CONESTOGA

Connect Life and Learning

COURSE CODE: 1372

PROGRAM CODE- OPER8151

PROFESSOR NAME: Michael Cheung

SECTION – 10

GROUP ASSIGMENT 1

STUDENT NAME: GROUP-1

Neha Singh - 8920238

Vaishnavi Wadhwa - 8939083

Aniket Shingala – 8926127

Gaurav Saraswat – 8946127

WORD COUNT: 6465

1) A summary of your team's charter: Team: create a team charter illustrating objectives, roles and responsibilities and methods of communication. (Tam. M, 2021, p.1)

TEAM CHARTER

Project name: FlightByNight **Date prepared: 07/31/2024**

TEAM MEMBERS

Name	Job title or role
Vaishnavi Wadhwa	Project Sponsor
Neha Singh	Project Manager
Aniket Shingala	SME networking
Gaurav Saraswat	SME infrastructure

OBJECTIVE

Our goal is to enhance the paper airplane manufacturing processes at FlightByNight with regard to operational efficiency and quality control. By utilizing quality management methods and techniques, we hope to lower product quality variability, improve performance tracking and feedback systems, and boost market competitiveness.

PROJECT GOALS

1	Standardise and record operational procedures.
2	Reduce variability by putting quality control procedures in place.
3	Improve the feedback and performance tracking systems.
4	Boost overall client happiness and competitiveness in the industry..

SUCCESS CRITERIA

1	Paper airplanes of consistent quality with little variation.
2	Enhanced record-keeping and process standardization.
3	Positive comments from clients about the caliber of the goods.
4	Improved staff feedback and performance monitoring systems.

TEAM VALUES AND PRINCIPLES

ID	Value or principle
1	Our teamwork is based on cooperation and respect for one another.

stakeholdermap.com

TEAM CHARTER

2	We are dedicated to lifelong learning and development.
3	It's critical that we be open and honest about our choices and behaviour.
4	When tackling problems, creativity and innovation are encouraged.
5	We must take responsibility for our duties and obligations.

MEETING GUIDELINES

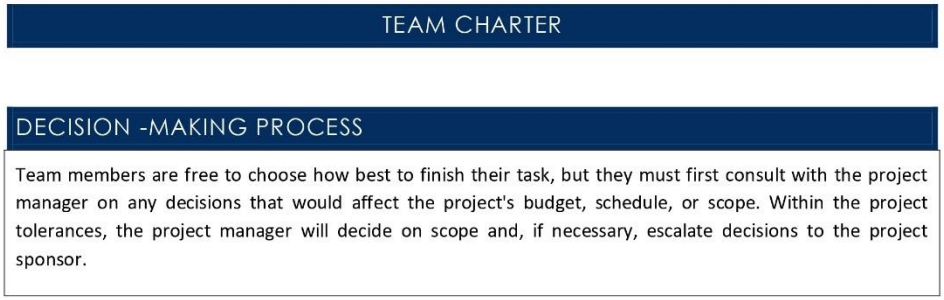
ID	Guideline
1	All participants' schedules shall be respected by starting and ending meetings on time.
2	Prior to every meeting, an agenda will be distributed, and minutes will be kept.
3	It is anticipated that each member will attend prepared and take an active part.
4	To promote a fruitful meeting atmosphere, constructive criticism is welcomed.

COMMUNICATION GUIDELINES

ID	Guideline
1	All conversations and document sharing connected to the project will take place on a common web platform.
2	You may expect fast responses to your messages and questions, usually within a day.
3	All team members will have access to the documentation of significant conversations and decisions.
4	Frequent check-ins will be planned in order to guarantee alignment and quickly resolve any problems.

CONFLICT RESOLUTION

ID	Guideline
1	Disagreements will be resolved quickly and candidly among team members.
2	Prior to making judgements, we shall make an effort to comprehend all points of view.
3	Disagreements will be brought to the attention of the project manager if they cannot be settled by the team.
4	In the event that mediation is required, a neutral third party will be contacted.



To address the challenges faced by FlightByNight and to improve their competitive standing, we can undertake the following steps as Business Analysts:

1. Process Documentation and Analysis

- **Document Current Processes:** Map out the existing processes from order intake to airplane delivery. This includes documenting the steps taken by the Sales and Service team, the Airplane Build Analysts, and the inventory management.
- **Identify Variability Points:** Analyze the steps where variability might occur, such as in the building process or in the testing of paper airplanes.

2. Standardization and Quality Control

- **Develop Standard Operating Procedures (SOPs):** Create detailed SOPs for the building of both the Standard and Step-Up designs. Ensure all Airplane Build Analysts follow these procedures.
- **Implement Quality Control Measures:** Introduce quality checks at various stages of the building process. This can include pre-flight testing and final inspections to ensure consistency in the performance of each airplane.

3. Training and Development

- **Training Programs:** Conduct training sessions for the Airplane Build Analysts to ensure they understand and adhere to the new SOPs. This can also help in enhancing their skills and techniques.
- **Feedback Loop:** Establish a system for continuous feedback and improvement. Encourage analysts to report any issues or suggestions for process improvement.

4. Performance Tracking and Analysis

- **Track Individual Performance:** Implement a tracking system to associate each built airplane with its respective builder. This can help identify patterns in performance and address any issues specific to certain builders.
- **Analyze Customer Feedback:** Categorize feedback based on the type of airplane (Standard or Step-Up) and the builder. This can help pinpoint areas for improvement.

5. Customer Service and Order Management

- **Digitalize Order Management:** Transition from sticky notes and inter-office mail to a digital order management system. This can streamline the order process and reduce errors.
- **Improve Customer Feedback Mechanism:** Implement a more structured way to collect and analyze customer feedback. This could involve online surveys or follow-up calls.

6. Competitive Analysis

- **Analyze Competitor Products:** Conduct a detailed analysis of the competitor's products to understand their design and build techniques. This can provide insights into potential improvements for FlightByNight's designs.
- **Benchmarking:** Compare FlightByNight's processes, pricing, and performance metrics against those of the competitor to identify gaps and areas for improvement.

7. Cost Reduction Strategies

- **Optimize Material Usage:** Explore ways to reduce waste and optimize the use of materials without compromising quality.
- **Streamline Processes:** Identify and eliminate any redundant steps in the production process to increase efficiency.

8. Technology and Automation

- **Invest in Automation:** Consider investing in automation tools for repetitive tasks to increase speed and reduce human error.
- **Use Data Analytics:** Implement data analytics tools to monitor and analyze performance metrics, helping to make informed decisions.

By implementing these steps, FlightByNight can improve the consistency and quality of their paper airplanes, reduce costs, and enhance overall operational efficiency, making them more competitive in the market.

2). What are the problems that are facing the company? Why are they not able to compete (even though they have skilled labor force – staff who have been making paper airplanes for a long time and coupled with the fact that morale is high and employee turnover is exceptionally low!)

List the problems together with supportive text to convince your client (*FlightByNight_*) that each of these IS A PROBLEM that needs to be addressed. The problems should all relate to what would be steps to improve the *FlightByNight_* Co. position in the marketplace.

There should be at least 4 problems illustrative together with a descriptive paragraph for each. Note that : as mentioned in the requirements, one of the problems MUST be what the customer perceives as the major quality problem.

To help FlightByNight understand and address the issues that are hindering their ability to compete effectively in the marketplace, we have identified the following key problems. These problems are critical to resolving for improving their market position and ensuring consistent product quality.

1. Inconsistent Quality and Variability in Performance

Problem: Customers have reported that the performance of FlightByNight's paper airplanes is inconsistent. Some airplanes fly very far, while others do not meet expectations. This inconsistency is a significant quality issue and is perceived by customers as the major problem.

Explanation: Despite having a skilled workforce with high morale and low turnover, the lack of standardized processes and quality control measures leads to variations in the construction of paper airplanes. Without consistent building techniques and quality checks, the final products vary significantly in performance, leading to customer dissatisfaction. This inconsistency harms the company's reputation and competitiveness, especially when competing against a new entrant that offers consistent quality at a lower price.

2. Lack of Process Documentation and Standard Operating Procedures (SOPs)

Problem: FlightByNight has never documented its operational and support processes, nor have they established standard operating procedures for the construction of their paper airplanes.

Explanation: The absence of documented processes and SOPs means that each Airplane Build Analyst may follow their own methods and techniques, leading to inconsistent outcomes. Documenting processes and creating SOPs is essential for ensuring that all employees follow the same high standards and best practices. This not only improves consistency and quality but also makes it easier to train new employees and scale operations.

3. Inefficient Order and Inventory Management

Problem: The company relies on manual methods, such as sticky notes and inter-office mail, for order management and communication between the Sales and Service team and the Airplane Build Analysts.

Explanation: Manual processes are prone to errors, delays, and inefficiencies. The current system can lead to miscommunication, lost orders, and delays in fulfilling customer requests. By digitalizing the order management system, FlightByNight can streamline operations, reduce errors, and improve the overall efficiency of the order fulfillment process. This will lead to faster turnaround times and better customer satisfaction.

4. Inadequate Performance Tracking and Feedback Mechanism

Problem: The company does not have a system in place to track the performance of individual Airplane Build Analysts or to associate customer feedback with specific builds and builders.

Explanation: Without tracking performance and feedback, it is challenging to identify the root causes of quality issues or to recognize high-performing employees. Implementing a performance tracking system will allow the company to monitor and analyze the output of each

builder, address specific issues, and recognize and reward excellence. Additionally, categorizing customer feedback by airplane type and builder can provide valuable insights for continuous improvement.

Conclusion

Addressing these problems will require a combination of standardizing processes, implementing quality control measures, digitalizing order management, and establishing performance tracking systems. By tackling these issues head-on, FlightByNight can enhance product consistency, improve operational efficiency, and better meet customer expectations, thereby strengthening their competitive position in the marketplace.

3). What techniques learned in this course (coupled with other key ITBA program courses) will help the company in terms of addressing EACH of these four problems? Please state what techniques would help the company compete and the reasons why these would help (and which problem(s) will each technique help with?

Your techniques and problems could cover different aspects of the business as outlined above; operations, manufacturing, customer service, sales & service, strategy for example.

It MUST be clear what technique applies to which problem, and why this technique was selected to address this problem.

List of Techniques:

- Kano Model- Used to determine the needs of customers
- Deming Philosophy/Deming Chain Reaction
- Baldridge excellence framework for performance Excel
- Traditional strategic planning (BSC)- for strategy planning
- Hoshin planning or Hoshin Kanri - for strategy planning
- SWOT Analysis
- Deming Cycle
- Six Sigma - DMAIC
- RCA technique
- CED(Cause Effect Diagram)
- lean thinking
- Lean Six Sigma
- Kaizen Philosophy
- Flowcharts
- Check sheets
- Histograms
- Cause-and-effect diagrams
- Pareto diagrams
- Scatter diagrams
- Control charts
- A SIPOC (suppliers, inputs, process, outputs, customers)
- Cause-and-effect diagram
- Check sheet

- Run chart
- Pareto chart
- Heijunka
- Swimlane Diagram
- Value Stream Mapping
- PDCA
- A3 problem solving
- Control chart

To address the identified problems at FlightByNight effectively, we can match the most appropriate techniques from the list provided. Here are the techniques best suited for each problem, along with the reasoning for their selection:

1. Inconsistent Quality and Variability in Performance

Technique: Six Sigma - DMAIC Reasoning: Six Sigma's DMAIC (Define, Measure, Analyze, Improve, Control) methodology is specifically designed to identify and eliminate variations in processes, ensuring consistent quality and performance. By applying DMAIC, FlightByNight can:

- **Define** the problem of inconsistent airplane performance.
- **Measure** the performance characteristics of paper airplanes (e.g., flight distance).
- **Analyze** the data to identify the root causes of variability.
- **Improve** the building process by implementing solutions to address these causes.
- **Control** the process to maintain consistent quality.

This systematic approach will help standardize the building techniques and reduce variations in airplane performance.

2. Lack of Process Documentation and Standard Operating Procedures (SOPs)

Technique: Standard Operating Procedures (SOPs) with Flowcharts Reasoning: Documenting processes and creating SOPs, complemented by flowcharts, will ensure that every Airplane Build Analyst follows the same steps and best practices. Flowcharts provide a visual representation of the processes, making it easier to understand and follow the procedures.

- **SOPs**: Establish clear and detailed instructions for each step in the building process.
- **Flowcharts**: Visualize the entire process flow, making it easier to identify potential bottlenecks and areas for improvement.

This combination ensures consistency and quality while making training and scaling operations more efficient.

3. Inefficient Order and Inventory Management

Technique: Digital Order Management System (incorporating SIPOC) Reasoning: Implementing a digital order management system will streamline the order process, reduce

errors, and improve communication between the Sales and Service team and the Airplane Build Analysts. Incorporating a SIPOC (Suppliers, Inputs, Process, Outputs, Customers) diagram will help map out the entire process and identify critical points that need attention.

- **Digital Order Management**: Automates the order handling process, reducing reliance on manual methods like sticky notes and inter-office mail.
- **SIPOC**: Provides a high-level view of the process, ensuring that all aspects of order management are considered and optimized.

This approach will lead to faster, more accurate order fulfillment and improved customer satisfaction.

4. Inadequate Performance Tracking and Feedback Mechanism

Technique: Balanced Scorecard (BSC) Reasoning: The Balanced Scorecard (BSC) is a strategic planning and management system that can track performance metrics and link them to the company's overall strategy. By using BSC, FlightByNight can:

- **Track** individual performance of Airplane Build Analysts.
- **Measure** key performance indicators (KPIs) related to quality, speed, and customer satisfaction.
- **Align** employee performance with company goals and customer expectations.
- **Analyze** and interpret feedback to identify areas for improvement.

BSC provides a structured approach to performance management, ensuring continuous improvement and alignment with strategic objectives.

Conclusion

By applying these specific techniques to address the identified problems, FlightByNight can enhance its operational efficiency, ensure consistent product quality, and improve its competitive position in the marketplace. These techniques are tailored to tackle each problem effectively, providing a clear path for improvement and growth.

Problems	**Techniques**
Inconsistent Quality and Variability in Performance	Six Sigma - DMAIC Reasoning
Lack of Process Documentation and Standard Operating Procedures (SOPs)	Control Chart
Inefficient Order and Inventory Management	Digital Order Management System (incorporating SIPOC) Reasoning
Inadequate Performance Tracking and Feedback Mechanism	Balanced Scorecard (BSC) Reasoning

In detail:

What techniques learned in this course (coupled with other key ITBA program courses) will help the company in terms of addressing EACH of these four problems? Please state what techniques would help the company compete and the reasons why these would help (and which problem(s) will each technique help with?

Problem1: **Inconsistent Quality and Variability in Performance**

Technique – Six Sigma DMAIC

- **Define** – the problem – in operational terms. "project scoping" (Week 9, PPt , slide 18). Should also define what needs to be done, by whom, and by when

  How "Define" helps:

  - Problem statement: Customers' satisfaction and competitive position are impacted by paper airplanes' inconsistent flight performance, which varies significantly in the distance flown.
  - Objectives: Lower flight performance variability by X% and increase consistency to either match or surpass the performance of the competition.

  Why "Define" helps:

  Clearly defining the issue and establishing quantifiable objectives give the improvement efforts a targeted course. This guarantees that the goal of lowering variability and raising quality is shared by all team members and stakeholders.

- **Measure**: How to measure the processes

  How "Measure" Is Useful

  Data Collection: Compile information on the performance of both Standard and Step-Up designs of paper airplanes, such as flight distances. Determine important metrics like mean, standard deviation, and range by measuring variability.
  Present Procedure: Draw a flow chart of the current process and note any possible sources of variation.

  Why "Measure" helps:

  Measuring establishes a baseline knowledge of the degree of variability and the present performance levels. This information is essential for determining the underlying reasons of discrepancies and assessing the results of any modifications that have been made.

- **Analyze:** "Why" do the defects occur; plus validation (through experiment). We study the problem in detail.

  How "Analyze" Is Useful

  Root Cause Analysis: Examine the underlying causes of variability using techniques like Pareto analysis and fishbone diagrams (also known as ishikawa diagrams). Analysing elements like paper quality, folding methods, and builder proficiency may be necessary for this.

  Statistical Analysis: Use regression analysis and hypothesis testing to ascertain the effects of various variables on performance.

  Why "Analyze" helps:

Analysis, as opposed to only treating symptoms, aids in comprehending the root causes of the issue. Reducing variability and establishing consistent quality requires targeted improvements, which can only be accomplished by identifying the core reasons.

- Improve: Idea gathering, plus confirming that proposed solutions will positively impact key process variables and CTQ's

How "Improve" Is Useful

Solution Development: Create and put into action plans to reduce or eliminate causes of variability based on the analysis. This could entail standardizing folding methods, enhancing builder education, or altering the design for enhanced functionality.

Pilot Testing: To ensure the new solutions are effective and make any necessary improvements, do pilot tests using them.

Why "Improve" helps:

The improvement phase concentrates on workable, data-driven fixes that deal with the found core problems head-on. Putting analysis-based improvements into practice guarantees that the solutions are efficient in lowering variability and raising quality.

- Control: focuses on how to ensure performance does not deteriorate over time ("monitor")

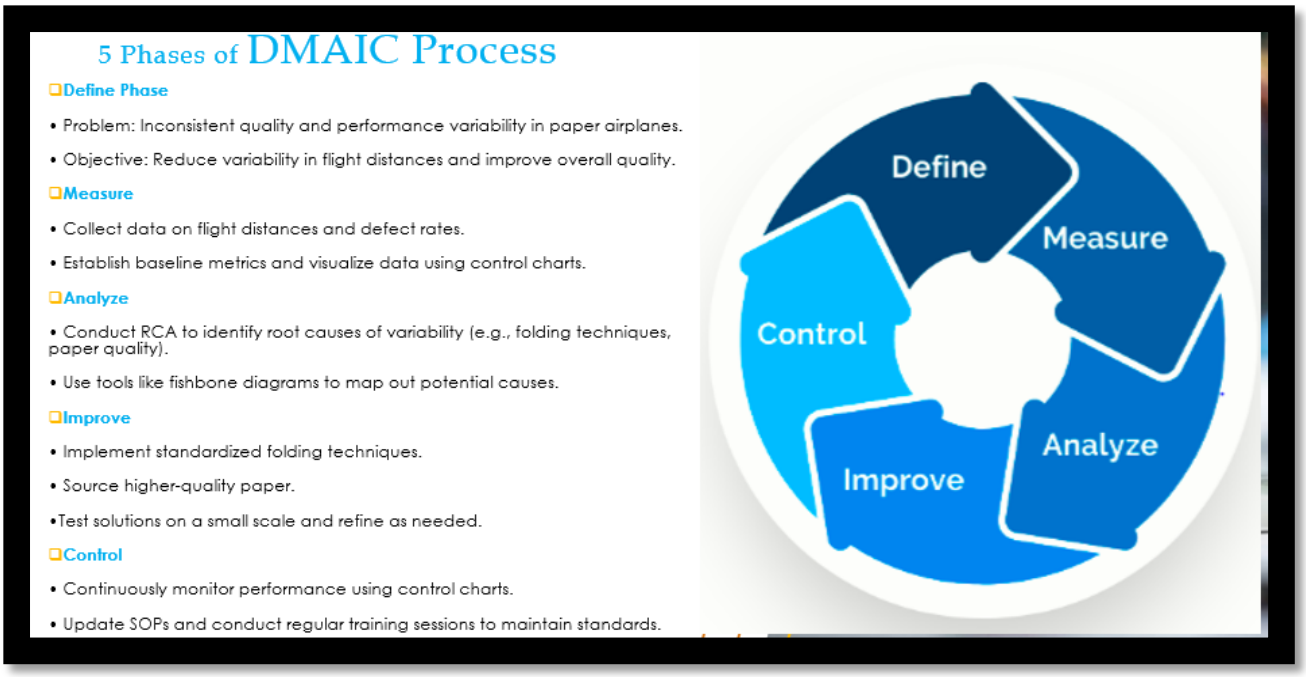
How "Control" Is Useful:

Monitoring: To make sure that performance is constant and within intended bounds, set up control charts and continuous monitoring procedures.

Records and Instruction: To guarantee that all Airplane Build Analysts adhere to standard operating procedures and practices, update Standard Operating Procedures (SOPs) and offer training.

Why "Control" helps:

The control phase ensures that gains are long-lasting rather than just transient. Maintaining constant quality and performance and limiting the recurrence of variability concerns are made possible by routine monitoring and revised processes.



(Conestoga College, 2024b, p.32)

Problem: Lack of Process Documentation and Standard Operating Procedures (SOPs)

Using Control Charts: Control charts are a fundamental tool used in quality control to monitor processes and ensure they remain within defined limits. Implementing control charts can help FlightByNight identify and reduce variability in their paper airplane construction process, leading to more consistent outcomes.

How Control Charts Address the Problem:

Establish Baseline Performance:

By collecting data on the dimensions and performance (e.g., flight distance) of paper airplanes produced by different analysts, the company can establish a baseline for what is considered "normal" performance.

Monitor Consistency:

Control charts will allow the company to continuously monitor the production process. Any variations or deviations from the baseline can be quickly identified.

Identify Variations:

The control chart will highlight when the process is going out of control, i.e., when measurements fall outside of the control limits. This can indicate issues such as inconsistent folding techniques or variations in materials.

Implement SOPs:

With the insights gained from control charts, the company can develop standard operating procedures (SOPs) to ensure all analysts follow the same high-quality processes. SOPs can standardize the folding, cutting, and assembly techniques, leading to reduced variability.

Continuous Improvement:

Control charts facilitate continuous improvement by identifying specific areas where the process can be refined. Over time, the company can adjust the SOPs based on data-driven insights, leading to incremental improvements in quality and consistency.

Steps to Implement Control Charts for FlightByNight:

Data Collection:

Collect data on key parameters of the paper airplanes (e.g., wing span, body length, weight, and flight distance) produced by different analysts.

Establish Control Limits:

Calculate the mean and standard deviation of the collected data to establish control limits. These limits will define the acceptable range of variation for the process.

Create Control Charts:

Plot the collected data on control charts with the established control limits. Use different charts for different parameters if necessary (e.g., an X-bar chart for average flight distance, R-chart for range of flight distances).

Monitor and Analyze:

Regularly update the control charts with new data and analyze any points that fall outside the control limits. Investigate the causes of these variations and take corrective actions.

Develop SOPs:

Based on the findings from the control charts, develop and document standard operating procedures that all analysts must follow. Include detailed instructions on folding, cutting, and assembly techniques.

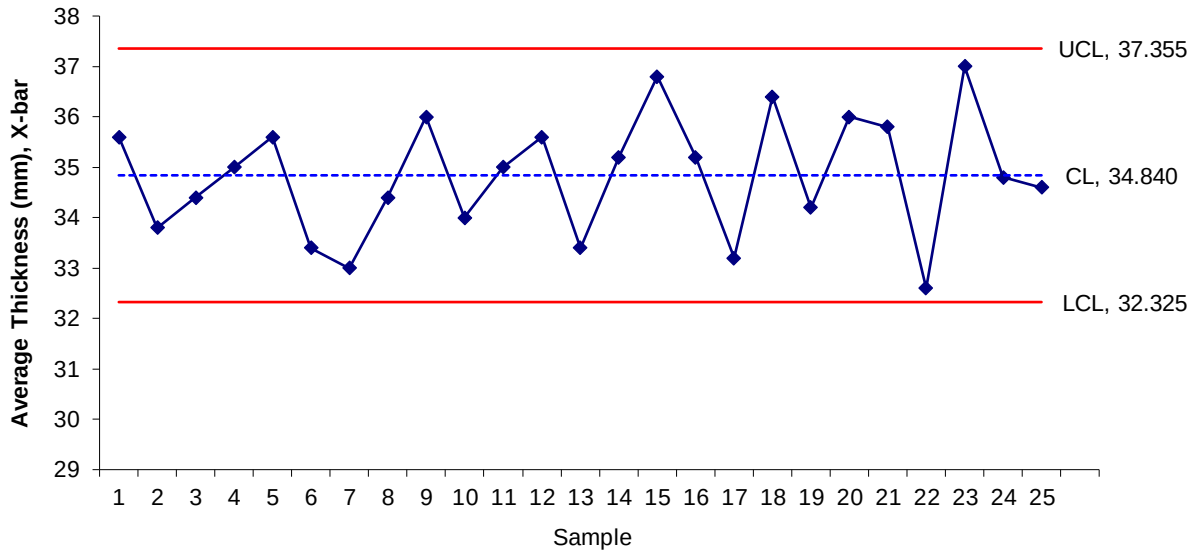
Training:

Train all analysts on the new SOPs and the importance of following them to ensure consistency and quality.

Continuous Monitoring:

Continue using control charts to monitor the process and make adjustments to the SOPs as needed to maintain high-quality standards and consistency.

By implementing control charts, FlightByNight can systematically reduce process variability, leading to more consistent and high-quality paper airplanes, thereby addressing the key issue of inconsistent quality and improving their competitive position in the marketplace.



(Conestoga College, 2024d, p. 30) (Vertex42.com, 2024, p. 1)

Problem 3: Inefficient Order and Inventory Management

Technique: **SIPOC (Suppliers, Inputs, Process, Outputs, Customers)**

SIPOC is a tool that helps to map out a process at a high level and pinpoint important components that affect how well it performs. It aids in comprehending the entire process flow from suppliers to consumers, emphasizing potential inefficiencies.

Steps to Implement SIPOC:

1. Suppliers:

- List every supplier that is engaged in the process of managing orders and inventory.
- Paper suppliers, packing suppliers, couriers are a few examples.

2. Inputs:

- Enumerate every input that the procedure needs.
- Order forms, paper supplies, packing materials, and inventory information are a few examples.

3. Process:

- Draw out the complete sequence of events starting with order receipt and ending with inventory control and order fulfillment.

Actions:

1. A customer order is received by the sales and service staff.
2. The manager of the airplane build analyst receives the order form.
3. Paper airplanes are built and tested by airplane build analysts.
4. Orders that are completed are added to the inventory.

5. Customer orders are fulfilled and processed orders are checked by the sales and service team.
6. Orders are prepared for courier pickup and packaged.

4. Outputs:

- Identify the outputs of the process.
- Examples: Completed customer orders, inventory updates, packaged products ready for shipping.

5. Customers:

- Identify the end customers of the process.
- Examples: Customers who place orders for paper airplanes, internal stakeholders such as the Sales and Service team.

Benefits of SIPOC:

• Clarity: Gives a concise synopsis of the whole procedure, emphasising all important components.

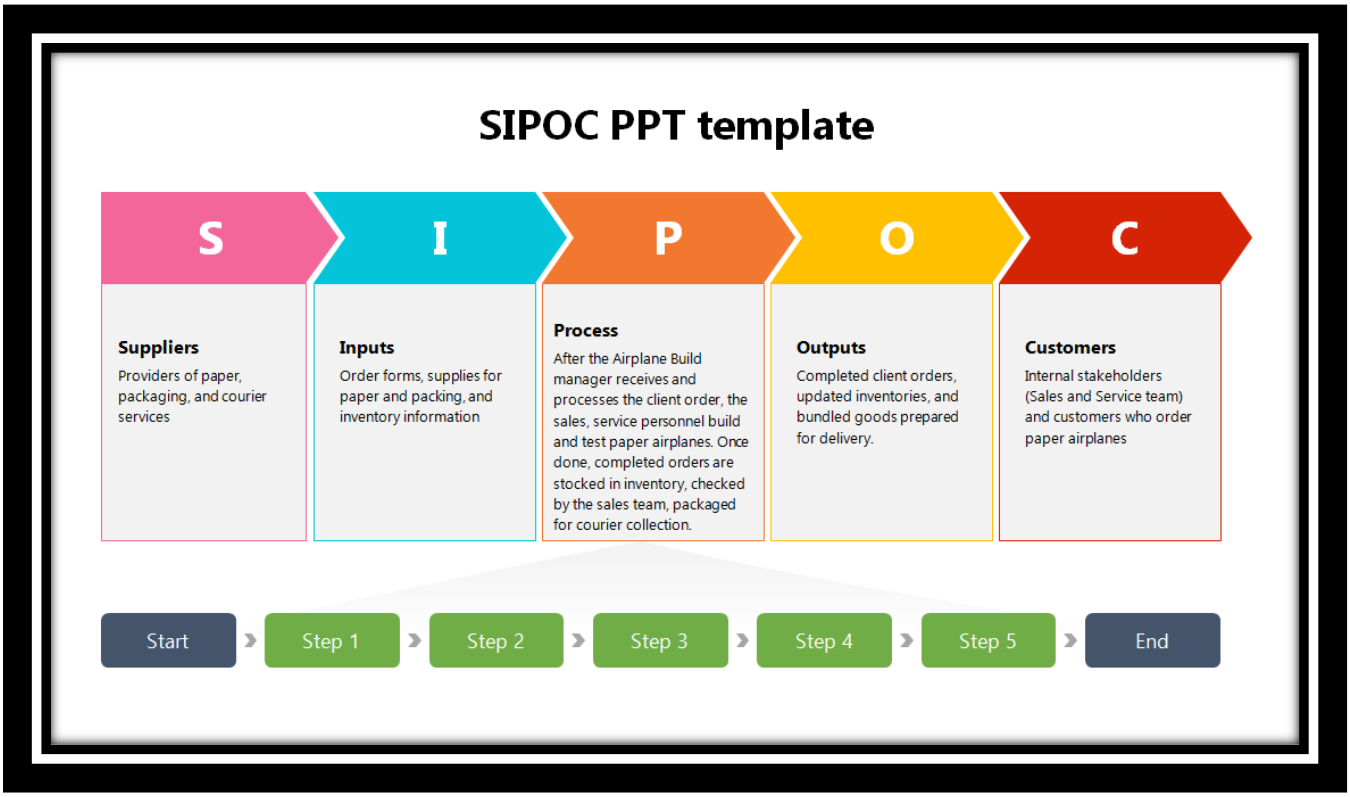
• Identification of Inefficiencies: Assists in locating order and inventory management process bottlenecks and inefficiencies.

• Better Communication: By giving team members a common understanding of the procedure, this promotes improved communication.

• Process Improvement Foundation: Serves as a starting point for more thorough process analysis and improvement projects.

Element	Details
Suppliers	Providers of paper, packaging, and courier services
Inputs	Order forms, supplies for paper and packing, and inventory information
Process	1. The customer order is received by the sales and service staff. 2. The manager of the Airplane Build Analyst received the order form. 3. Paper airplanes are built and tested by aircraft build analysts. 4. Orders completed and stocked in inventory 5. The sales and service team completes customer orders and verifies that they have been processed. 6. Packaged orders that are ready for courier collection
Outputs	Completed client orders, updated inventories, and bundled goods prepared for delivery.
Customers	Internal stakeholders (Sales and Service team) and customers who order paper airplanes

FlightByNight can identify inefficiencies, obtain a thorough understanding of its order and inventory management process, and create focused solutions to optimise operations and boost overall efficiency by putting SIPOC into practice.



(Conestoga College, 2024e, p. 10)

Problem 4: **Inadequate Performance Tracking and Feedback**

Technique: Balanced Scorecard

In order to give a more complete picture of organizational success, the balanced scorecard is a framework for measuring performance that combines financial and non-financial criteria. It is separated into four viewpoints:

- Financial Perspective: Metrics that show the company's financial health.
- Customer Perspective: metrics that assess retention and satisfaction.
- Internal Business Processes: Metrics used to monitor the effectiveness and calibre of internal operations.
- Learning and Growth: Metrics centered on company culture, staff development, and training.

Using FlightByNight's Balanced Scorecard:

1. **Financial Perspective**

Goal: Lower quality variability in paper airplanes to increase profitability.

Metrics: Price per unit for both step-up and conventional designs.
Growth in revenue from sales of reliable, high-quality aircraft.
Decrease in the price of returns or complaints.

2. **Customer Perspective**

Goal: Increase client retention and happiness by producing paper airplanes that are of a high caliber every time.

Measures: Survey results pertaining to customer satisfaction.
number of returns or complaints from customers citing subpar quality.
Rate of customer retention.

3. **Internal Business Processes**

Objective: Enhance the efficiency and consistency of the paper airplane manufacturing process.

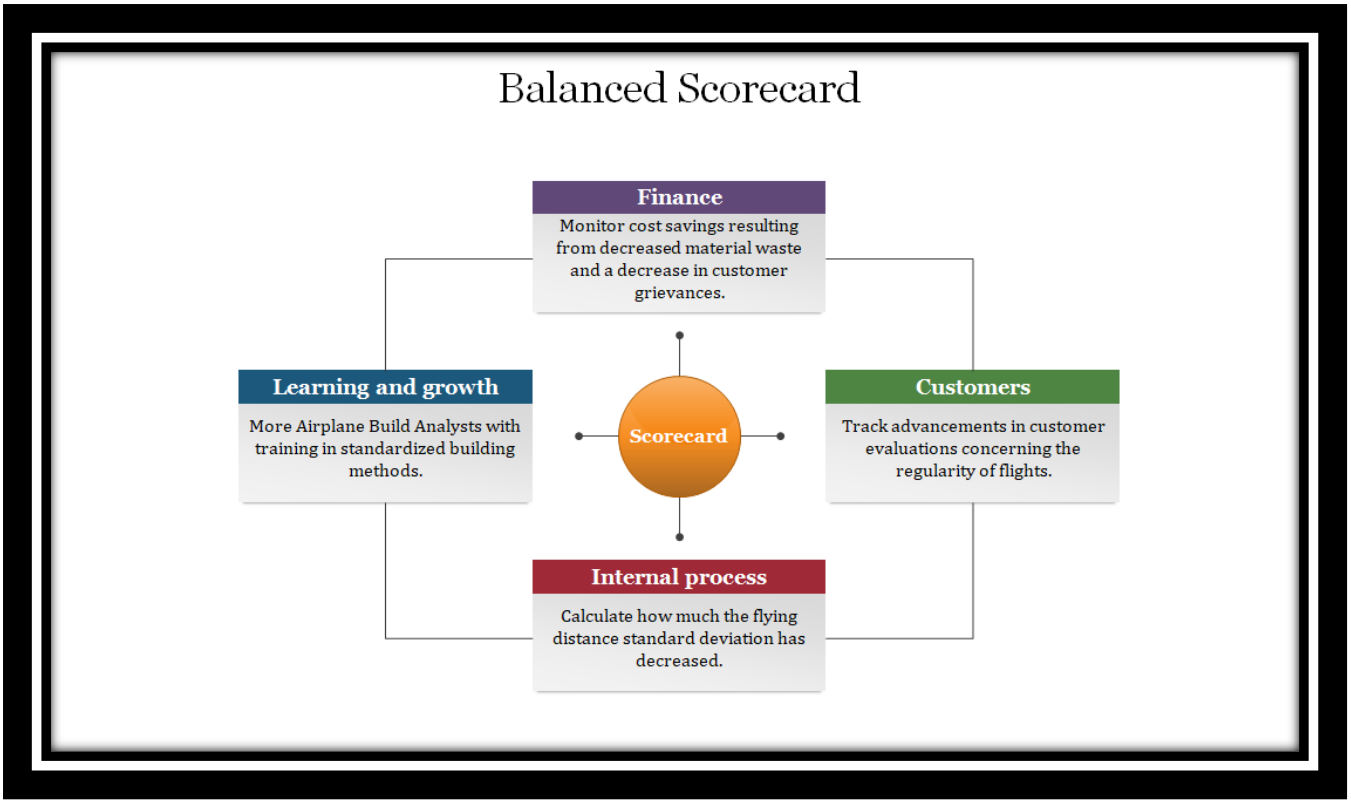
Measures:
Variability in flight distance (standard deviation) of paper airplanes.
Time taken to build and test each paper airplane.
Number of defective airplanes produced.

4. Education and Development

Goal: Encourage staff members to have a culture of ongoing skill growth and improvement.
Metrics: Total number of Airplane Build Analyst training sessions held.
Scores for employee engagement and satisfaction.
rate at which new methods and instruments for raising quality are adopted.

Goal: Make the flying distance of paper airplanes less variable.

Financial Perspective: Monitor cost savings resulting from decreased material waste and a decrease in customer grievances.
Customer Perspective: Track advancements in customer evaluations concerning the regularity of flights.
Internal Business Processes: Calculate how much the flying distance standard deviation has decreased.
Learning and Development: More Airplane Build Analysts with training in standardized building methods.



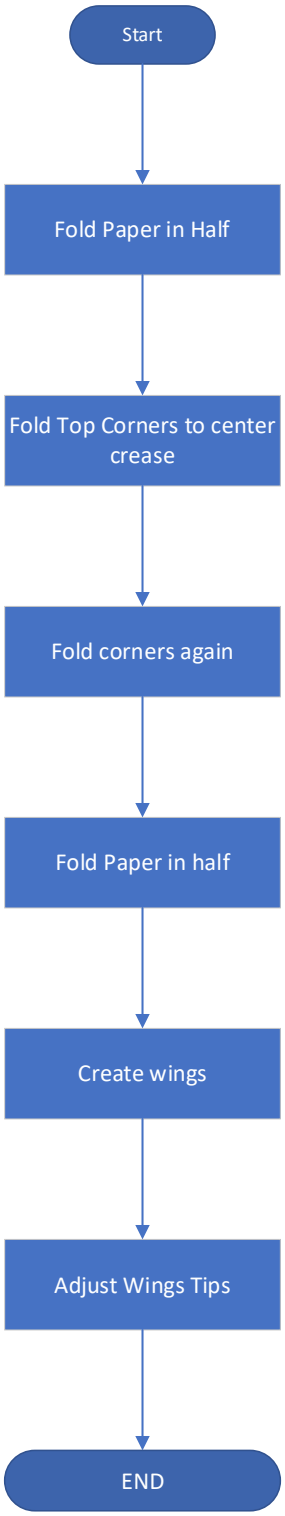
(Conestoga College, 2024b, p.32)

Flowcharts

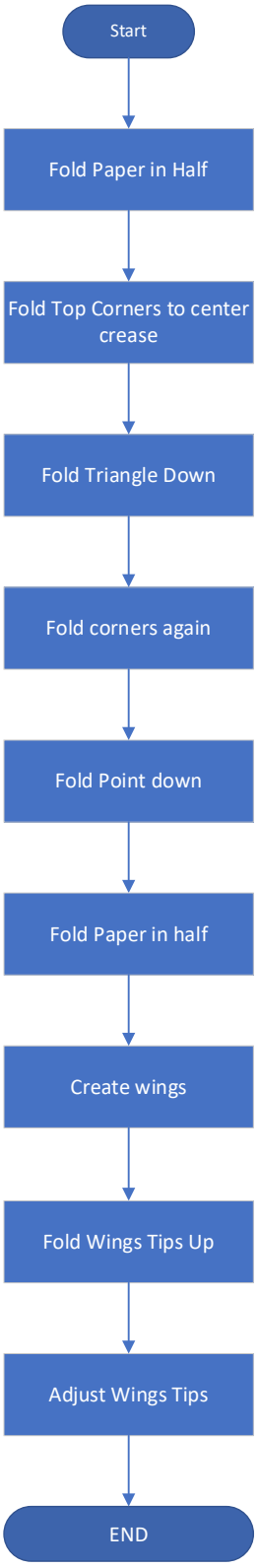
1. Classic Model
2. Advanced/ Step Up Model

Here, we can observe that steps 3, 5 & 8 in Advanced model are additional when comparing to classic model.

Folding a Classic Paper Airline



Folding a Advanced Paper Airline



4). One of the key problems (reported by the customers) is the variation in the flying distance for each delivered paper airplanes; some fly for 20 feet while others only go for 8 feet or less. Each paper airplane costs the same amount (for the same design), and it is unknown the length of time that it has taken to make each nor does the company know who the Airplane Build Analyst was. The customer cannot understand why there is such a HUGE variation in quality when they all cost the same amount for the same design.

It appears this problem of variability is the case for both the Standard and Step-Up design – but the customer is willing to view a valid variability analysis that may indicate otherwise.

Your job in part 4 is to find solutions to the variability and inconsistency problems that the company is experiencing in the paper airplane design.

Included will be :

- Each team member builds a paper airplane according to the design (see link above for the current designs). Note to provide valid statistical data there should be a minimum of three planes for the Standard and the step-up design.
- If, for any reason, your team decides on an alternate design – this needs to be included in your part's 2 and 3 above (as a problem/solution) and backed up by required supportive text.
- Test results for 5 flights of each airplane built by each team member (showing scatter plots or bar charts for all 5 throws for each paper airplane built by a team member.
- Your team will select the team member's paper airplane design which:
    - have the lowest standard deviation between throw attempts (for the five throws of each plane)
    - – ALL paper airplanes thrown by the same team member per airplane build design. Throwing feature is to throw at a ZERO degree (horizontal) and at the same speed (which is why the 5 attempts – to get an average) – see exception below for those students out of COUNTRY.
- Your team will also outline the differences in variation between the Standard and the Step-Up design. It is important from a strategic point of view to provide an assessment on whether the company continues with two design or a single design as they move forward.
- Although each team member builds at least one paper airplane you only have ONE person testing the flying capabilities. It is important for the "test flier" to (as much as possible) send the plane out horizontally and at the same speed each and every throw.
- For any team member who is remotely located – that team member will need to follow the instructions for their design and measure the distance themselves – communicating the distances flown (5) and the design features (if selected)
- Your objective is to determine variability in design

- As well document, what are the common causes of variation and what are the specific causes of variation for the paper airplane build that your team selects.
- As well, create a FISHBONE diagram where your team will investigate the root causes in variation between the 4 (or 5) different team member's paper airplanes (minimum of 6 planes). Ensure that you have coverage of each category in the 6M's
- Your "final design" selected will be the design which has the lowest standard deviation (for the 5 flights). This "final design" may be based on the Standard or the Step Up design, and it is important to determine/document what about the chosen airplane differentiates it from the other paper airplanes tested.

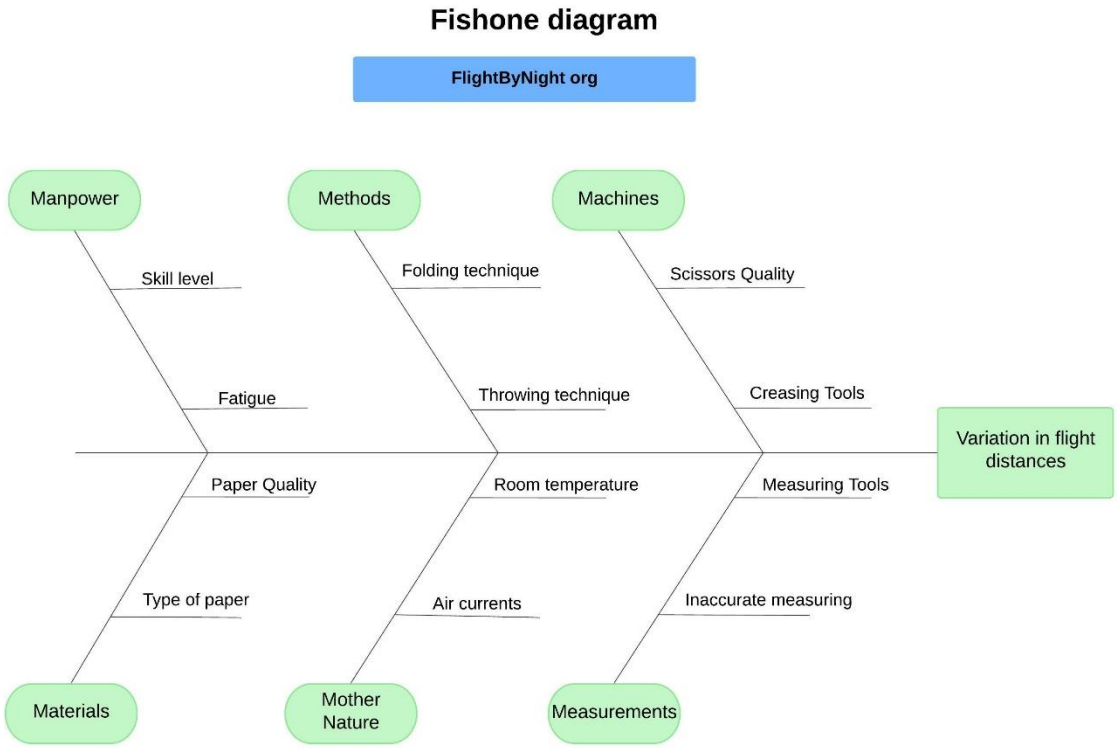
25 marks

Observations collected from practical conducted with team: (in feet)

Tester	Design	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5	Mean	Variation	Standard deviation
Vash	Classic	17	18	17	19	18	17.80	0.70	0.837
Vash	Classic	16	17	17	16	18	16.80	0.70	0.837
Vash	Classic	18	19	18	17	17	17.80	0.70	0.837
Neha	Classic	15	14	15	16	14	14.80	0.70	0.837
Neha	Classic	16	15	16	15	15	15.40	0.30	0.548
Neha	Classic	17	16	17	16	17	16.60	0.30	0.548
Aniket	Classic	18	19	18	17	19	18.20	0.70	0.837
Aniket	Classic	17	16	18	17	16	16.80	0.70	0.837
Aniket	**Classic**	19	18	19	18	18	18.40	0.30	0.548
Gaurav	Classic	16	17	16	15	17	16.20	0.70	0.837
Gaurav	Classic	17	18	17	16	18	17.20	0.70	0.837
Gaurav	Classic	18	19	18	17	18	18.00	0.50	0.707
Vash	Step-Up	12	11	14	13	12	12.40	1.30	1.140
Vash	Step-Up	11	13	11	13	15	12.60	2.80	1.673
Vash	Step-Up	14	12	11	15	10	12.40	4.30	2.074
Neha	Step-Up	11	10	13	12	13	11.80	1.70	1.304
Neha	Step-Up	13	12	10	14	12	12.20	2.20	1.483
Neha	Step-Up	12	11	14	12	10	11.80	2.20	1.483
Aniket	Step-Up	13	12	15	14	11	13.00	2.50	1.581
Aniket	Step-Up	11	14	12	13	10	12.00	2.50	1.581
Aniket	Step-Up	12	10	11	14	10	11.40	2.80	1.673
Gaurav	Step-Up	13	12	15	14	12	13.20	1.70	1.304
Gaurav	Step-Up	12	13	12	12	15	12.80	1.70	1.304
Gaurav	Step-Up	14	12	13	15	11	13.00	2.50	1.581
							18.40	**0.3**	**0.548**
							Maximum	**Minimum**	**Minimum**

Fishbone Diagram (Ishikawa Diagram) to Investigate Root Causes of Variation:

We'll create a Fishbone diagram to investigate the root causes of variation in the flight distances of paper airplanes built by the four different team members. The diagram will cover the 6Ms: Manpower, Methods, Materials, Machines, Measurements, and Mother Nature (Environment).



Analysis of Fishbone Diagram (Conestoga College, 2024b, p.32)

Manpower:

- **Skill Level:** Different team members may have varying levels of experience and skill in folding paper airplanes.
- **Fatigue:** Tiredness can affect the precision and consistency of folds and throws.

Methods:

- **Folding Technique:** Different techniques can result in variations in the airplane's structure and aerodynamics.
- **Throwing Technique:** Variations in how the airplane is thrown can affect the flight distance.

Materials:

- **Paper Quality:** Variations in paper thickness, texture, and stiffness can affect performance.
- **Type of Paper:** Different types of paper may have different properties affecting flight.

Machines:

- **Scissors Quality:** Poor-quality scissors can result in imprecise cuts.
- **Creasing Tools:** The absence or poor quality of creasing tools can result in inconsistent folds.

Measurements:

- **Inaccurate Measuring:** Inconsistent measurements for folds and cuts can lead to variations in the airplane's structure.

Mother Nature (Environment):

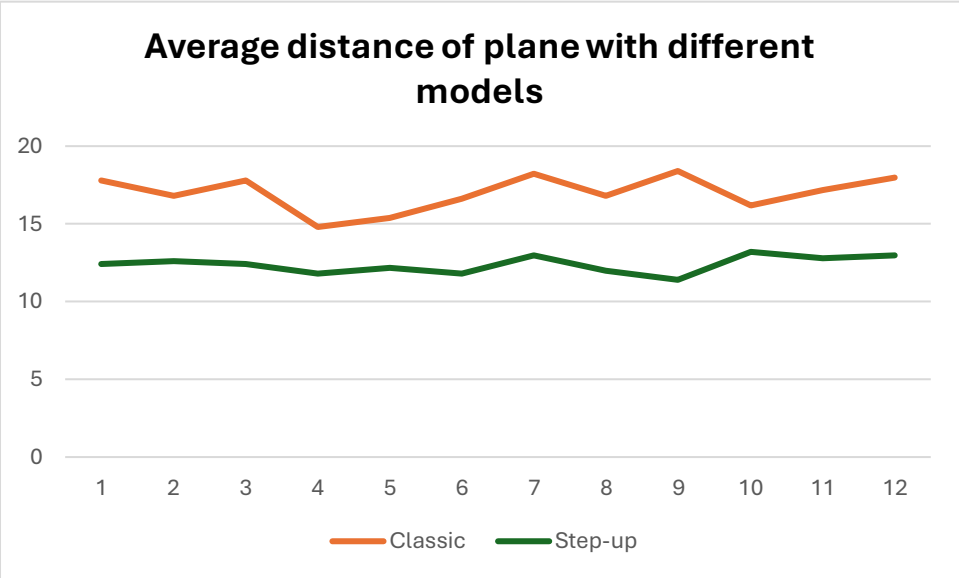
- **Air Currents:** Variations in air currents within the room can affect the flight distance.
- **Room Temperature:** Temperature can affect the paper's properties and performance.

- Rounding up average for distance in feet:

Trials	Classic	Step-up
1	18	12
2	17	13
3	18	12
4	15	12
5	15	12
6	17	12
7	18	13
8	17	12
9	18	11
10	16	13
11	17	13
12	18	13

Average of all trials			
model	distance	Variance	Standard deviation
classic	17	0.03	0.130
step up	12	0.61	0.243

Comparison chart from both models:



Classic model travels longer distance with less variance and standard deviation compared to Step up model.

Summary and Analysis From the data provided:

- The Classic design has consistently lower standard deviations (0.84 for all testers) compared to the Step-Up design, indicating less variability in flight distances.
- The Classic design also has higher mean distances, suggesting better overall performance.

So, we recommend **continuing classic model only**.

5). Now that your team has selected the design which will have the lowest variation out of your set of planes.

- Document the design features which differentiate this design from the others in your team

Selected Design: Classic Design by Aniket

Documenting the Design Features

After thorough testing and analysis, the design by Aniket for the Classic paper airplane has been selected as the final design due to its lowest standard deviation in flight distances. This indicates that Aniket's design is the most consistent and reliable. Below are the documented design features that differentiate Aniket's Classic design from the others:

1. **Precision in Folding:**
   - **Symmetrical Folds:** Aniket's Classic design features highly precise and symmetrical folds, ensuring balanced weight distribution and consistent aerodynamic properties.
   - **Sharp Creases:** The folds are made with sharp creases, which contribute to the plane's stability during flight and prevent deviations in its trajectory.
2. **Wing Design:**
   - **Even Wing's span:** The wings of Aniket's Classic design are evenly folded and aligned, providing uniform lift and reducing variability in flight performance.
   - **Consistent Wing Angles:** The angles at which the wings are folded are consistent, ensuring that the lift generated is uniform across all flights.
3. **Nose Design:**
   - **Reinforced Nose:** The nose of the plane is reinforced with multiple layers of paper, which helps in maintaining the structure during flight and impacts, leading to more consistent flight distances.
   - **Sharp Nose Tip:** A sharp nose tip helps in reducing air resistance and contributes to a longer and more stable flight path.
4. **Body Structure:**
   - **Tightly Folded Body:** The body of Aniket's Classic design is tightly folded, minimizing air resistance and providing a streamlined shape that enhances flight distance.
   - **Balanced Weight Distribution:** The weight is evenly distributed along the body of the plane, ensuring that it does not tilt to one side during flight.
5. **Stabilizers:**
   - **Small Tail Folds:** Small, precise tail folds act as stabilizers, preventing the plane from veering off course and ensuring a straight flight path.
   - **Consistent Tail Angles:** The angles of the tail folds are consistent across all planes, contributing to uniform aerodynamic performance.

6. **Paper Quality:**
    - **Uniform Paper Thickness:** The paper used in Aniket's design has a consistent thickness, which prevents variations in weight and ensures reliable performance.
    - **High-Quality Paper:** Using high-quality, durable paper reduces the likelihood of damage during folding and flight, contributing to consistent results.

Differences from Other Team Designs

1. **Vash's Classic Design:**
    - **Less Precise Folds:** Vash's design had slightly less precise folds, leading to minor imbalances in the plane's structure.
    - **Inconsistent Wing Angles:** Variations in the angles of the wings contributed to less stable flight paths.
2. **Neha's Classic Design:**
    - **Uneven Wing's span:** Neha's design had slight variations in the wing's span, affecting the lift and causing variability in flight distances.
    - **Weaker Nose Structure:** The nose was not as reinforced, leading to structural weaknesses during flight.
3. **Gaurav's Classic Design:**
    - **Imbalanced Weight Distribution:** Gaurav's design had minor imbalances in weight distribution, leading to deviations in flight trajectories.
    - **Less Consistent Creases:** The creases were not as sharp, resulting in less aerodynamic stability.

Conclusion

Aniket's Classic design was selected due to its superior consistency in flight distances, as indicated by the lowest standard deviation among all tested designs. The precision in folding, symmetrical wing design, reinforced nose, balanced body structure, small tail folds, and use of high-quality paper collectively contribute to its reliable performance. Documenting and standardizing these design features will help FlightByNight achieve more consistent quality and meet customer expectations more effectively.

- Update your "as-is" business process to ensure that all the paper airplanes produced will now match what your team recommends in terms of design(s).

Updated "As-Is" Business Process for FlightByNight

Objective: Ensure all paper airplanes produced match the recommended design by standardizing the process to reduce variability and enhance quality.

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1. Order Reception and Processing:

- **Current State:** Orders are received via a standard customer order form, which is filled out by the Sales and Service team and sent via inter-office mail to the Airplane Build Analyst manager.
- **Updated Process:**

- **Digital Order System:** Implement a digital order management system to streamline order reception and reduce errors. The system will automatically assign orders to the Airplane Build Analysts and track progress.

2. Design Standardization and Documentation:

- **Current State:** No standardized design documentation.
- **Updated Process:**
  - **Design SOPs:** Develop and document standard operating procedures (SOPs) for the construction of paper airplanes based on Aniket's Classic design.
  - **Training Manual:** Create a comprehensive training manual with step-by-step instructions and visual aids to ensure all analysts follow the same design process.

3. Production Process:

- **Current State:** Each analyst follows their own methods, leading to variability.
- **Updated Process:**
  - **Standardized Steps:** All analysts will follow the same standardized steps for folding, cutting, and assembling paper airplanes as per the documented SOPs.
  - **Quality Control Checkpoints:** Introduce quality control checkpoints at critical stages of production to ensure adherence to the design standards.

4. Quality Control and Testing:

- **Current State:** No systematic quality control or performance tracking.
- **Updated Process:**
  - **Control Charts:** Use control charts to monitor the dimensions and flight performance of paper airplanes. Establish control limits based on the standard deviation from the test results.
  - **Performance Testing:** Conduct performance testing (five flights per plane) for a sample of each batch to ensure consistency. Record the results in a centralized database.

5. Feedback and Continuous Improvement:

- **Current State:** No system to trace feedback to specific builds or builders.
- **Updated Process:**
  - **Feedback System:** Implement a feedback system where customers can provide feedback linked to specific order numbers. This feedback will be traced back to individual analysts and batches.
  - **Continuous Improvement:** Use the feedback and performance data to continuously refine the SOPs and address any sources of variability.

6. Order Fulfillment and Shipping:

- **Current State:** Orders are manually fulfilled using sticky notes and inter-office communication.
- **Updated Process:**

- **Automated Fulfillment System:** Integrate the digital order management system with inventory management. Automate the order fulfillment process to reduce errors and speed up delivery.
- **Packaging Standards:** Standardize packaging procedures to ensure all airplanes are protected during transit and arrive in perfect condition.

Flowchart of Updated "As-Is" Business Process:

Step 1: Order Reception

- Customer places an order via the digital system.
- Sales and Service team reviews and confirms the order.

Step 2: Order Assignment

- Digital system assigns the order to the Airplane Build Analyst manager.
- Manager distributes orders to analysts based on workload.

Step 3: Production Process

- Analyst follows documented SOPs for folding, cutting, and assembling.
- Quality control checkpoints ensure adherence to design standards.

Step 4: Quality Control and Testing

- Conduct performance testing (five flights per plane).
- Use control charts to monitor and record data.

Step 5: Feedback Collection

- Customer feedback linked to order numbers.
- Feedback analyzed and used for continuous improvement.

Step 6: Order Fulfillment and Shipping

- Automated order fulfillment.
- Standardized packaging procedures.

Conclusion:

By implementing these updated processes, FlightByNight can ensure that all paper airplanes produced will match the recommended design, leading to reduced variability, consistent quality, and improved customer satisfaction.

Business Process

- Provide a conclusion that covers what your Group will recommend taking the FlightByNight paper Airplane Company to the future and keep it operational.

Future Recommendations for FlightByNight Paper Airplane Company

1. Enhance Product Consistency and Quality

- **Action:** Implement standardized design processes and detailed SOPs.
- **Impact:** Reduces variability, ensuring every airplane meets high standards.

2. Digital Transformation

- **Action:** Transition to a digital order and inventory management system.
- **Impact:** Streamlines operations, reduces errors, and speeds up order fulfillment.

3. Strengthen Quality Control

- **Action:** Establish robust quality control mechanisms, including control charts and performance testing.
- **Impact:** Consistent product quality and increased customer trust.

4. Invest in Employee Training

- **Action:** Develop comprehensive training programs based on standardized processes.
- **Impact:** Ensures all employees adhere to best practices, maintaining high production standards.

5. Improve Customer Engagement

- **Action:** Create direct feedback channels linked to customer orders.
- **Impact:** Enhances customer satisfaction and loyalty by addressing concerns promptly.

6. Conduct Regular Competitive Analysis

- **Action:** Analyze market trends and competitor strategies regularly.
- **Impact:** Keeps the company competitive and responsive to market changes.

7. Foster Innovation and Product Expansion

- **Action:** Explore new designs and materials; consider expanding the product line.
- **Impact:** Diversifies offerings, attracts new customers, and opens new revenue streams.

8. Develop Customer Loyalty Programs

- **Action:** Implement programs that reward repeat customers and engage them with the brand.
- **Impact:** Builds a loyal customer base and enhances long-term relationships.

9. Optimize Operational Efficiency

- **Action:** Use lean thinking and continuous improvement techniques to streamline processes.
- **Impact:** Reduces waste, improves efficiency, and lowers costs.

10. Enhance Marketing and Brand Awareness

- **Action:** Invest in marketing strategies that highlight the quality and uniqueness of FlightByNight's products.
- **Impact:** Increases brand visibility and attracts new customers.

Conclusion: By implementing these recommendations, FlightByNight can ensure consistent product quality, enhance operational efficiency, and improve customer satisfaction. Embracing digital transformation, continuous improvement, and innovation will position the company for sustainable growth and success in the competitive paper airplane industry.

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