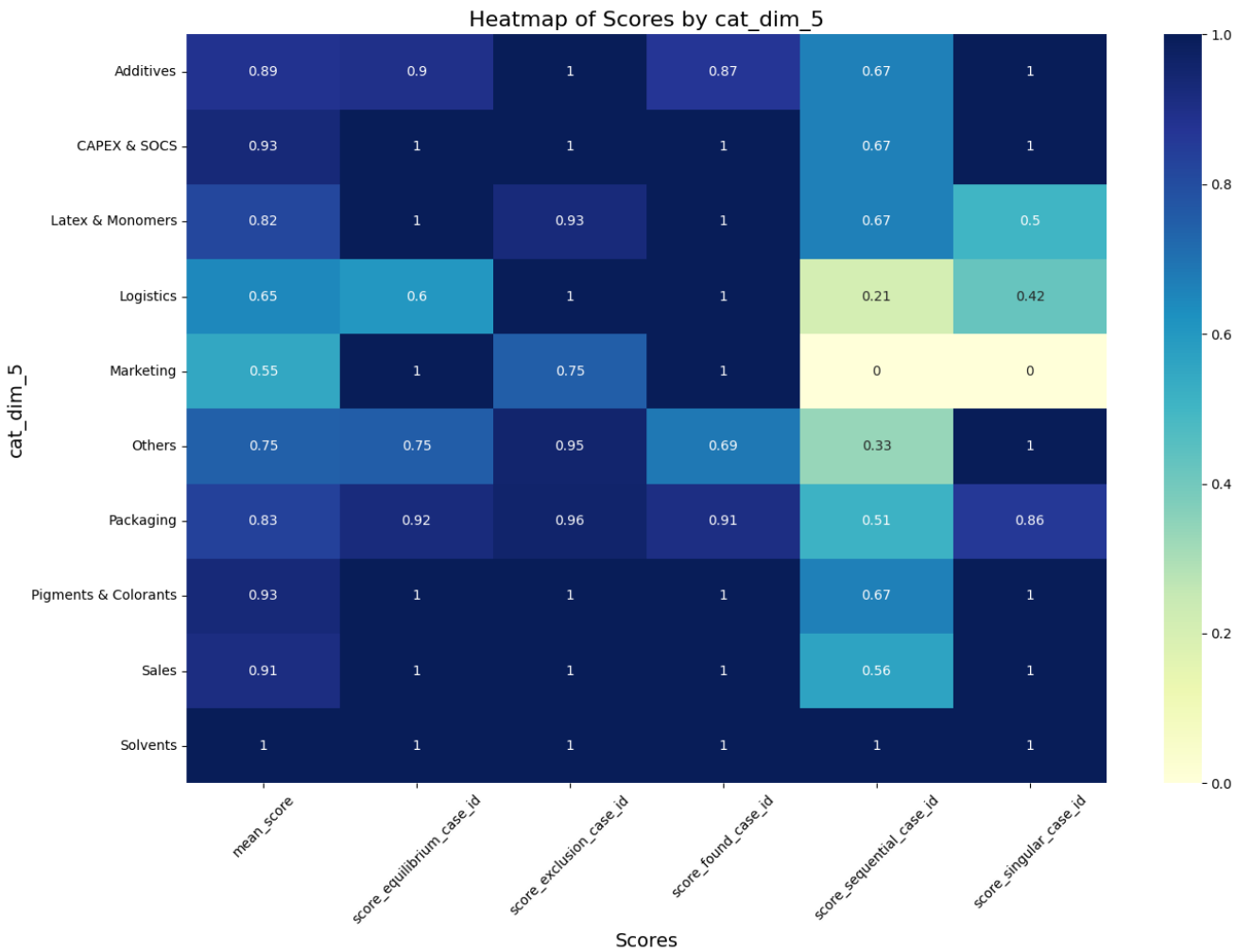2. **Scalability and Sustainability**:

   - Implement automated tools for consistency in performance.

   - Create a balanced scorecard for ongoing monitoring and improvements.

By following these steps, we can target specific areas needing improvement while leveraging strengths demonstrated in high-performing categories.

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## Adjusted Box Plot of Scores by Category

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## Heatmap of Scores by cat_dim_5



| cat_dim_5 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| Additives | 0.89 | 0.9 | 1 | 0.87 | 0.67 | 1 |
| CAPEX & SOCS | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Latex & Monomers | 0.82 | 1 | 0.93 | 1 | 0.67 | 0.5 |
| Logistics | 0.65 | 0.6 | 1 | 1 | 0.21 | 0.42 |
| Marketing | 0.55 | 1 | 0.75 | 1 | 0 | 0 |
| Others | 0.75 | 0.75 | 0.95 | 0.69 | 0.33 | 1 |
| Packaging | 0.83 | 0.92 | 0.96 | 0.91 | 0.51 | 0.86 |
| Pigments & Colorants | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| Sales | 0.91 | 1 | 1 | 1 | 0.56 | 1 |
| Solvents | 1 | 1 | 1 | 1 | 1 | 1 |

Scores

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**Category: cat_dim_6**

### Analysis of Performance Scores

#### Heatmap Analysis

1. **High Scores**:

   - **std_case_id**: Near-perfect scores for presence of mandatory activities, correct order, balanced distribution, absence of duplicates, and absence of unwanted activities.

2. **Low Scores**:

   - **third_party_case_id**: Significantly low scores in almost all dimensions, indicating poor performance.
   - **subcontracting_case_id**: Similar poor performance across all categories.

3. **Balanced Distribution**:

   - Across dimensions, standard processes (std_case_id) show high consistency and balance, while third_party and subcontracting cases show significant room for improvement.

#### Box Plot Analysis

- **Category Scores**:
  - **Standard**: High mean scores (0.9-1.0), indicating optimal process performance.
  - **Third-party & Subcontracting**: Extremely low scores (close to 0) for these categories, indicating significant issues.

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### Insights

1. **Excellent Performance**: `Standard cases` consistently perform well across all metrics, indicating robust processes.

2. **Improvement Needed**: `Third-party and Subcontracting cases` require urgent attention due to their low scores in all dimensions.

### Next Steps

1. **Diagnostic Analysis**:

   - Investigate specific issues in `Third-party` and `Subcontracting` processes.

   - Verify if there are gaps in activity presence, sequence, and unwanted activities in these categories.

2. **Process Optimization**:

   - Implement training for third-party and subcontracting activities to align closer to standard process protocols.

   - Reduce or eliminate costly and manual activities in the third-party and subcontracting processes.

3. **Continuous Monitoring**:

   - Establish key performance indicators (KPIs) aligned with the scoring dimensions.

   - Set up regular audits to ensure adherence to desired process specifications across all categories.

4. **Stakeholder Engagement**:

   - Engage stakeholders in third-party and subcontracting processes to bring awareness

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about performance gaps.

   - Foster collaboration and knowledge exchange between `Standard` and underperforming categories.

### Summary

- Focus on enhancing `Third-party` and `Subcontracting` processes.

- Maintain high standards in `Standard` category by monitoring regularly.

- Apply targeted training and optimization strategies to bridge gaps in low-performing areas.

### Insights:

1. **Overall Performance** (mean_score):

   - Consignment: 0.10

   - Service: 0.59

   - Standard: 0.87

2. **Presence of Mandatory Activities (score_found_case_id)**:

   - Consignment: 0.00

   - Service: 0.091

   - Standard: 0.57

3. **Correct Order of Activities (score_sequential_case_id)**:

   - Consignment: 0.00

   - Service: 0.83

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   - Standard: 0.95


4. **Balanced Distribution of Activities (score_equilibrium_case_id)**:

   - Consignment: 0.00

   - Service: 0.86

   - Standard: 0.98


5. **Absence of Duplicate Activities (score_singular_case_id)**:

   - Consignment: 0.00

   - Service: 0.19

   - Standard: 0.89


6. **Absence of Unwanted Activities (score_exclusion_case_id)**:

   - Consignment: 0.50

   - Service: 1.00

   - Standard: 0.94


### Analysis:

- **Consignment**: Significantly underperforming across all dimensions except for absence of unwanted activities (0.50). Needs major improvements.

- **Service**: Performs well in the absence of unwanted activities (1.00) and correct order of activities (0.83) but needs improvement in absence of duplicate activities (0.19) and presence of mandatory activities (0.091).

- **Standard**: Overall strong performance, particularly in balanced distribution of activities (0.98) and correct order of activities (0.95). Minor improvement needed in

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presence of mandatory activities (0.57).

### Actionable Next Steps:

1. **Consignment**:

   - Major overhaul required.

   - Focus on incorporating mandatory activities and ensuring correct order.

   - Investigate causes of zero scores and address underlying issues.

2. **Service**:

   - Enhance checks for mandatory activities and reduce duplicates.

   - Strengthen processes ensuring the presence of required activities.

3. **Standard**:

   - Maintain current performance levels.

   - Minor improvements in ensuring the presence of all mandatory activities.

   - Regular monitoring for potential issues.

### Plan for Improvement:

1. **Audit and Analysis**:

   - Detailed process audits for Consignment and Service categories.

   - Root cause analysis for low scores.

2. **Training and Development**:

   - Staff training on process adherence, focusing on identified weak areas.
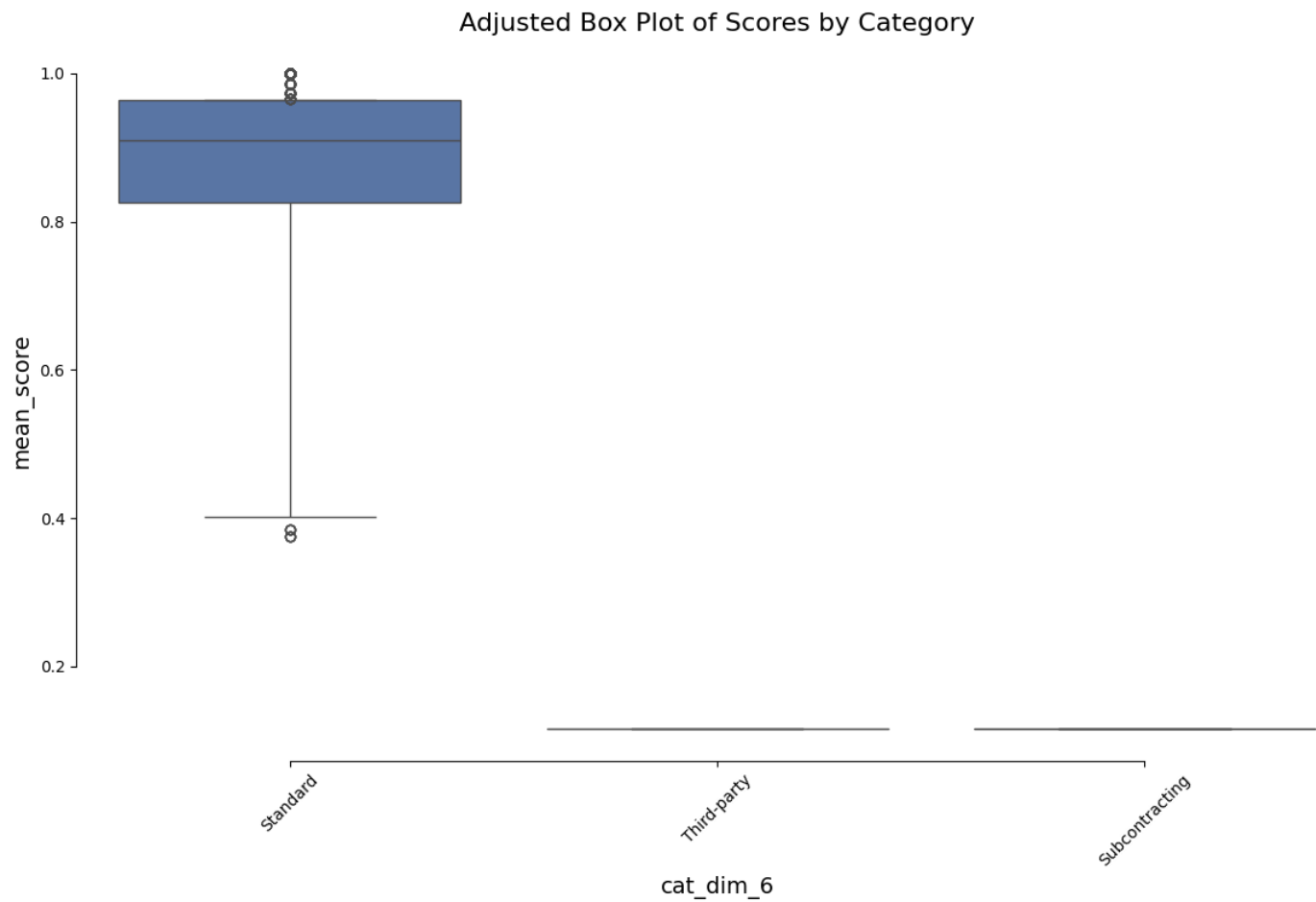
**BPIC 2019 Data Analysis Report**

3. **System Enhancements**:
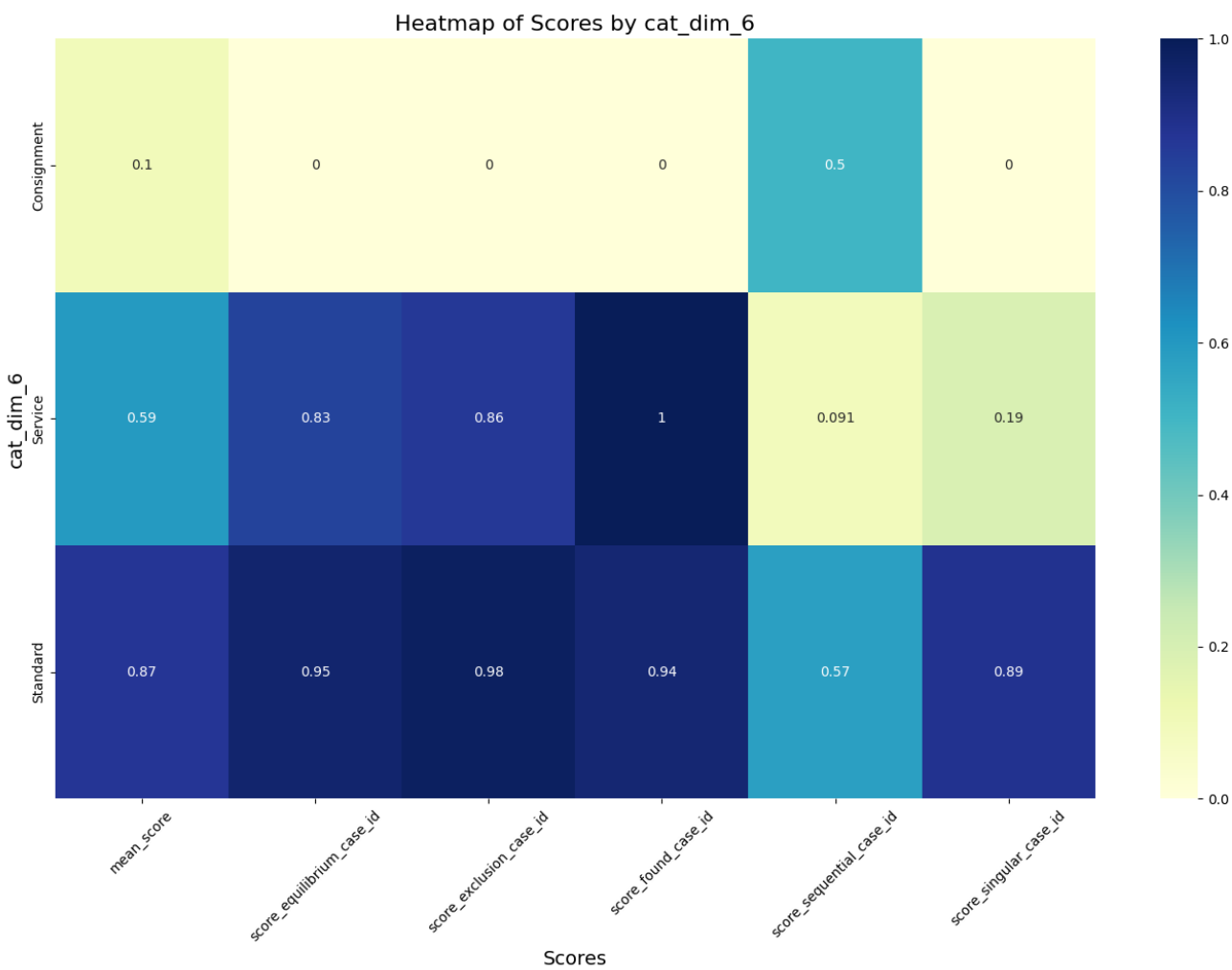
   - Implement automated checks for presence, order, and duplication of activities.

   - Regular system reviews and updates.

4. **Monitoring and Reporting**:

   - Establish real-time performance dashboards.

   - Quarterly reviews and adjustments based on performance metrics.

Adjusted Box Plot of Scores by Category

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_6

**BPIC 2019 Data Analysis Report**

**Category: cat_dim_7**

### Insights from the Data

1. **Box Plot Analysis**:

   - **Category: 3-way match, invoice before GR**

     - **Mean Score**: Approximately 0.85 to 0.9 (assuming mean score is around the box center line).

     - **Outliers**: Present above the upper limit (score close to 1.0).

### Recommendations for Next Steps

1. **Focus Areas**:

   - **Performance Metrics to Maintain**:

     - Majority of scores are high (0.8-0.9), indicating good process performance.

   - **Outlier Analysis**:

     - Investigate the cases scoring close to 1.0 to identify best practices or exceptional performance activities.

2. **Process Improvement**:

   - **Mandatory Activities**:

     - Ensure that all necessary mandatory activities are included and correctly sequenced.

   - **Order of Activities**:

     - Continue monitoring and ensuring the correct sequence of activities to maintain

**BPIC 2019 Data Analysis Report**

high scores.

   - **Distribution Management**:

     - Maintain an even distribution of activities to avoid bottlenecks and ensure process balance.

   - **Duplicate Activities**:

     - Regularly review processes to eliminate any redundant activities.

   - **Exclusion of Unwanted Activities**:

     - Identify and remove manual, costly, and unwanted activities to further streamline the process.

3. **Data Analysis**:

   - Conduct root cause analysis for outliers to replicate successful processes.

   - Evaluate the impact of high-performing cases on overall process efficiency.

4. **Benchmarking**:

   - Regularly benchmark against the current high scores to measure improvement and set new targets.

5. **Continuous Monitoring**:

   - Implement real-time monitoring systems to ensure the process remains optimal and scores continue to improve.

### Action Plan

1. **Detailed Root Cause Analysis**:

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   - Identify high-performing outliers.

   - Document best practices.

2. **Regular Process Audits**:

   - Schedule quarterly audits to evaluate process adherence and performance consistency.

3. **Training Programs**:

   - Develop training for staff on identified best practices.

4. **Performance Reviews**:

   - Set up a review committee to regularly assess performance scores and implement improvements.

5. **Tools and Technology**:

   - Invest in process management tools to automate monitoring and scoring of process activities.

By focusing on these areas and following the action plan, the process performance can be maintained and further improved.

### Analysis of Process Performance Scores

#### Categories: `cat_dim_7`
1. 3-way match, invoice after GR

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2. 3-way match, invoice before GR

3. Consignment


#### Dimensions: Scores

1. `mean_score`

2. `score_equilibrium_case_id`

3. `score_exclusion_case_id`

4. `score_found_case_id`

5. `score_sequential_case_id`

6. `score_singular_case_id`


### Observations:

1. **3-way match, invoice after GR**

   - High in `score_found_case_id` (1.00)

   - Relatively high in `score_sequential_case_id` (0.83) and `score_equilibrium_case_id`

(0.86)

   - Low in `score_exclusion_case_id` (0.097) and `score_singular_case_id` (0.2)

   - Decent overall performance (`mean_score`: 0.60)


2. **3-way match, invoice before GR**

     - High across most scores, especially `score_sequential_case_id` (0.95),

`score_found_case_id` (0.94), and `score_equilibrium_case_id` (0.98)

   - Moderate in `score_exclusion_case_id` (0.56) and `score_singular_case_id` (0.88)

   - Very high overall performance (`mean_score`: 0.86)

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3. **Consignment**

- Low to zero across most scores, i.e., `score_exclusion_case_id` (0.0), `score_equilibrium_case_id` (0.0), `score_singular_case_id` (0.0)

- Only moderate score in `score_sequential_case_id` (0.50)

- Poor overall performance (`mean_score`: 0.10)

### Next Steps:

1. **Focus on Low-Scoring Areas for "3-way match, invoice after GR":**

- **score_exclusion_case_id (0.097)**: Investigate costly or unwanted activities and streamline them.

- **score_singular_case_id (0.2)**: Reduce duplicate activities.

2. **Maintain and Enhance High-Scoring Areas for "3-way match, invoice before GR":**

- **score_sequential_case_id (0.95) and score_equilibrium_case_id (0.98)**: Maintain high correct order and balanced distribution of activities.

- **score_singular_case_id (0.88)**: Further reduce duplicates if possible.

3. **Revamp Consignment Process:**

- **Overall Low Scores**: Re-evaluate the entire consignment process workflow.

- **score_equilibrium_case_id and score_exclusion_case_id**: Identify and mitigate inefficiencies.

4. **General Recommendations:**

- Enhance training and guidelines: To improve `score_exclusion_case_id` and `score_singular_case_id`.

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   - Regular performance reviews: Focus on processes with scores below 0.5 to identify root causes.

   - Automate and streamline processes: Especially in areas affecting `score_exclusion_case_id`.

### Quantifiable Metrics:

- Target high impact areas including `score_exclusion_case_id` for processes with low scores.
- Improve minimal score thresholds (e.g., raise any score below 0.3 to above 0.5 in the next quarter).

This concise and actionable plan will help focus on key areas for improvement and ensure continuous performance enhancement in the process workflows.

# BPIC 2019 Data Analysis Report

## Adjusted Box Plot of Scores by Category



cat_dim_7

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_7



| cat_dim_7 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| 3-way match, invoice after GR | 0.6 | 0.83 | 0.86 | 1 | 0.097 | 0.2 |
| 3-way match, invoice before GR | 0.86 | 0.95 | 0.98 | 0.94 | 0.56 | 0.88 |
| Consignment | 0.1 | 0 | 0 | 0 | 0.5 | 0 |
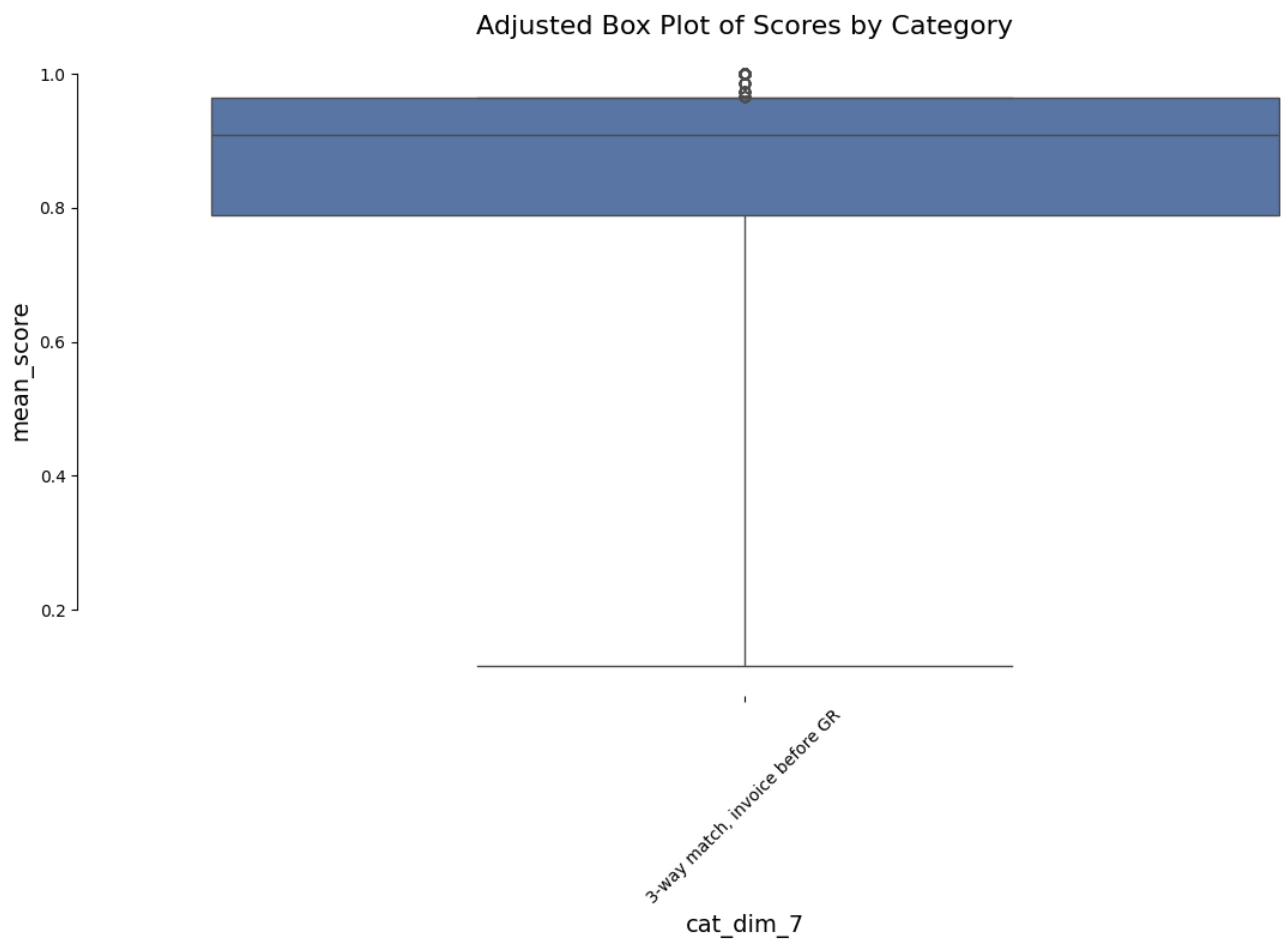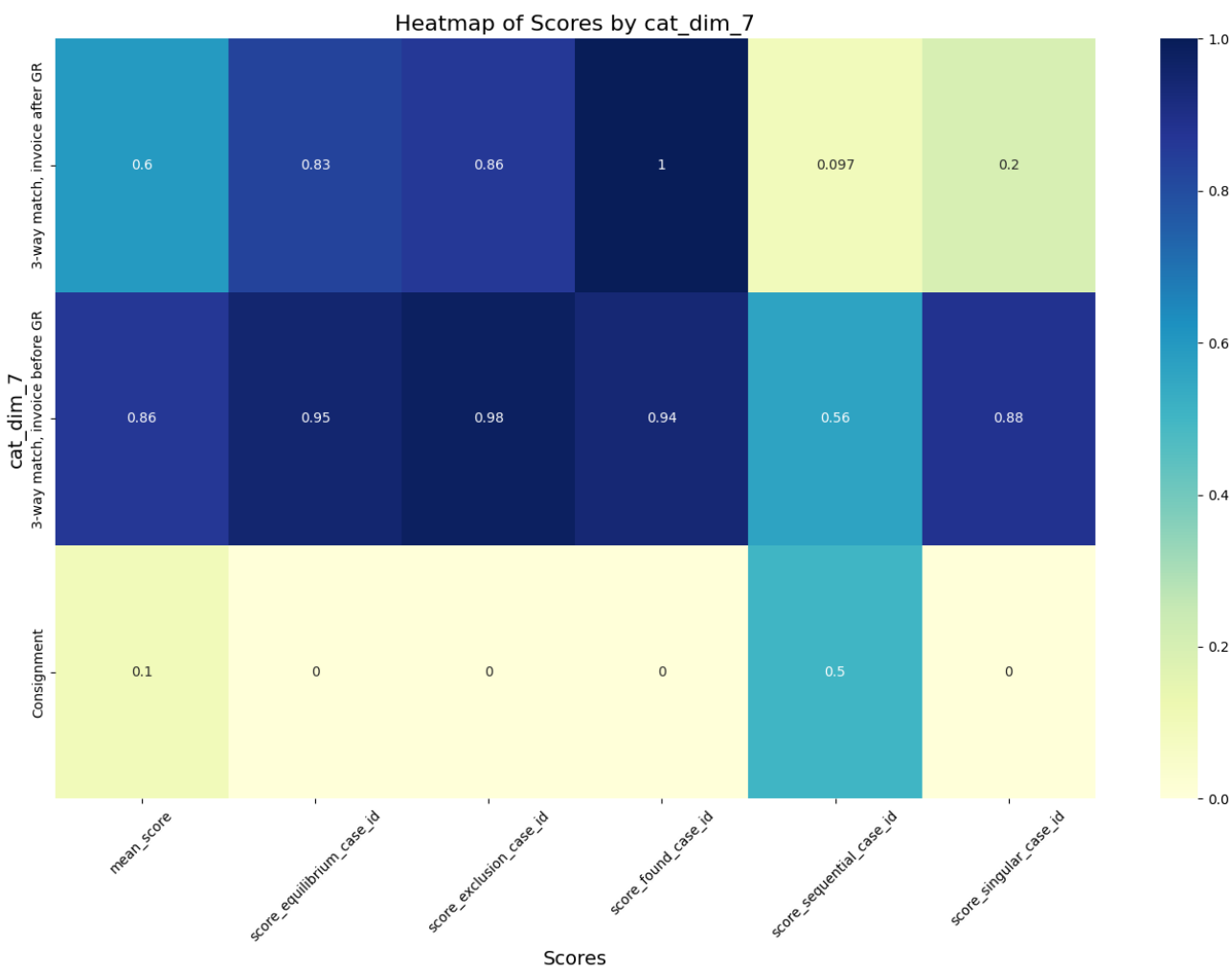
Scores

**BPIC 2019 Data Analysis Report**

**Category: cat_dim_8**

### Insights

#### General Observations:

- **Score Range**: Scores range between 0.2 to 1.0, indicating variations in process performances.
- **Predominant Score Bracket**: Many processes seem to have high performance with scores primarily between 0.8 and 1.0.

#### Categories (Cat_Dim_8):

- **Consistency**: Some categories exhibit consistent performance (tight box plots with fewer outliers), while others show more variability (wide box plots with numerous outliers).
- **Top Performers**: Categories with median scores near 1.0 indicate excellent overall process performance.
- **Underperformers**: Categories with wide interquartile ranges or low median scores need attention.

#### Variability:

- Categories with significant variability and numerous outliers demonstrate potential areas for process improvement.

### Action Plan

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#### Immediate Focus Areas:

1. **Identify Key Performers**:

   - Isolate categories with median scores close to 1.0.

   - Understand best practices and successful strategies in these categories.

2. **Analyze Underperforming Categories**:

   - Focus on categories with lower median scores or high variability.

   - Investigate root causes for lower performance.

3. **Stabilize High Variability Categories**:

   - Deep-dive into reasons for wide interquartile ranges and numerous outliers.

   - Standardize processes to ensure more consistent performance.

#### Next Steps:

1. **Data Deep Dive**:

   - Segment data by category for detailed analysis.

   - Evaluate each category against defined process performance metrics.

2. **Priority Actions**:

   - Develop improvement plans for the bottom 25% categories.

   - Leverage best practices from top-performing categories to elevate performance across the board.

3. **Continuous Monitoring**:

   - Implement a monitoring framework for ongoing performance tracking.

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  - Use real-time dashboards to flag deviations from expected performance.

### Quantifiable Metrics

- **Top Quartile**: Categories with a median score of ≥0.9.

- **Median Range**: Categories scoring between 0.8 and 0.9.

- **Low Performers**: Categories with scores <0.8.

### Key Performance Indicators (KPIs)

- **Median Score**: Measure progress by observing shifts in median scores over time.

- **Interquartile Range (IQR)**: Aim to reduce the IQR for highly variable categories.

- **Outlier Count**: Monitor and aim to minimize the number of outliers.

### Conclusion

- **Strengths**: Majority of categories exhibit strong performance.

- **Areas for Improvement**: Focus on underperforming and high-variability categories.

- **Actionable Metrics**: Use outlined KPIs for targeted improvements and continuous monitoring.

### Insights

1. **High Performers**:

   - Vendors with consistent high scores (≥0.8) across most dimensions:

       - e.g., `vendorID_0103`, `vendorID_0105`, `vendorID_0211`, `vendorID_0231`, `vendorID_0374`

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2. **Balanced Process Distribution**:

   - Vendors with balanced scores (≥0.9) in `score_equilibrium_case_id`:

   - e.g., `vendorID_0103`, `vendorID_0136`, `vendorID_0203`

3. **Sequential Adherence**:

   - Vendors with perfect scores (1.0) in `score_sequential_case_id` indicating the correct order followed:

   - Multiple vendors including `vendorID_0103`, `vendorID_0105`, `vendorID_0211`, `vendorID_0231`

4. **Absence of Duplicate Activities**:

   - Vendors with perfect scores (1.0) in `score_singular_case_id`:

   - Most vendors do well here

5. **Areas of Improvement**:

   - Low performers with significantly lower scores that indicate critical areas for improvement, e.g., `vendorID_0188` has particularly low scores across all dimensions.

   - Specific vendors with low scores in specific dimensions need targeted interventions:

   - e.g., `vendorID_0364`, `vendorID_0366` (low on `score_equilibrium_case_id` and `score_found_case_id`)

### Plan for Next Steps

1. **Deep Dive Analysis**:

   - **High Performers**: Study methodologies of high-performing vendors

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(`vendorID_0103`, `vendorID_0105`).

   - **Low Performers**: Conduct root cause analysis for underperforming vendors (`vendorID_0188`, `vendorID_0364`).

2. **Targeted Workshops**:

   - **Order Adherence**: For vendors with low `score_sequential_case_id` (e.g., `vendorID_0364`). Workshops on the importance of sequential adherence.

   - **Activity Presence**: Improving `score_found_case_id` for vendors consistently missing mandatory activities (`vendorID_0188`).

3. **Process Optimization**:

   - **Balanced Activity Distribution**: Focus on vendors with low `score_equilibrium_case_id` (e.g., `vendorID_0364`, `vendorID_366`). Incorporate load-balancing algorithms.

   - **Duplicate Activities**: Revisit SOPs for vendors with low `score_singular_case_id` to eliminate redundancy (`vendorID_0577`).

4. **Monitoring & Feedback Loop**:

   - Establishing a regular review and feedback loop to keep track of improvements and make necessary adjustments.

5. **Benchmarking & Training**:

   - Utilize high scorer strategies to develop benchmarking criteria and training programs for the rest of the vendors.

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By focusing on these areas, we can systematically address the underperforming dimensions and improve overall process performance across vendors.



Adjusted Box Plot of Scores by Category

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_8



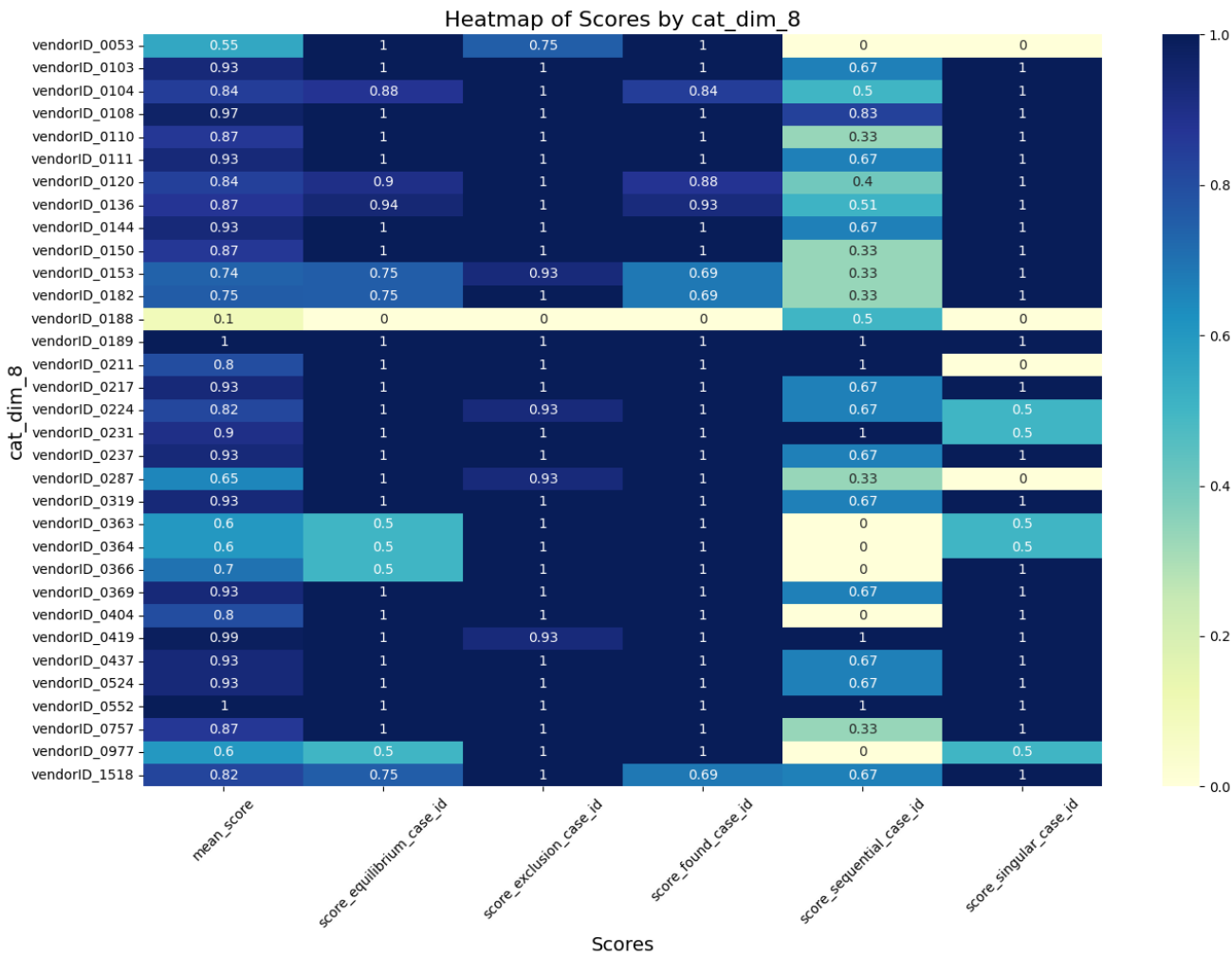| cat_dim_8 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| vendorID_0053 | 0.55 | 1 | 0.75 | 1 | 0 | 0 |
| vendorID_0103 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0104 | 0.84 | 0.88 | 1 | 0.84 | 0.5 | 1 |
| vendorID_0108 | 0.97 | 1 | 1 | 1 | 0.83 | 1 |
| vendorID_0110 | 0.87 | 1 | 1 | 1 | 0.33 | 1 |
| vendorID_0111 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0120 | 0.84 | 0.9 | 1 | 0.88 | 0.4 | 1 |
| vendorID_0136 | 0.87 | 0.94 | 1 | 0.93 | 0.51 | 1 |
| vendorID_0144 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0150 | 0.87 | 1 | 1 | 1 | 0.33 | 1 |
| vendorID_0153 | 0.74 | 0.75 | 0.93 | 0.69 | 0.33 | 1 |
| vendorID_0182 | 0.75 | 0.75 | 1 | 0.69 | 0.33 | 1 |
| vendorID_0188 | 0.1 | 0 | 0 | 0 | 0.5 | 0 |
| vendorID_0189 | 1 | 1 | 1 | 1 | 1 | 1 |
| vendorID_0211 | 0.8 | 1 | 1 | 1 | 1 | 0 |
| vendorID_0217 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0224 | 0.82 | 1 | 0.93 | 1 | 0.67 | 0.5 |
| vendorID_0231 | 0.9 | 1 | 1 | 1 | 1 | 0.5 |
| vendorID_0237 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0287 | 0.65 | 1 | 0.93 | 1 | 0.33 | 0 |
| vendorID_0319 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0363 | 0.6 | 0.5 | 1 | 1 | 0 | 0.5 |
| vendorID_0364 | 0.6 | 0.5 | 1 | 1 | 0 | 0.5 |
| vendorID_0366 | 0.7 | 0.5 | 1 | 1 | 0 | 1 |
| vendorID_0369 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0404 | 0.8 | 1 | 1 | 1 | 0 | 1 |
| vendorID_0419 | 0.99 | 1 | 0.93 | 1 | 1 | 1 |
| vendorID_0437 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0524 | 0.93 | 1 | 1 | 1 | 0.67 | 1 |
| vendorID_0552 | 1 | 1 | 1 | 1 | 1 | 1 |
| vendorID_0757 | 0.87 | 1 | 1 | 1 | 0.33 | 1 |
| vendorID_0977 | 0.6 | 0.5 | 1 | 1 | 0 | 0.5 |
| vendorID_1518 | 0.82 | 0.75 | 1 | 0.69 | 0.67 | 1 |

Scores

**BPIC 2019 Data Analysis Report**

**Category: cat_dim_9**


### Insights:

1. **Performance by Category (`cat_dim_9`)**

   - **NPR Category**:

     - Median Score: ~0.85

     - Range: 0.2 to 1.0

     - Outliers: Several above 0.95

   - **PR Category**:

     - Median Score: ~0.9

     - Range: 0.4 to 1.0

     - Outliers: Several above 0.95

   - **O Category**:

     - Median Score: ~0.85

     - Range: ~0.5 to 1.0

     - Outliers: One around 1.0

   - **OTHER Category**:

     - Median Score: ~0.8

     - Range: ~0.6 to 1.0

     - Outliers: One around 1.0


### Recommendations:

1. **Comparative Performance Analysis:**

   - `PR` shows the highest median score.

   - `O` and `NPR` also show strong performance but with more variability.

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   - Investigate outliers in all categories, especially in `NPR` and `PR`.


2. **Focus Areas for Improvement:**

   - Reduce variability in the `NPR` and `O` categories.

   - Lower scores in the `O` and `OTHER` categories need improvement.


3. **Outlier Management:**

   - Analyze reasons behind high outliers in `NPR`, `PR`, and `O` for best practices.

   - Examine the low outlier in the `OTHER` category for corrective actions.


### Next Steps:

1. **Root Cause Analysis:**

   - Conduct deep-dive sessions to understand the reasons behind the high and low scores in various categories.


2. **Benchmarking:**

   - Identify benchmarks from `PR` category and apply them to `NPR`, `O`, and `OTHER`.


3. **Process Optimization:**

   - Streamline activities to increase median scores and reduce variability in the `NPR` and `O` categories.

   - Implement best practices identified from high-performing cases.


4. **Monitoring and Continuous Improvement:**

   - Develop a score monitoring system and establish regular reviews.

   - Continuously adapt and improve based on performance metrics.

5. **Training and Development:**

   - Provide additional training focused on improving specific areas with lower scores.

   - Encourage knowledge sharing sessions across the categories.

By addressing these points, the overall process performance can be optimized to achieve higher consistency and efficiency across all categories.

### Performance Analysis of Process Scores

#### Categories:

1. NPR (Non-Product Related)

2. OTHER

3. PR (Product Related)

#### Features:

1. **mean_score**: Overall average score.

2. **score_equilibrium_case_id**: Balanced activity distribution.

3. **score_exclusion_case_id**: Absence of unwanted activities.

4. **score_found_case_id**: Presence of mandatory activities.

5. **score_sequential_case_id**: Correct order of activities.

6. **score_singular_case_id**: Absence of duplicate activities.

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#### Insights:

- **Overall Performance**:

  - **NPR**:

    - Highest: `score_found_case_id` (1)

    - Lowest: `score_sequential_case_id` (0.12)

      - Overall good presence of activities, poor in correct order and some unwanted activities.

  - **OTHER**:

    - Highest: `score_exclusion_case_id` and `score_singular_case_id` (Both 1)

    - Lowest: `score_sequential_case_id` (0.33)

    - Overall balanced, some improvement needed in ordering of activities.

  - **PR**:

    - Highest: `score_found_case_id` (0.93)

    - Lowest: `score_sequential_case_id` (0.57)

      - Good in mandatory and balanced activities, need improvement in correct activity order and absence of dupes.


- **Individual Feature Performance**:

  - **Presence of Mandatory Activities (`score_found_case_id`)**:

    - Highest in NPR (1.00) and PR (0.93).

    - Reasonably good across categories.

  - **Correct Order of Activities (`score_sequential_case_id`)**:

    - Low across NPR (0.12) and OTHER (0.33).

    - Needs significant improvement.

  - **Balanced Distribution (`score_equilibrium_case_id`)**:

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   - Highest in PR (0.94) and NPR (0.84).

   - Performance is satisfactory.

  - **Absence of Duplicate Activities (`score_singular_case_id`)**:

   - Highest in OTHER (1.00) and NPR (0.83).

   - Generally good.

  - **Absence of Unwanted Activities (`score_exclusion_case_id`)**:

   - High scores in GENERAL category (PR: 0.96).

   - Satisfactory to excellent across categories.


### Actionable Next Steps:


1. **Improve Sequential Order**:

   - **NPR**: Target "score_sequential_case_id" (0.12) - Detailed training and process mapping.

   - **OTHER**: Focus on "score_sequential_case_id" (0.33) - Identify and correct common sequences errors.

   - **PR**: Enhance "score_sequential_case_id" (0.57) - Check for critical path in workflows.


2. **Reduce Unwanted Activities**:

   - Enhance focus on `score_exclusion_case_id` in NPR (0.23) - Implement stricter controls for manual and costly activities.


3. **Balance Activity Distribution**:

   - Monitor and ensure equilibrium in NPR - Continued focus on balanced workload

distribution.

4. **Absence of Duplicate Activities**:

   - Maintain high standard in `score_singular_case_id` in all categories, but especially in PR.
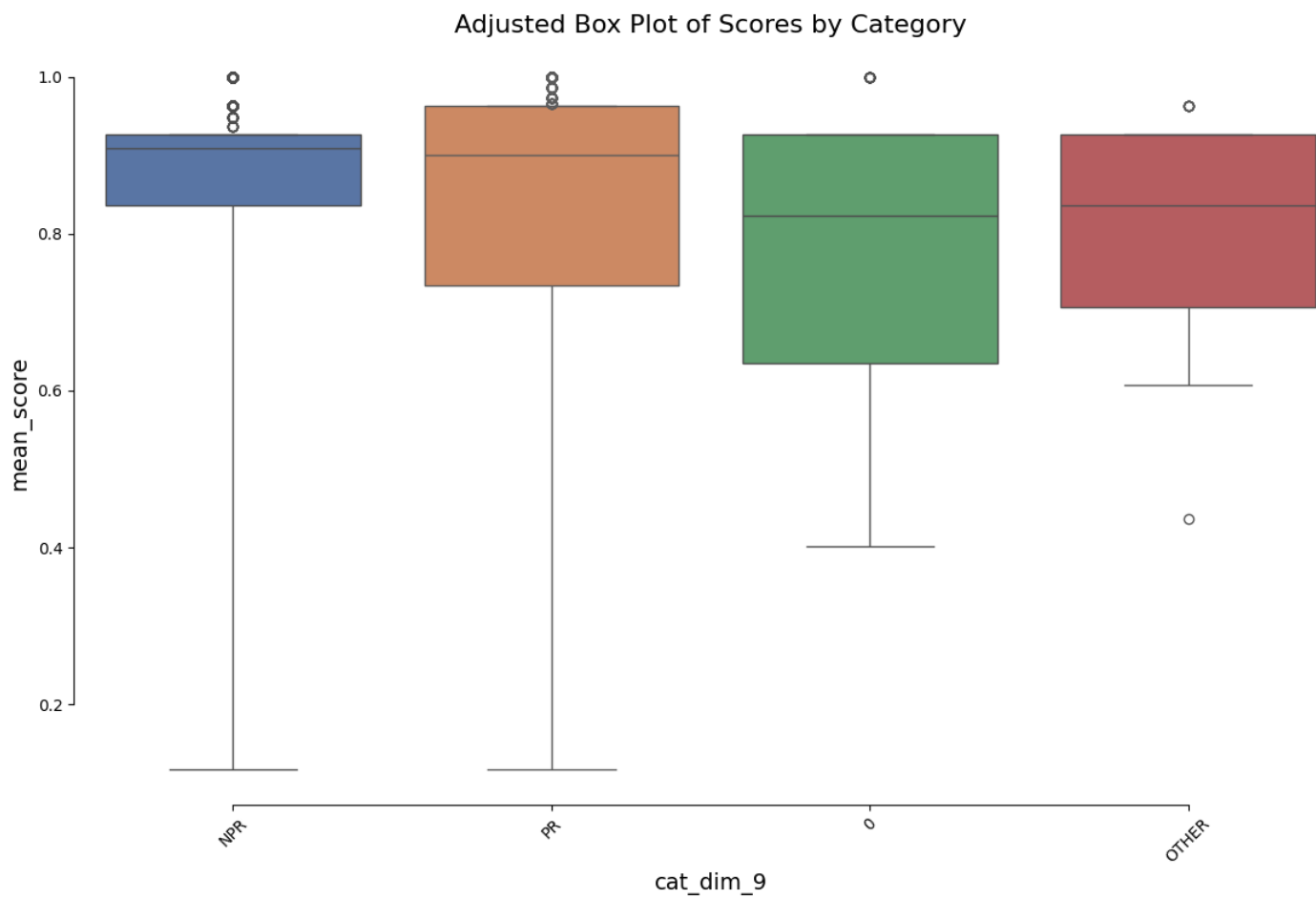
5. **Training and Audit**:

   - Regular audits and consistent training to maintain absence of unwanted and duplicate activities.
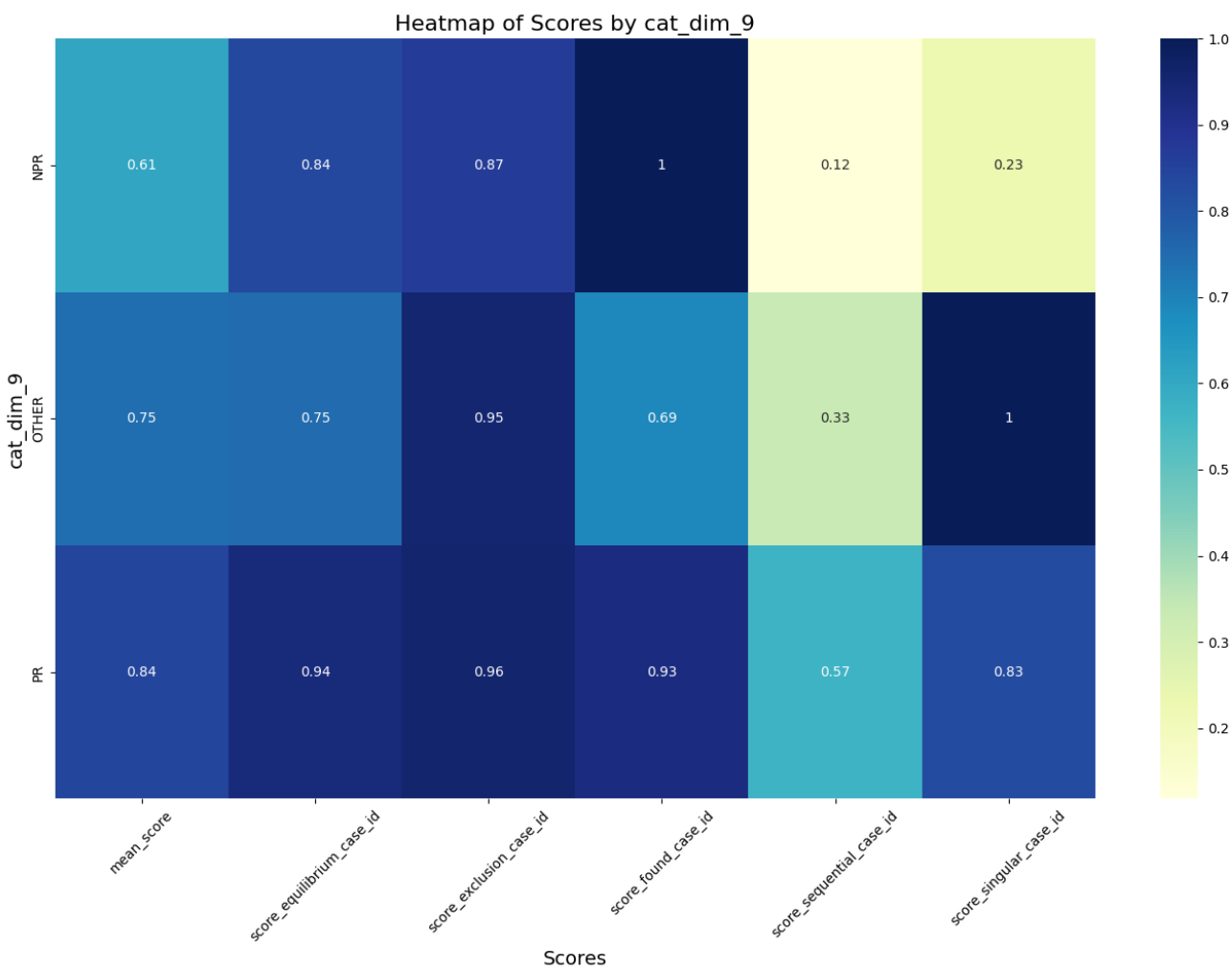
Metrics to track progress:

- Regular quarterly reviews comparing new scores to current baseline.

- Implementation of a feedback loop for continuous improvement.

By applying these steps, improvements can be systematically tracked and maintained, enhancing overall process efficiency.

# BPIC 2019 Data Analysis Report



Adjusted Box Plot of Scores by Category

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_9



| cat_dim_9 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|-----------|-----------|---------------------------|-------------------------|---------------------|--------------------------|------------------------|
| NPR | 0.61 | 0.84 | 0.87 | 1 | 0.12 | 0.23 |
| OTHER | 0.75 | 0.75 | 0.95 | 0.69 | 0.33 | 1 |
| PR | 0.84 | 0.94 | 0.96 | 0.93 | 0.57 | 0.83 |

Scores

**BPIC 2019 Data Analysis Report**

**Category: cat_dim_10**

### Insights:

#### Box Plot of Scores by Category

- **Overall Performance**

  - Median score: ~0.88

  - Range: 0.8 to 1 (excl. outliers)

  - Outliers: Several data points below 0.8

#### Heatmap Analysis

- **score_found_case_id**

  - Evaluates presence of mandatory activities.

  - Higher scores indicate mandatory activities are mostly present.

- **score_sequential_case_id**

  - Examines the correct order of activities.

  - Higher scores suggest processes are following the intended sequence.

- **score_equilibrium_case_id**

  - Assesses balanced distribution of activities.

  - Higher scores indicate balanced workload.

- **score_singular_case_id**

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   - Reviews absence of duplicate activities.

   - Higher scores reflect minimal duplication.


- **score_exclusion_case_id**

   - Evaluates absence of unwanted activities.

   - Higher scores point to fewer unwelcome actions.


### Next Steps:


1. **Identify Outliers**

   - Validate data integrity for outliers below 0.8.

   - Investigate root causes for underperformance in these cases.


2. **Improve Low Scores**

   - Focus on categories with scores around or below 0.8.

   - Implement targeted improvements (e.g., training, process redesign).


3. **Track Improvements**

   - Reassess same metrics after changes.

   - Utilize continuous monitoring for quality assurance.


4. **Detailed Analysis**

   - Perform deeper analysis to understand deviations in individual score categories.

   - Correlate with process bottlenecks or inefficiencies.

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5. **Stakeholder Engagement**

   - Communicate findings effectively to process owners.

   - Collaborate on strategic process improvements.


#### Quantifiable Goals:

- Increase category median score from 0.88 to 0.92.

- Reduce number of outliers from several to less than 2% of total cases.

- Ensure no category scores fall below 0.8.


These steps and insights should help improve process performance, ensuring processes

adhere closely to desired standards and reducing variability.


### Insights from Heatmap Analysis:


- **High Performance**:

  - `score_found_case_id`: 0.99 - Near-perfect for mandatory activity presence.

  - `score_equilibrium_case_id`: 0.88 - Well-balanced distribution.

  - `score_exclusion_case_id`: 0.85 - Minimal unwanted activities.


- **Average Performance**:

  - `mean_score`: 0.65 - Overall moderate performance.


- **Low Performance**:

  - `score_singular_case_id`: 0.33 - Issues with duplicate activities.

  - `score_sequential_case_id`: 0.19 - Incorrect activity order is a major issue.

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### Next Steps Plan:

1. **Focus on Low-Scoring Features**:

   - **Improve Sequential Score**:

     - Implement stricter controls and monitoring to ensure activities follow the correct order.

   - **Reduce Duplicate Activities**:

     - Investigate and eliminate redundant steps or activities in the process.

2. **Maintain High-Scoring Features**:

   - **Mandatory Activities**:

     - Continue ensuring presence of necessary activities.

   - **Balanced Distribution**:

     - Keep monitoring to maintain activity balance.

   - **Unwanted Activities**:

     - Continue restrictions on manual or costly activities.

3. **Analyze and Understand Causes**:

   - **Root Cause Analysis**:

     - Perform detailed analysis to understand why scores are low in sequential order and duplicate activities.

4. **Enhance Monitoring Systems**:

   - **Automated Alerts**:

- Set up alerts for activities out of sequence or when duplicates occur.

5. **Process Training**:

  - **Employee Training**:

    - Conduct training sessions to ensure understanding of the correct process flow.
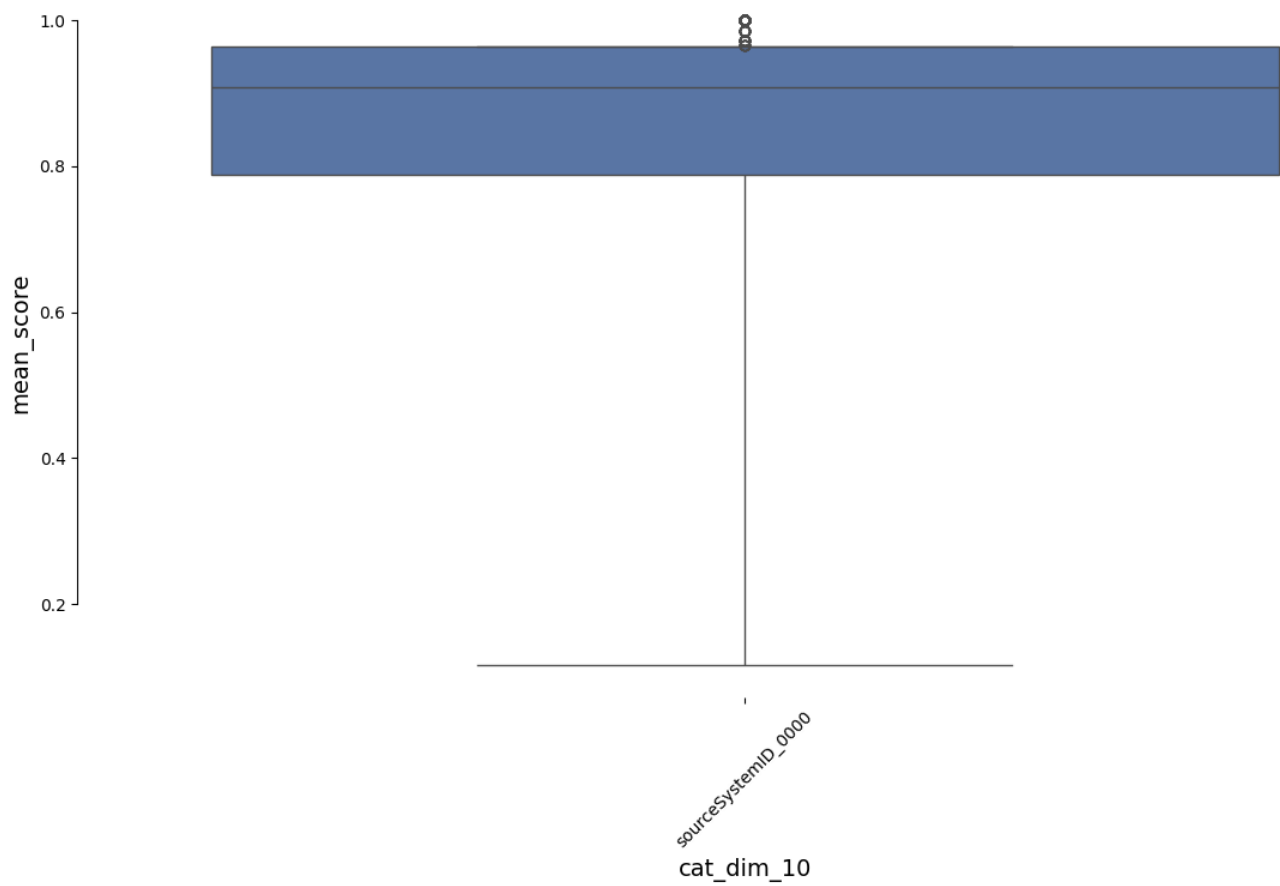
6. **Continuous Improvement**:

  - **Regular Review**:

    - Schedule periodic reviews to monitor improvements and ensure sustained performance.
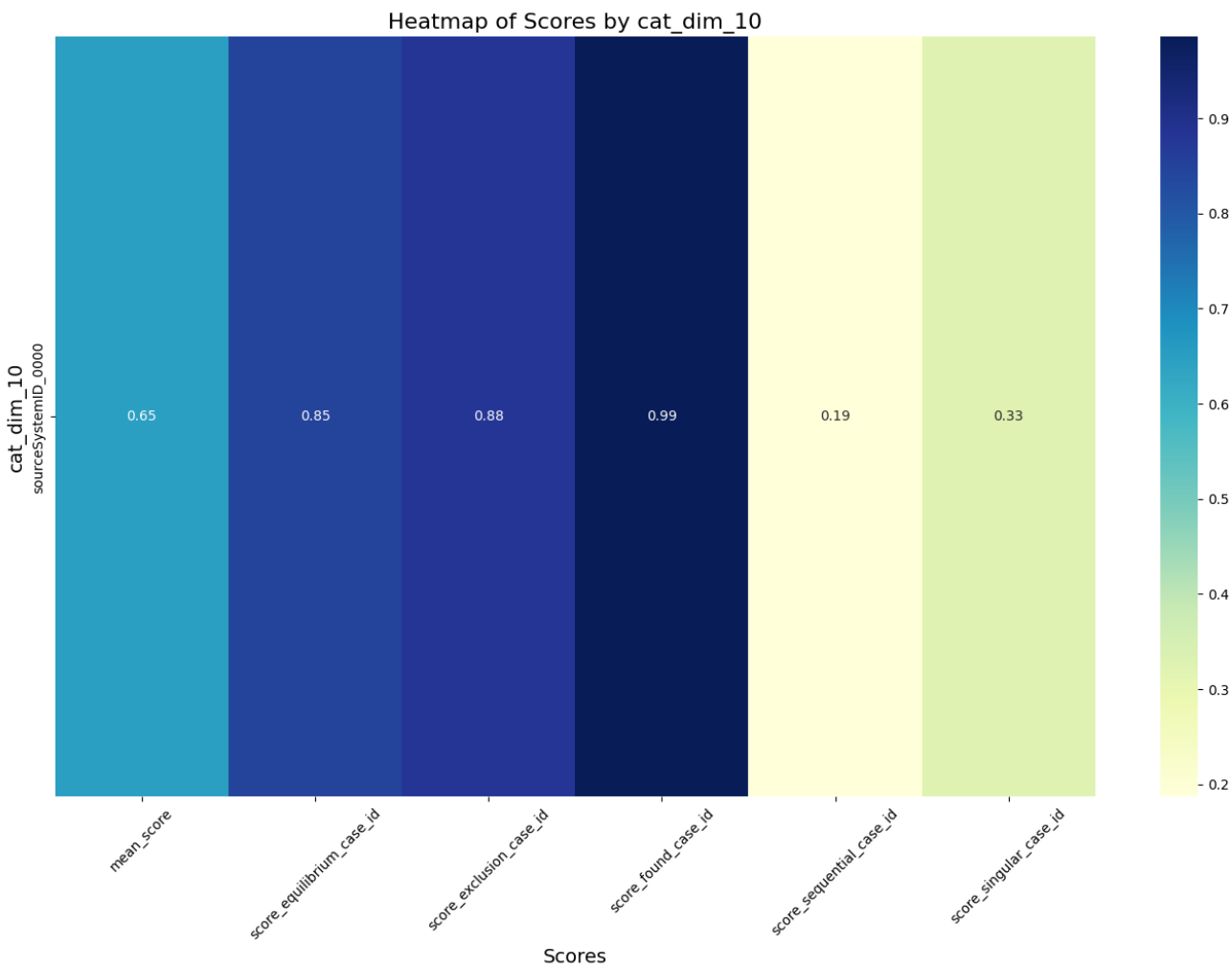
This plan focuses on improving the critical low-scoring areas while maintaining the strengths in process performance.

# BPIC 2019 Data Analysis Report

## Adjusted Box Plot of Scores by Category



cat_dim_10

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_10



| | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| sourceSystemID_0000 | 0.65 | 0.85 | 0.88 | 0.99 | 0.19 | 0.33 |

cat_dim_10

Scores

**BPIC 2019 Data Analysis Report**

**Category: cat_dim_12**

### Analysis and Insights

#### Heatmap:

- **Score Contexts:**

  - `score_found_case_id`: presence of mandatory activities.

  - `score_sequential_case_id`: correct order of activities.

  - `score_equilibrium_case_id`: balanced distribution of activities.

  - `score_singular_case_id`: absence of duplicate activities.

  - `score_exclusion_case_id`: absence of unwanted activities.

#### Box Plot Insights:

- **Mean Score Variation:**

  - Median score: Approximately 0.0008.

  - Interquartile range: Most scores fall between 0.0006 and 0.0010.

  - Outliers: Several high outliers suggest that exceptional cases exist with significantly better scores.

### Next Steps:

1. **Process Improvement Targets:**

   - Focus on reducing unwanted activities (`score_exclusion_case_id`).

   - Identify and replicate cases leading to high outliers as best practices.

2. **Data Deep Dive:**

**BPIC 2019 Data Analysis Report**

   - Conduct detailed analysis of cases with full score (`1`) in any dimension to find effective process patterns.

   - Evaluate cases with scores less than the 25th percentile (0.0006) to understand common process pitfalls.

3. **Categorical Analysis:**

   - Further categorize processes and analyze by department, team, or other relevant segments to identify high and low-performing groups.

   - Investigate the common characteristics of low performing categories to implement focused improvements.

4. **Process Re-engineering:**

   - Standardize successful sequences and mandatory activities.

   - Implement measures to balance work distribution (`score_equilibrium_case_id`) and reduce duplication.

5. **Training and Development:**

   - Develop training modules based on best practices.

   - Use data to inform continuous improvement workshops.

6. **Monitoring and Control:**

   - Set up regular monitoring of process scores.

   - Create alerts for processes falling below a certain threshold.

### Conclusion:

**BPIC 2019 Data Analysis Report**

The analysis highlights specific areas for targeted process improvement and helps to outline actionable steps towards enhancing overall performance.

### Insights

- **Mean Score (0.65)**:
  - Overall process performance is moderate.

- **Score by Dimensions**:
  - **Presence of Mandatory Activities (0.99)**:
    - High compliance with mandatory activities.
  - **Correct Order of Activities (0.19)**:
    - Major issue with the sequence of activities.
  - **Balanced Distribution of Activities (0.85)**:
    - Good balance in the distribution of activities.
  - **Absence of Duplicate Activities (0.33)**:
    - Significant presence of duplicate activities.
  - **Absence of Unwanted Activities (0.88)**:
    - Low occurrence of unwanted activities.

### Next Steps

1. **Sequence Improvement**:
   - Investigate causes of low sequencing score (0.19).
   - Develop training or automated checks to ensure correct order of operations.

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2. **Duplication Reduction**:

   - Identify steps frequently duplicated (score 0.33).

   - Implement controls or audits to minimize repetitions.

3. **Maintain High Standards**:

   - Continue to monitor and sustain high performance in mandatory activities (0.99) and exclusion of unwanted activities (0.88).

4. **Balanced Operations**:

   - Maintain the balance in activities distribution (0.85).

   - Periodically review processes for any emerging imbalances.

5. **Comprehensive Reviews**:

   - Conduct regular process reviews to ensure consistent compliance and to identify areas needing attention.

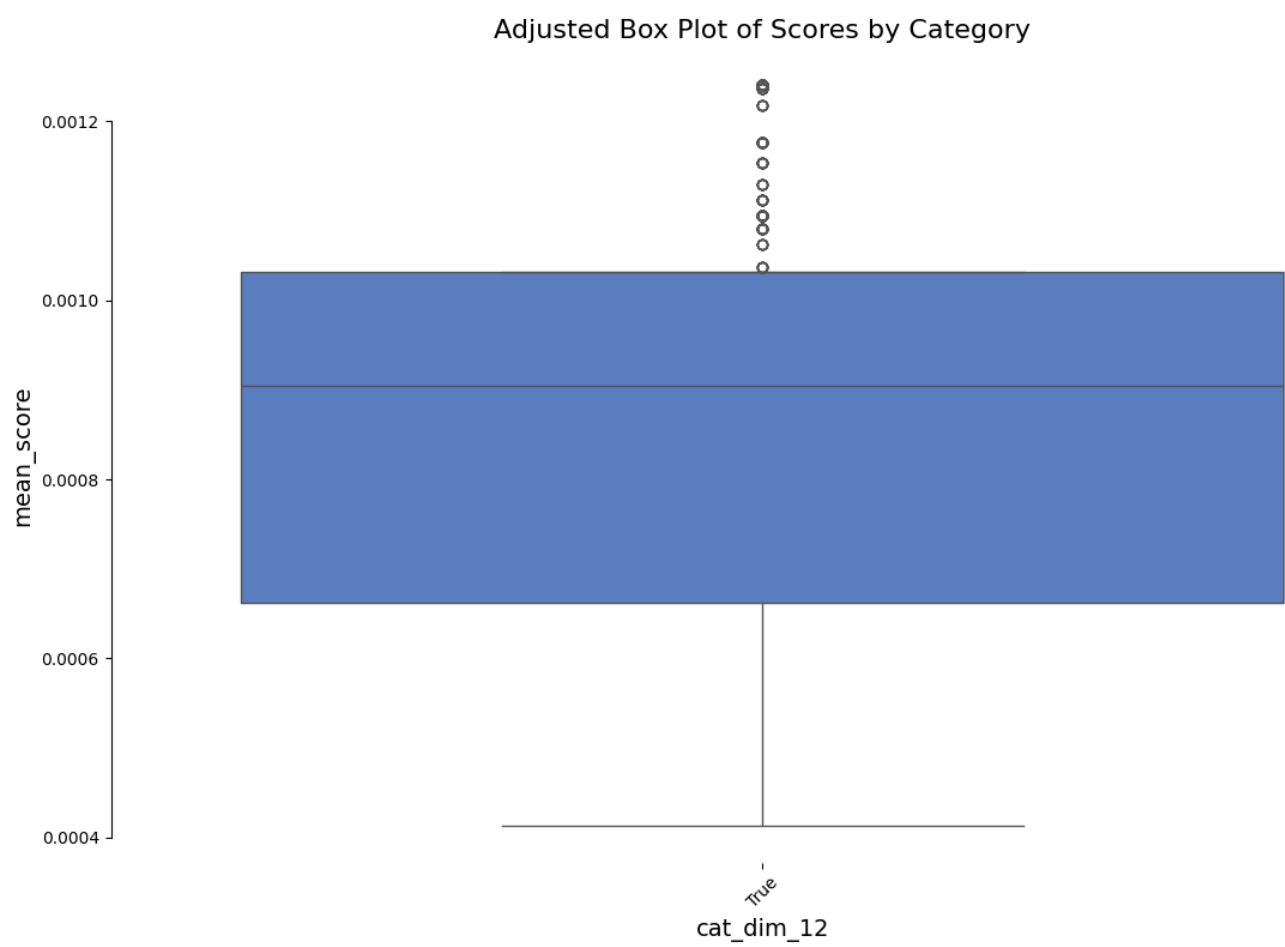### Actionable Metrics

- **Target Improvements**:

   - **Sequential Score**: Aim to increase from 0.19 to at least 0.7 within the next quarter.

   - **Singular Score**: Aim to reduce duplications and raise the score from 0.33 to 0.6.

- **Monitoring High Performances**:

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   - Set alerts for scores falling below 0.8 in balanced distribution and absence of unwanted activities.

By focusing on these areas, the process can become more efficient, cost-effective, and compliant.



Adjusted Box Plot of Scores by Category

# BPIC 2019 Data Analysis Report

## Heatmap of Scores by cat_dim_12



| cat_dim_12 | mean_score | score_equilibrium_case_id | score_exclusion_case_id | score_found_case_id | score_sequential_case_id | score_singular_case_id |
|---|---|---|---|---|---|---|
| True | 0.65 | 0.85 | 0.88 | 0.99 | 0.19 | 0.33 |

Scores