Impact of Passenger Load Factor Variability on Average Daily Flight Kitchen Waste in Flight Catering Industry in Sri Lanka

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ABSTRACT

Globally, the airline catering industry produces 630 million meals a year. Variation between classes, the lengths of flights, time of day as well as special or dietary requirements. Food waste management and disposal is one of the most significant issues in the Flight Catering Industry. In this study, Impact of Passenger Load Factor Variability on Average Daily Flight Kitchen Waste in Flight Catering Industry in Sri Lanka was evaluated and identified the Potential Strategies to minimize the Food waste in Flight Kitchens.

The research was conducted in order to analyze, Impact of the Passenger Load Factor (PLF) Fluctuation within 24 Hours to the Estimated Time of Departure (ETD) of an Airline for the Average Daily Flight Kitchen Waste in Flight Kitchen based on the Historical Data of 14 International Airlines, catered by Flight Catering Company. There was a Variability in the Initial Passenger Loads and the Final Passenger Loads provided by the Customer Airline and this has Created uncertainty in the Production Floor. The average daily kitchen Waste per Meal fluctuate throughout the year varying the average Profit margin.

Initial Passenger Load Factor, Final Passenger Load Factor, Passenger Load Factor Variability and Number of Meals Catered per Day are Independent Variables, and the Dependent Variable is Production Waste per Meal (kg). A combination of Descriptive Research, Correlation research and Applied Research were used as Research methods. The population for this study was all the Airlines catered from July to October 2017. The Stratified and Judgmental sampling techniques was used for Sampling Procedure.

Selected Sample for the Study is 75% Percent of Total Meals and the 80% of the Sectors of the Research Period. The Flight Loads data were collected using secondary data collection method and the Production Waste using Primary Data Collection Method. The Data analysis was done using the MINITAB statistical Software. The descriptive data analysis, Simple Linear Regression, Pearson Correlation Coefficient were mainly used in data analysis.

The Production Waste per Meal is reducing with the Increase of the Number of meals per day. The Demand Uncertainty has significantly affect the increase of Waste in the Production Area. The Minimum Waste per Meal has achieved when the Initial Passenger Load factor was 100%.

Irrespective of the month, the Pattern of the Average daily meal count of the Week Day has continued over the period of the research. The highest fluctuations has occurred in the Short Sector Flights. The Business Class Load factor Variance is Minimum in the months which represents the highest Load Factor of the Period of the Research. The Average Pax Loads for all the Classes of the both Airlines has Increased (Positive Variance) representing that the Risk of the increasing of the Loads within Last 24 hours has transferred to the Caterer by the Airline. The Airline has not given a significant provision for potential Load Increases when they place the initial Order to the Caterer. This creates Production Uncertainty whereas the caterer has to take the risk of Last minutes top-ups in advance and produce more than the Initial Order Placed by the Airline creating the Supply Chain Bullwhip effect.

Per meal highest waste and the Standard Deviation was represented by Pre Production area. Minimum waste per Meal and the Standard Deviation was represented by the Confectionery. The highest portion of the average Waste per meal has generated by the Vegetable room then the Hot Kitchen. Total Average Waste per meal has followed the popular Pareto Theory which is 80% of the Average Waste per meal has generated from the Pre-Production (Vegetable Room and Butchery) and the balance 20% has generated for the Other Kitchens (Hot Kitchen, Cold Kitchen, Confectionery and the Bakery). Each sub kitchens has reported the Lowest Average Waste per meal on the Peak period with highest Meal Count of the Research period. The Highest waste has reported in the off-Peak Months. The provision for the potential increases has caused the Average waste per meal due to the uncertainty in the production line, due to the non-availability of an accurate forecast for Final Passenger Loads.

Per Meal Waste Variation was high in Pre- Production (Vegetable Room and Butchery), because multiple factors have affected the Pre- Production Waste such as Seasonality, Quality of the Raw Material. The First Class Meal which has led to an increase of the waste, because the kitchens produce customized products for the First Class Meals with less Standardization and the Lack of mass Production and the practice of Production for First Class Meals.

The Hypothesis test reveals that the Mean Waste per Meal values of Different Sectors are Equal, Mean Waste per Meal values of Different Months are Not Equal, The Mean Waste per Meal values of Week Days are Not Equal. The Pearson Correlation Analysis represents, the Pre-preparation in

Vegetable Room and butchery has minimized the risk of increasing the Loads at the Last 24 hours by producing for Configuration (Full Passenger Loads). The Impact of the Variability of the Passenger Load Factors was very minimum for the Average Waste per Meal in Confectionery and Bakery Compared to hot kitchen and Cold kitchen due to the sensitivity of the Outputs, Standardization and the number of Components and the processes of the Meals.

The risk of waste generated by not increasing the Passenger Loads will have to bear by the Caterer according to the Current Situation. The supply chain uncertainty has created the producer to produce more than the Initial Passenger Loads to cater the passenger load increases in last 24 hours to the estimated time of Departure. All the factors analyzed are scientifically significant for the total Waste in Production Department, indicates that the importance of developing a method to control the Uncertainty in the Production department on Passenger Loads of Customer Airlines.

The Study Recommended to Develop a Proper Forecasting System and Implement a Meal Bank (Standard Meal Store to Cater the Late Additions) system to Minimize the Production Waste with Strategic Menu Planning.

Keywords: Food waste, Flight Catering Industry, Passenger Load Factor, Variability, Initial Pax Load, Final Pax Load, Estimated Time of Departure

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LIST OF ACRONYMS

PLF - Passenger Load Factor

ETD - Estimated Time of Departure

ATD - Actual Time of Departure

FC – First Class

BC – Business Class

PEY – Premium Economy Class

EY – Economy Class

SPML – Special Meals

CCP- Critical Control Points

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CHAPTER 1

INTRODUCTION

1.1. Background of the Study

Air transport provides economic benefits not just for its passengers and cargo shippers, but also for the wider economy by connecting businesses and individuals to global markets. Modern, just-in-time, global supply chains and multinational businesses are made possible by global airline networks.

The demand for air travel is sensitive to changes in air travel prices. Air transport is one of the world's fastest-growing industries. This is particularly the case in the fast growing Asia-Pacific region. Worldwide tourism and the international exchange of goods and services would not be possible without aircraft. There is no end in sight to this fast pace of development, as experts predict annual growth rates of 5 to 6 % for some years to come.

Aviation provides speedy worldwide transportation network which is vital part of the increasing globalized world economy, thus facilitating the growth of international trade and investment, tourism, and connecting people across different continents.

In the current competitive environment, some carriers are attempting to generate savings through efficiency improvements in their periphery operations. Savings generated from increased efficiency may be directed toward improving customer service. Inflight meal provisioning is one such area worthy of pursuit as it involves high volumes and significant costs, and has direct impact on customer service. (Jason Goto, 1999)

At the present time, the airline industry faces many cost pressures. The industry has made remarkable achievements in improving its efficiency. But cost pressures continue.

The passenger load factor (PLF): The passenger load factor of an airline, sometimes simply called the load factor, is a measure of how much of an airline's passenger carrying capacity is used. It is passenger-kilometers flown as a percentage of seat-kilometers available.

$$\textbf{Load Factor} = \frac{\textbf{Number of Carried Passengers} * \textbf{Distance}}{\textbf{Available Seats} * \textbf{Distance}} * \textbf{100}\%$$

Equation 1.1: Passenger Load Factor Calculation

Flight Length: In aviation, the flight length is defined as the time airborne during a flight. There are four categories: short-haul, medium-haul, long-haul and ultra-long-haul.

Table 1.1: Target population of the Study

Category	**Time Airborne**
Short-Haul Flight:	Under 3 Hours
Medium-Haul Flight:	3 To 6 Hours
Long-Haul Flight:	6 To 12 Hours
Ultra Long-Haul Flight:	Over 12 Hours

Forecasting demand for products and services in the airline industry is particularly important. The tourism industry is a highly variable one and seasonality has a large impact on the airline industry with travel patterns being most unpredictable.

1.1.1. The Airline Catering Industry

There are five major types of players in the airline catering business. These are the carriers (Airlines), the providers (Caterers), the suppliers (manufacturers), the distributors and the passengers. Each airline carrier decides what kind and how much food service they require and which flights need which types of service. Food service can be used as a marketing tool; some Airlines for instance, do not give as much service if they have no competition or if the flight is exceptionally short such as under 1 hour. Some passengers may be willing to forgo food on 'no frills' or 'peanuts' flights if fare prices are slashed. All of this is for the airline company to decide. The carrier must also decide whether to operate its own catering operation or which caterer to contract with. This decision is based upon location, availability, reliability, long time relationships, cost and convenience. Costs must be carefully negotiated by both the caterer and the carrier. The carrier cannot afford to pay too much as each fraction of a penny may add up to thousands of pounds or dollars, while the caterer cannot afford to accept too little as food prices may fluctuate or labour costs may increase, and the caterer must deliver a quality product to preserve not only their image but that of the airline.

Globally, the airline catering industry produces 630 million meals a year. Tightly regulated by food safety and quality measures. In-flight providers cater to a number of Airlines each with their own menu and expectations. Variation between classes, the lengths of flights, time of day as well as special or dietary requirements to cater for. Providing all meals, beverages, and perhaps other products such as paper goods, blankets, magazines, headsets, amenity kits, and so on. Caterer who prepare food for the Airlines also take advantage of economies of scale to purchase raw goods for the manufacture of airline meals, desserts, beverages and snacks. These suppliers can produce meals for economy class much more cheaply and efficiently.

The flight catering industry is a very large, global activity. The total market size is estimated to be around 13 billion US Dollars. More than 1 billion passengers are served each year. It is probably one of the most complex operational systems in the world.

In an industry tightly regulated by food safety and quality measures, many issues may be faced when considering food waste reduction. In-flight providers often cater to a number of Airlines each with their own menu and expectations, and within that, each flight is a different size. In addition, there is variation between classes, the lengths of flights, time of day as well as special or dietary requirements to cater for. “Flight catering is 80% logistics and 20% catering”, because of the fluid yet strict environment of the airline industry in-flight providers face many issues. Loughlin describes some of the issues faced by in-flight service providers including time constraints and menu variation. In-flight service orders may change up to 30 minutes before departure as last minute passengers purchase tickets. It is an industry where food safety and quality are incredibly stringent, yet the environment needs to be dynamic enough to cope with last minute changes and a wider variety of both food and non-food products. Airline caterers work directly for an airline or for a catering company contracted to prepare and deliver to the planes prior to take-off. The staff of an airline-catering Production department typically includes an Executive Chef, Executive Sous chef, Sous Chef, Chef de Partie, Demi Chef De Partie, Commis chef and Trainee Chefs, Kitchen helpers and dishwashers round out the staff.

The airline caterer works with the airline operations representative to plan the menus for each flight. Various meals are required to serve first class, business and Economy Class travelers. Specific dietary requests are reviewed and placed in the order. Menus for breakfast, lunch, dinner and snacks are required for flights 24 hours a day. Overseas flights that last longer than eight hours require that two meals be served on a single flight.

Chefs and managers of airline catering companies must ensure that all Hazard Analysis & Critical Control Points (HACCP) are followed. The HACCP are guidelines and procedures of the Food & Drug Administration (FDA) that must be closely followed for food preparation and delivery on all flights. The HACCP procedures for food safety are followed by all retail food service organizations and are watched closely in the airline food service industry.

Airline catering companies such as LSG Sky Chefs and Gate Gourmet offer Airlines a number of options in how the meals are delivered. A caterer often delivers meals that are frozen and can be heated in the ovens in the Aircrafts. Short flights may require cold meals that are placed in Chillers. The meals are delivered to the plane on a schedule to provide the airline with time to store the food and serve it to the passengers. Airline caterers must be flexible to adapt to changing airline schedules, weather events and other timing obstacles.

Caterers have two main roles: to prepare items not bought in directly from suppliers to a state ready for loading on board and to assemble trays and trolleys. Flight kitchens are always located near to major airports and are usually used to produce consumable food items.

There has been little investigation into in-flight catering and waste. Foodservices dispose of as much as 20% of the food they procure and therefore are a focal setting for food waste research. The majority of foodservice waste research has been on waste quantification and consumer plate waste. A foodservice sector whose waste has not yet been investigated is the airline catering industry, which globally produces more than 600 million meals each year (Yi-Chi Chang Y., Jones P. 2007). Research in the area of food waste has focused on quantifying the issue and investigating plate waste, with little examination of the drivers of food waste and the opportunities and barriers to waste reduction. This is surprising, given industry dynamics and activities, provide an environment in which large quantities of food waste can occur. For example, tightly regulated food safety and quality, and catering to multiple Airlines, each with their own menu and expectations. Additionally, there is variation between size, class, lengths of flights, and time of day as well as dietary requirements to cater for. (Jessie R., 2014).

Solid waste management and disposal is one of the most significant issues in the environmental management of the Flight Catering Industry. Conducting a waste analysis in a foodservice is important to gain better Understanding of the present waste situation, identify where waste may be reduced, and providing a baseline to measure future waste reduction. There are many methods of waste assessment, from conducting observations through to in-depth ‘waste stream analyses where all daily waste was collected, sorted into categories (Individual Sub-Kitchen waste) and weighed.

In this study, the relationship between the airline Passenger Load Factor and the Flight Kitchen Waste was Analyzed based on the Historical Data of 14 International Airlines catered by the Flight Catering Company and Identify the Interrelationships of the Passenger Load Factors which minimize the Flight Kitchen Waste

Process Flow – Flight Catering Company

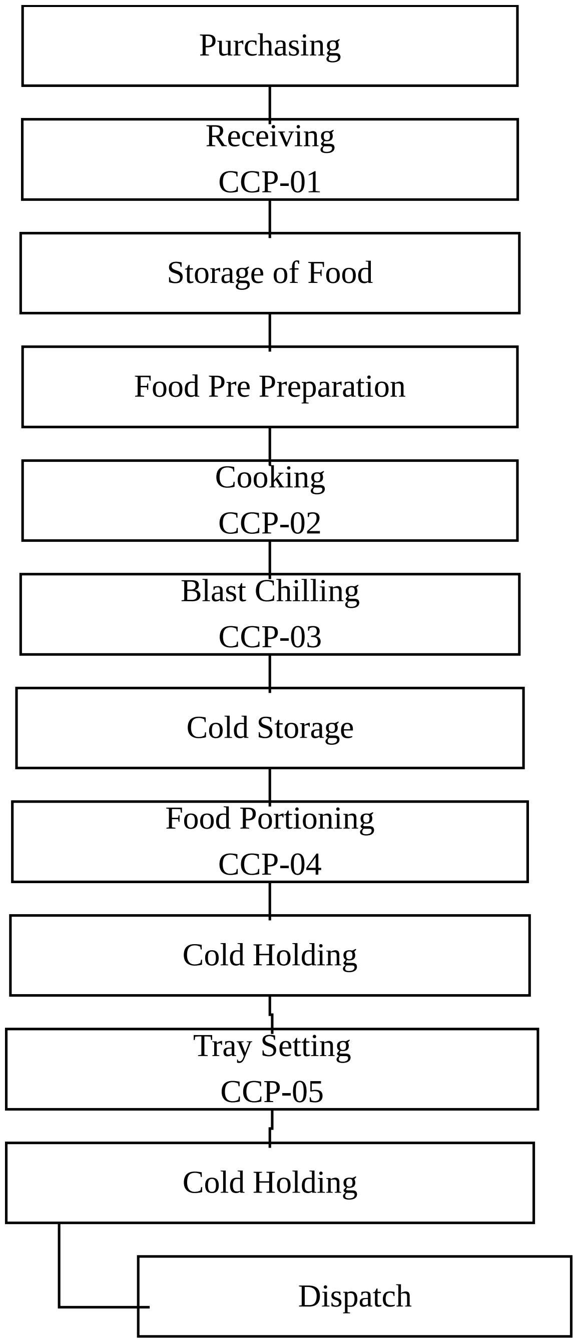


Figure 1.1: Process Flow – Flight Catering Company

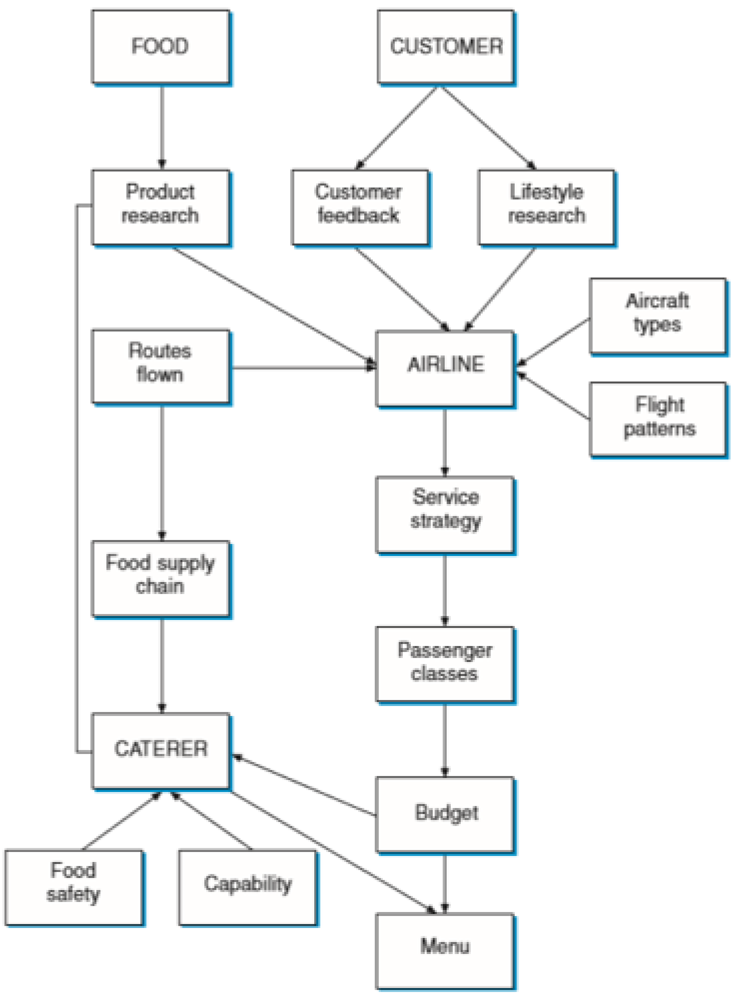
The caterer is often in an unusual and sometimes difficult, position. Although they are a customer of the supplier, the products used may not be of their choosing but may have been determined by the airline. When the products used are those purchased directly by the airline, caterers only charge for a handling and storage fee of the product but not the cost of the product. For instance, all liquor products for tax reasons must be purchased by the Airlines, either through a prepaid arrangement with the distributor or through an arrangement whereby the charges are directly invoiced to the airline. However, the caterer is often responsible for keeping and accounting for any such products and these products are usually delivered directly to the caterer's bonded store. The challenge for caterers is that the products are the property of the individual Airlines served by the caterer. Products belonging to one airline cannot be used for another, even if the two Airlines use identical products.

Due to the Food Waste the Company is losing not only the purchase cost of food, but are also unable to recover the add-on operational costs associated with labour, water, energy and waste disposal.

1.1.2. Overview of the Organization

Incorporated in 1979, The Flight Catering Company is currently the sole airline caterer operating at the Bandaranaike International Airport. Flight Catering Company consists of a state of the art Flight Kitchen, one of the best in Asia. The Production Department of the Flight Catering Company is responsible for producing meals for the Flights in Sri Lanka.

Flight Menu Planning Process



Source: Flight Catering – Prof. Peter Jones (2004)

Figure 1.2: Flight Menu Planning Process

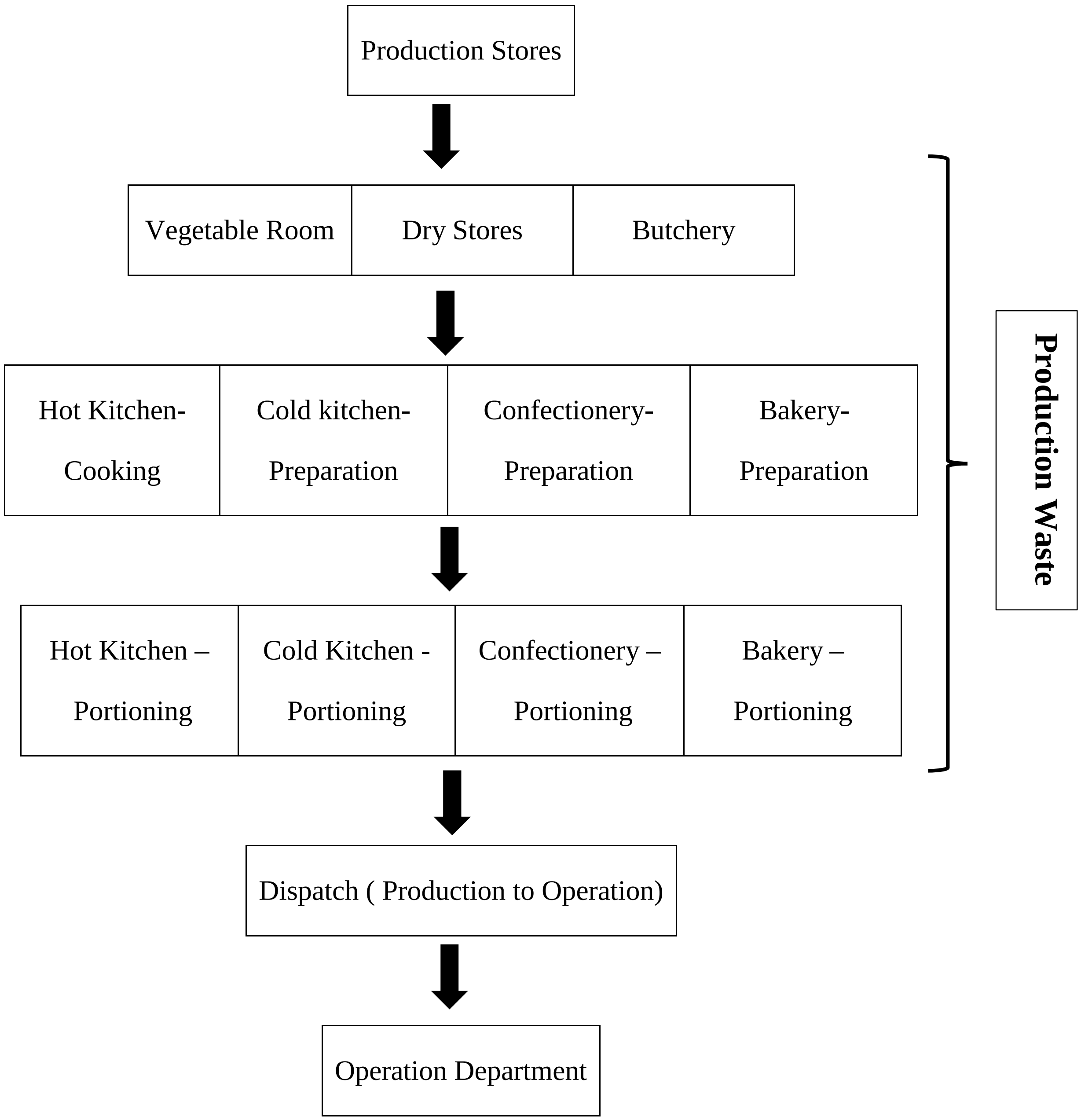


Figure 1.3: Production Waste Generation

The Dependent Variable of the Research, Average Daily Waste Per Meal Was Calcutated Using the Below Equation,

$$\textbf{Daily Waste Per Meal} = \frac{\textbf{Number of Carried Passengers} * \textbf{Distance}}{\textbf{Available Seats} * \textbf{Distance}} * \textbf{100\%}$$

Equation 1.2: Average Daily Waste per Meal Calculation

1.2. Statement of the Problem

There is a Variability between the Initial Passenger Loads and the Final Passenger Loads provided by the Customer Airline within 24 hours to the Estimated Time of Departure and this has Created uncertainty in the Production Floor. The average daily Flight kitchen waste per Meal fluctuate throughout the year and this affect average Profit margin (Profit per Meal) significantly.

There is a variation of the average Daily waste Per Meal in the Flight Catering Company. Production of the Flight Kitchen are vary in terms of total Pax count, types of meals, Airline Classes, etc. The average daily kitchen waste fluctuate throughout the year. The average Profit margin (Profit per Meal) is significantly depending on the Average Waste per meal. The waste is generated due to both controllable and non-controllable factors. It is important to identify and calculate the impact of the Passenger Load factor of the Airline for the Waste in order to Control. This will provide a guideline in price negotiating process between airline and the catering Company to offer a better price for the more accurate Passenger Load Providers with Provisions for the Potential Additions.

1.3. Research Objectives

The research was conducted in order to analyze,

1. Impact of the Passenger Load Factor (PLF) Fluctuation within 24 Hours to the Estimated Time of Departure (ETD) of an Airline for the Average Daily Flight Kitchen Waste in Flight Catering Industry in Sri Lanka
2. Calculate the Initial Passenger Load Factor Variability for Class Wise each Sector
3. Calculate the Average Waste Figures with Costing and Pricing team to Make better decisions in Price Negotiations
4. Assess the Relationship between Initial Load Factor Variability and Kitchen Wise Waste Per Meal
5. Identify the importance of having forecasted Pax Loads before 24 Hours to the Estimated Time of Departure (ETD)
6. Identify the Optimum Level of Passenger Load Factor for Individual Classes (FC, BC, EY) for each Sector Which Minimizes the Food Waste
7. Asses the Importance of Having Meal Bank to Minimize the Waste

1.4. Scope of the Research

Variables of the Research

- Average Waste per Meal (kg),
- Passenger Load Factor/ Variability (%)

Target Area - Production Department at Flight Catering Company

Vegetable Room ,Butchery , Butchery Pot Wash, Hot Kitchen, Hot Meal Portioning ,Hot Kitchen Pot Wash, Bakery ,Oven Room, Bread Room ,Bakery Pot Wash ,Cold Kitchen ,Cold Meal Portioning ,Confectionery

Customer Airlines –

All the Sectors of Airlines which Cover 75 % of the Production by Flight Catering Company will be selected

AB Airlines - Short Sector, Medium Haul Sector, Long Haul Sector

XY Airlines – Scheduled Four Flights per Day

1.5. Limitations of the Research

Research was conducted in Single Flight Catering Company

Limited No of Airlines Catered by Flight Catering Company

Limited Flights are operated by Foreign Airlines

Operational Inefficiencies, Specific to the Flight Kitchen, might not be identified

1.6. Significance of the Study

This Research will help to the Flight Catering Companies to identify the importance of having accurate Forecasting System to Identify, Measure and Control the Production Waste. This Study will provide information for more accurate, Customer Based Costing and Pricing which maximize the Profits. The Company will be able to negotiate with the Customer Airline for Customer based costing and pricing instead of general costing for All the Customers

Identify the Importance of maintaining a Meal Bank in Production Department and Provide Required Meal buffer Stocks for Class wise each Sector

CHAPTER 2

LITERAURE REVIEW

This chapter presents a review of the related literature on the subject under the study by various researchers, scholars and authors. It discusses the historical background of the Flight Catering industry which provides a guide in conducting the research. The chapter provides the general economic situation, overview on global and local industry situation of the Flight Catering Industry which could affect the research data, information and objectives.

2.1. Air Transport Industry

Global economy and worldwide distribution of resources would be unthinkable without the enormous progress made in the evolution of mobility by means of trains, automobiles and aircrafts. Supported by air transport, industry is able to move goods promptly from one continent to another. Equally important are the trips that make it possible for business people to establish and maintain working relations with their counterparts around the world (British Airways Limited, 1995; Lufthansa, 1997).

The number of leisure travelers will increase to one billion per year in 2010, according to predictions by the World Travel Organization (Lufthansa, 1997).

Commercial aviation has become one of the fastest growing industry sectors in the global economy nearly contributing to 3.5% of global GDP (ATAG, 2014).

With increasing economic liberalization across the world and in emerging economies, trade is expected to increase at an accelerated rate with India, China, and other emerging countries, giving further boost to the commercial aviation sector in these countries. It also plays a vital role in facilitating economic growth, particularly in developing countries like Sri Lanka.

Air transport today carries 0.5% of the volume of trade shipments and it is 35% of total value of goods transported (www.atag.org). It is expected to grow over the next two decades at an average annual growth rate of nearly 6.5% in freight demand and 5% in passenger traffic when nearly 3 billion passengers will board the aircraft somewhere on earth (Airbus Industries, 2006), (Current Market Outlook, 2007). The aviation industry itself is a major generator of employment supporting nearly 58.1 million jobs worldwide be it Airline.

The passenger airline industry operates on low profit margins with many competitors. Airline carriers sustain profitability through operational efficiency improvements and by maintaining or increasing market share. (Jason Goto, 1999)

The airline industry is one of high resource consumption. It has been argued that globalization and liberalization have caused an industry of "excessive air traffic growth and wasteful competition" the ramification of this being negative social and environmental impacts. The primary focus for sustainable behavior has been on emissions, decreasing weight, being more fuel efficient, and (a small focus on) recycling .

2.2. Food Waste in General

'Food' is defined by the European Parliament and Council (2002) as "any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans". But in fact it is a very complex issue as it is not only the ingestion of nutrients but, according to Brunner et al. (2007), food is associated with four main social and cultural functions: Physiological function: metabolism, provision of nutrients and energy, Social function: identification, communication, Cultural function: customs, religion, national cuisines, taboos, Psychological function: consumption, emotional security, self-esteem, All these functions are differently important to an individual and will influence any statements when talking about food.

It can be argued that some of the food waste is unavoidable due to a number of reasons. Empirical evidence, however, shows that most of the food waste is unnecessary (Antoaneta B., 2013).

Furthermore, it can be suggested that the large volumes of food waste are likely to decrease global food supply, which results in higher food prices. The FAO Food Price Index has increased nominally with more than 110% just in the last decade. The significant price spike is observed in all five food categories: meat, dairy, cereals, oils and fats, as well as sugar. Even when numbers are adjusted for inflation, the food price index increases with approximately 40%, despite the steady growth in the overall global food production (United Nations, 2013). As a result, food waste is suggested to not only cause direct economic losses, but also to adversely affect food affordability across the globe, especially in the poor countries.

Food waste has serious environmental implications as well. From an environmental standpoint, food production requires valuable resources and energy that is eventually wasted, if the produced food is not consumed. Moreover, the very process of food waste leads to higher methane creation, which is a greenhouse gas (WRAP, 2008).

In general, food losses refer to the decrease in the so called “edible food mass” throughout the supply chain that leads to edible food for consumption. In this context, food losses take part in the production, post-harvest and processing stages of the supply chain. When one refers to “food waste”, this is mainly related to retailers’ and consumers’ behaviour that results in food waste. As Gustavsson et al. (2011) explain: “Per definition, food losses or waste are the masses of food lost or wasted in the part of food chains leading to “edible products going to human consumption”.

This definition is important as it effectively clarifies the meaning of “food waste” and the areas where it is likely to occur. In this context, many of the food losses that take place in the supply chain can be excluded from the analysis, so that the focus is put only on the last parts of the chain, where most of the food waste takes place.

Food losses occur throughout the food system and have been divided by Kantor et al. (1997) into four main stages.

- **Farm and post-harvest**

Severe weather conditions like droughts and floods or pest infestations can reduce expected harvests. Another reason that hinders the production of food in the first place is quality standards that might prompt farmers to selectively harvest those fruits and crops, which will be accepted in the processing plant.

- **Processing and wholesaling**

After food left the farm, the main reason for food loss is improper storage. Pests, mould, deterioration or improper transportation and handling are the major threats at this stage. Inadequate packaging or simply too much time passed in the storage can lead to shrinkage (loss in amount or volume). Food safety regulations are especially targeting perishable foods like meat or milk and therefore divert those products which do not meet quality or hygiene standards. Thogersen (1996) describes a waste shift from household food waste to the processing plant due to modern consumption patterns. Industrially processed pineapples for example are bought pre-cut in cans and so the nonedible parts will pile up in the processing plant where they will be categorized as industrial waste.

- **Retail**

A case study from Schneider and Wassermann (Salhofer et al., 2007) showed that 45 kg of food (50% vegetables, 30% fruits and 9% grain products) was wasted every day in each one of the two investigated discount supermarkets. According to Jones (2004) around 0.8% of all food products, offered by supermarkets were lost at this stage. Overstocking, damaged packaging,
Causes of food waste generation in households – an empirical analysis products past its 'sell by date' or post-holiday discard of seasonal items were the main reasons for food losses at this stage. The comparatively low figure of 0.8% can be traced back to better logistics and storage rotation practices where supermarkets sell food going out of date cheaper (Jones, 2004).

- **Consumers and food services**

At this stage around one fourth of edible food supply is lost in due to over preparation, expanded menu choices, unexpected flotation and leftovers (Kantor et al., 1997).
It is estimated four billion metric tons of food is produced every year, yet 1.2-2 billion tones is never consumed, suggesting better utilization of the food we are already producing is needed (Fox T, Fimeche C. 2013). An enormous amount of waste occurs early in the food supply chain (e.g. agriculture, processing) (Food and Agriculture Organization of the United Nations 2013), however in developed countries the most significant waste reductions may occur in food retailers, consumers' homes and in foodservices (Parfitt J., Barthel M., Macnaughton S. 2010). The foodservice industry has the potential to contribute a great quantity of food waste, with estimates of one-fifth of the food that enters a foodservice ending up in the rubbish bin (Engström R. & Carlsson-Kanyama A. 2004). Food waste research has been conducted in a number of settings including hospitals (Goonan SL. 2012), college dining facilities (Kwon S., Bednar., C., Kwon J., Butler, K. 2012), restaurants, and school canteens (Engström R. & Carlsson-Kanyama A. 2004).
Academic interest in the topic of food waste is building as a range of disciplines, including Dietetics and Foodservice Management, explore ways to reduce the amount of food unnecessarily sent to landfill. The social, economic and environmental costs of food waste are well documented.

Perhaps most shockingly, many people face hunger and poverty every day, yet of the four billion metric tons of food produced worldwide, as much as 50% never reaches the consumer. In developed countries, most waste occurs in food retail outlets, consumer’s homes, and in foodservices.

With an increasing population and more competitive air travel, this number is likely to grow.

Waste management is an important accountability for foodservice operations. It is suggested foodservices should utilize an ‘integrated solid waste management system’ which adopts a variety of waste management practices.

2.3. Overview on Global Flight Catering Industry

While approximately one billion people, mainly in the developing countries, suffer from under nutrition or pure starvation, the situation with food waste in the developed world continues to deteriorate. Recent data from the US and the UK demonstrates the real implications of the problem. For instance, various studies estimate that between 18% and 22% of the purchased food in the UK is wasted which accounts for approximately 7.6-8.3 million tons per annum (WRAP, 2008; WRAP, 2009). The data from the US is even worse as approximately 40% of the available calories in the food supply or 45 billion tons are also wasted (Kantor et al., 1997; Hall et al., 2009). The provided examples are indicative for the overall food waste situation in the developed world, where the food waste tendency keeps on worsening. It can be argued that some of the food waste is unavoidable due to a number of reasons. Empirical evidence, however, shows that most of the food waste is unnecessary. Consumers in the US aggregately spend almost $100 billion per annum for food that is never used (Jones, 2006). Data from the UK is similar with an estimate of £10 billion wasted for unused food purchases (WRAP, 2008). These numbers unambiguously show the significant adverse economic impact from food waste. Food waste has serious environmental implications as well. From an environmental standpoint, food production requires valuable resources and energy that is eventually wasted, if the produced food is not consumed. Moreover, the very process of food waste leads to higher methane creation, which is a greenhouse gas (WRAP, 2008). It is estimated that approximately 20-30% of the environmental impact of the total private and public consumption in the EU is related to food consumption which is similar to the environmental impact caused by housing and transportation (Kjaer and Verge, 2010). Finally, the moral implications come from the fact that a significant portion of the world population still has no access to sufficient food supplies, despite the international efforts in this direction. In this context, wasting millions of tons of food in the developed world is simply unacceptable.

Catering Flights is an important part of an airline's operations. The meal service has a critical impact on customer service quality and represents significant costs. Unfortunately, due to high passenger load variability and minimum production lead-time requirements, it is difficult to get the number of meals to exactly match the passenger count on each flight. (Morency, V. 1999).

Flight catering starts with an understanding of the number of passengers and their needs such information is available from both market research and actual passenger behavior (Jones, P. (2004)

A catering system has to be designed and organized to produce the right quantity of food at the correct standard, for the required number of people, on time, and using the resources of staff, equipment and materials effectively and efficiently. A central constraint is that inflight catering, production is separated from service by distance and time. (Jones, P. (2004).

Significant lead time is required to produce a meal order. Meal provisioning involves preparation, cooking, assembling, chilling, and transporting the meal order, and in some airports, large flights depart within minutes of each other (Jason Goto, 1999).

The passenger load may vary considerably within the lead time. Last minute ticket purchases, missed flights, stand-by passengers, and upgrade coupons all contribute to variability in passenger load. (Jason Goto, 1999).

An airline caterer seeks to provide a meal quantity for each flight that closely matches final onboard passenger load. Faced with preparation lead-time, the caterer must estimate required meal quantities well in advance of departure. Passenger load may vary considerably during this lead-time. Thus, adjustments are often required as more information becomes available. (Jason Goto, 1999). The inflight food industry market size is estimated to be at $18 billion per annum with predicted growth of 5% per year (Jones P., 2007)

For each flight that requires a meal order, the caterer is faced with a series of decisions. The caterer must estimate the initial quantity of meals to build, and later decide whether to adjust the order as more information becomes available (Jason Goto, 1999).

The flight catering industry is a very large, global activity. The total market size is estimated to be around 12 billion euros. More than 1 billion passengers are served each year. It is probably one of the most complex operational systems in the world. For instance, a large-scale flight catering production unit may employ over 800 staff to produce as many as 25,000 meals per day during peak periods. Large international Airlines may have more than 1,000 takeoffs and landings every day. A single, long-haul Boeing 747 has over 40,000 items loaded on to it before it flies. All together these items weigh 6 metric tons and occupy a space of 60 cubic meters. These items range from meals to toilet bags, from duty-free goods to first aid boxes, from newspapers to headsets. Food items must be fresh and items for personal passenger use must be clean and serviceable. Jones, P. (2007)

Johan and Jones also emphasize the importance of forecasting for passenger by seat class as the meal options, quality and number of meals needed vary between classes. Forecasting passenger meals is a complex exercise as a number of factors influence whether a passenger will consume a meal, including the type of airline, seat class, and time of flight. Research conducted by the Travel Catering Research Centre found that caterers made little contribution to innovations inflight catering. Furthermore, there has been little focus on food as an area for new production development.

There are two main reasons why menu items may be made outside the airport flight kitchens: the cost of space and the cost of labor. Airport space is at a premium so often it is not feasible for a flight kitchen to produce all of the meals needed for every seat class. For instance, some flight kitchens or caterers may make their first-class, and in some cases business-class, meals from scratch at the flight kitchen and outsource all other meal production.

2.4. Overview of Sri Lankan Flight Catering Industry

Incorporated in 1979, as Air Lanka Catering Services Limited with BOI status, The Flight Catering commenced business as a Joint Venture with Thai Airways International. In 1998 when the Joint Venture Agreement with Thai Airways International lapsed Air Lanka Limited bought the shares of the Joint venture partner and thus Air Lanka Catering Services became the fully owned subsidiary of AB Airlines.

The Flight Catering Company is currently the sole airline caterer operating at the Bandaranaike International Airport. The Flight Catering Company Consist of a state of the art Flight Kitchen, one of the best in Asia. In its journey through the years The Flight Catering Company has grown into a star class operation winning several local and overseas catering accolades. Today The Flight Catering Company has been converted into a Public Company to meet the challenges of the Industry and grow in stature to be the best airline caterer in Asia.

CHAPTER 3

RESEARH METHODOLOGY

This chapter explains the methodology used to carry out the research .This includes the research design, target population, data collection methods and data analysis used in the research. Foodservices are dynamic environments with many relationships between their internal and external environments. A systems approach to managing such an environment helps integrate the objectives of the organization with all operations, and assists management functions such as decision-making and problem solving.

3.1. Theoretical Framework

Research design is the blueprint that guides the research process in coming up with the solutions to the research problem (Nachmias & Nachmias, 1996). It constitutes the plan and structure of investigations for the collection, measurement and analysis of data conceived to obtain answers to the research questions (Cooper & Schinder, 2003). In order to achieve the research objectives, the survey method was the research design used to analyze Impact of the Passenger Load Factor (PLF) Fluctuation within 24 Hours to the Estimated Time of Departure (ETD) of an Airline for the Average Daily Flight Kitchen Waste in Flight Catering Industry in Sri Lanka

- Independent Variable: Load Factor Variability(%), No of Meals Catered per Day
- Dependent Variable: Production Waste(kg)

3.2. Conceptual Framework

- Interrelationships between, (Simple Linear Regression/ (Pearson) Correlation Coefficient *r)*
  - Load Factor Variability Vs. Sectors
  - Load Factor Variability Vs. Individual kitchen Waste
  - No of Meals per Day Vs. Kitchen Waste
- Linear Programming (Maximization/Minimization) – Calculate the Optimum Load Factor Variance
- Sensitivity Analysis

If the P-value is smaller than the significance level α, we reject the null hypothesis in favor of the alternative. We conclude "there is sufficient evidence at the α level to conclude that there is a linear relationship in the population between the predictor x and response y."

If the P-value is larger than the significance level α, we fail to reject the null hypothesis. We conclude "there is not enough evidence at the α level to conclude that there is a linear relationship in the population between the predictor x and response y."

3.3. Research Hypothesis

- H_0 : Load Factor Variability(%) and Production Waste(kg) are independent
- H_A : Load Factor Variability(%) and Production Waste(kg) are associated
- H_0 : There is not a Linear Relationship between Load Factor Variability(%) and Production Waste(kg)
- H_A : $\rho \neq 0$ There is a Linear Relationship between Load Factor Variability(%) and Production Waste(kg)

3.4. Operationalization of the Independent and Dependent Variables

3.4.1. Load Factor

Load factor was denoted by dividing the total Pax Load of the Class for a Particular Flight divided by the total configuration of the Class for a Particular Flight catered by The Flight Catering Company. The following equation was developed to calculate the Load Factor in the study.

$$\boldsymbol{Load\ Factor} = \frac{\boldsymbol{Actual\ Pax\ Load\ of\ the\ Flight\ for\ the\ Class}}{\boldsymbol{Configuration\ of\ the\ Flight\ for\ the\ Class}}$$

Equation 3.1: Passenger Load Factor Calculation

3.4.2. Daily Waste

Daily Waste was calculated for the below areas covering Entire Production Area of the company.

- Butchery
- Hot Kitchen Pot Wash
- Confectionery
- Hot Kitchen
- Butchery Pot Wash
- Hot Meal Portioning
- Oven Room/Bread Room
- Bakery
- Cold Meal Portioning
- Bakery Pot Wash
- Cold Kitchen
- Vegetable Room

The Wastes were taken section wise to provide more detailed analysis for the decision making process by identifying the critical areas affected due to the Load factor Variance within 24 hours to the departure.

3.5. Methods of Research Used

The Research Used a combination of the below Research Methods in the process of Designing the Research Methodology.

- Descriptive Research
- Correlation Research
- Applied Research

3.6. Respondents and Sampling Procedure

3.6.1. Target Population of the Research

The population for this study was all the Airlines catered by The Flight Catering Company. Airlines catered by Flight Catering Company for the purpose of the study; were drawn from the Monthly sales reports of the Flight Catering Company. There were many reasons behind the selection of Flight Catering Company for the research such as it is one of the main Flight Catering company in the Asia Region, it represent a clear difference in Daily average Waste in different seasons in the year (Peak and Off-peak seasons), the Company contains both high and medium scale Airlines, available of many Airlines to cater which they can depend on their own Airline Company – AB Airlines, specialist knowledge of the supervisors on Flight Catering Company.
The total population of the research was as follows,
Total Population: 14 Airlines

Table 3.1: Target Population of the Study

Airline Code	Airline	Meals catered for the Period (July- October)	Percentage of Total Meals
BC	BC Air Lines	42592	1%
XY	XY Air Lines	184952	6%
CD	CD Air Lines	17999	1%
DE	DE Air Lines	44526	1%
EF	EF Air Lines	36249	1%
FG	FG Air Lines	28567	1%
GH	GH Air Lines	186547	6%
HI	HI Air Lines	62540	2%
IJ	IJ Air Lines	112342	4%
AB	AB Airlines	2165631	69%
JK	JK Air Lines	34573	1%
LM	LM Air Lines	2584	0%
MN	MN Air Lines	0	0%
Others	Others	214891	7%

Table 3.2: Meal Type wise Comparison for The Period

Meal Type	Meal Count	Percentage
Breakfast	666887	21%
Cold Meal	32150	1%
Lunch/Dinner	1875411	60%
Refreshment	559545	18%
Total	3133993	100%

3.6.2. Sample Selection

Table 3.3: Selected Sample for the Study

Airline Code	Airline	Meals catered for the Period (June- November)	Percentage of Total Meals
XY	XY Air Lines	184952	6%
AB	AB Airlines	2165631	69%
Total		2350583	75%

Sample Respondents of the study - Total Population: 14 Airlines

Sampling Techniques – Stratified Sampling, Judgment Sampling

Table 3.4: Sample Size of the Research – No of Meal

Airline Code	Airline	Production %
AB Airlines	AB Airlines	69%
XY Airlines	XY Airlines	6%
Total Sample		**75 %**

Table 3.5: Sample Size of the Research – No of Sectors

AB Airlines Sectors	12076	76%	**80 %**
XY AIRLINE Sectors	709	4%	
Total Sectors	15812		

The Stratified sampling technique was used in the study. Initially, Monthly total Meal count of all the Airlines Catered by Flight Catering Company in 2016 were collected. The first selection was the Airline which had Demanded Highest Meal Count consistently throughout the year from Flight Catering Company. Because it was important to the research on the accuracy and the effectiveness of data that provided by the sample without deliberately provide demand in selected seasons in order to cater their sudden demands. In that selection there was one airline based on total No of Meals catered and one airline selected based on the Revenue.

The daily Waste Variation of the Flight kitchen was comparing with the Load Factor variance with in last 24 Hour to the Flight Departure. 24 Hours Load factor variance was taken using following equation,

$$\textbf{Load factor Variation of the Class} = \frac{(\textbf{24 H before Flight Load of the Class} - \textbf{Final Load Catered of the Class})}{\textbf{Configuration of the Class}} * \textbf{100}\%$$

Equation 3.1: 24 Hours before Passenger Load factor Variation of the Class Calculation

3.7. Research Instruments

Primary Data Collection Form which was developed to collect the Daily Kitchen Waste (kg) was used as the Main Research Instrument of the Research.

3.8. Collection of Data

The Passenger Flight Load data was collected using secondary data collection method which was found suitable to the context of the study. The data used in the research was mainly secondary data. A structured data entry form was developed to record the data for each Airline per day. (Appendix 02) The time frame for the data used by the survey was Four Months to facilitate the identification of the seasonal variation within the Period. The process was repeated for all the Classes to minimize the errors.

Sample Collecting Period – 1st July 2017 to 31st October 2017 - 4 Months

Primary Data – Sub Kitchen Wise Waste Data Collection Form (Appendix 1.5)

Secondary Data – Initial and Final Passenger Loads – From the Customer Airline

Secondary Data – Actual Passenger Loads and Daily Meal Counts- Inflair ERP System

3.9. Statistical Treatment of Data

The data was adequately checked for accuracy and completeness before analysis commenced and entered into the statistical package (MINITAB) for the analysis to be conducted. The data analysis was done using descriptive statistics in the form of tables, frequency and percentages. The relationships between the variables were determined using appropriate statistical methods. The Regression analysis, descriptive data analysis and correlation analysis were mainly used in data analysis. Multiple Linear regression analysis was used to generate an equation to describe the statistical relationship between the Waste and independent variables in the study. This statistical method was used to test for equality of variances, and generate various plots. Under the main statistical method the One-Way analysis of variance with Tukey's comparisons was used in the research to analysis the responses (Daily Waste of the Area) to perform multiple comparisons of means of Daily Wastes of different areas of the Production Department in order to find best range of Load Factors which maximize the Daily Waste of the Flight Catering Company.

3.9.1. Empirical Model 01

In the empirical analysis multiple linear regression analysis was employed. Using the regression analysis, function y = f(x) was analyzed.

$$\boldsymbol{Daily\ Flight\ Kitchen\ Waste\ Per\ Meal\ =\ \alpha * \ Load\ factor\ Variance\ +\ \varepsilon}$$

α : *Coefficient,* $\mathcal{E}$: *Error*

Equation 3.2: Empirical Model 01 - Daily Waste per Meal

Using the regression analysis the impact of Load factor Variance of the Customer Airlines analyzed with production daily Waste. The study aimed to identify main determinants, which were associated with the variance analysis the study test the hypothesis about equality of regression coefficients and the association between the dependent and the individual explanatory variables (Ho: $\alpha = 0$) was tested using the statistical methods.

Statistical significance of the variables was obtained using the p- value. The acceptable statistical Significance was less or equal 5% (0.05) that reject the null hypothesis and to accept the conclusion on the dependence of the dependent variable on the individual explanatory variables. For the regression analysis it was important to estimate statistical significance of the regression coefficient (α) and the determination coefficient (R2) for the explanation of the regression by the specified explanatory variables. The empirical regression results were obtained by the panel data analysis of the data obtained from the sample from June 2016 to October 2016. The below data analyzing techniques were used for the statistical analysis of Data

- Linear Regression Analysis
- Pearson Correlation Analysis
- Linear Programming and Optimization

3.10. Linear Regression Analysis

Simple Linear regression analysis was used to generate an equation to describe the statistical relationship between one or more predictors and the response variable and to predict new observations. Regression generally uses the ordinary least squares method which derives the equation by minimizing the sum of the squared residuals. Regression results indicate the direction, size, and statistical significance of the relationship between a predictor and response. Sign of each coefficient indicates the direction of the relationship. Coefficients represent the mean change in the response for one unit of change in the predictor while holding other predictors in the model constant. P-value for each coefficient tests the null hypothesis that the coefficient is equal to zero (no effect).

Rejects the null hypothesis if the p-value is less than or equal to a specified significance level, If p-value is below the significance level (often 0.05, or 0.02 or 0.01) the factor is significant for the analysis (Response) Therefore, low p-values suggest the predictor is a meaningful addition to the model. The equation predicts new observations given specified

3.11. Correlation Analysis

The technique uses the Correlation transformer to determine the extent to which changes in the value of an attribute are associated with changes in another attribute. Correlation was used when two variables co-vary; there exists a relationship between them. The correlation coefficient was used to measures the strength and direction of a linear association between two variables. Through the calculation of the correlation coefficient, one can tell whether X and Y vary linearly but cannot tell whether X affects Y or Y affects X.

3.12. Analysis of Variance (ANOVA)

This statistical method was used to test for equality of variances, and generate various plots. Under the main statistical method the One-Way analysis of variance with Tukey's comparisons was used in the researches to analysis the responses to perform multiple comparisons of means of responses of different ranges of independent variables in order to find best range of independent variables which maximize the responses of the researches.

3.13. Linear Regression Optimization

3.13.1. Response Optimization

Response optimization Used to identify the combination of variable settings that jointly optimize a single/ multiple response (Average waste per Meal). This was used to evaluate the impact of multiple variables on a response/s.

3.13.2. Composite Desirability

Individual and composite desirability assess how well a combination of variables satisfies the goals have defined for the responses. Individual desirability (d) evaluates how the settings optimize a single response; composite desirability (D) evaluates how the settings optimize a set of responses overall. Desirability has a range of zero to one. One represents the ideal case; zero indicates that one or more responses are outside their acceptable limits.

CHAPTER 04

RESULTS AND DISCUSSION

The chapter presents the results and findings obtained from the collected data of the Research.

4.1. Descriptive Analysis of the Sample

Descriptive analysis was used to provide summary of the data collected from the sample of the study.

The population of the Research was all the Regular and Charter Flights Catered by the Flight Catering Company in the Period of July to October 2017. The Purpose of selecting this period was the period include both Peak month (August- Total Meal Count 715675) and Off-peak Months (July – Total Meal Count 613072) for the Company Production.

Table 4.1: Population of the Research

	July	**August**	**September**	**October**
Total Mel Count	613072	715675	627928	620676
No of flights	3082	3234	3134	3272
No of Sectors	4263	3694	3553	3703

The Selected sample Flights pax Counts represent approximately 80% of the Population of the Research. Approximately 80% of the total production is represented by the selected Sample for the Period of July to October 2017. Within the Sample approximately 74% is represented by AB Airline and 6% by XY Airlines.

Table 4.2: Sample Size of the Research

Month	**July**		**August**		**September**		**October**	
Total Meal Count	613072		715675		627928		620676	
AB Airlines	468977	76%	520972	73%	460099	73%	479256	77%
XY Airlines	38616	6%	52692	7%	43367	7%	34253	6%
Total Sample Size	507593	83%	573664	80%	503466	80%	513509	83%

The following figures (Figure 4.1 and Figure 4.2) represent the sample size of the research comparing with the total populations (Total Catered Meal Count of the Month) of the Research.

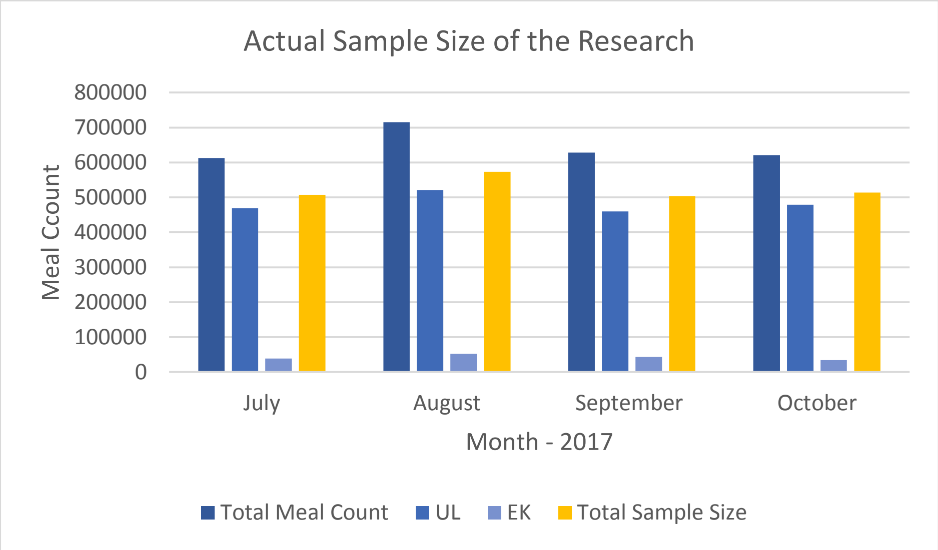


Figure 4.1: Actual Sample Size of the Research

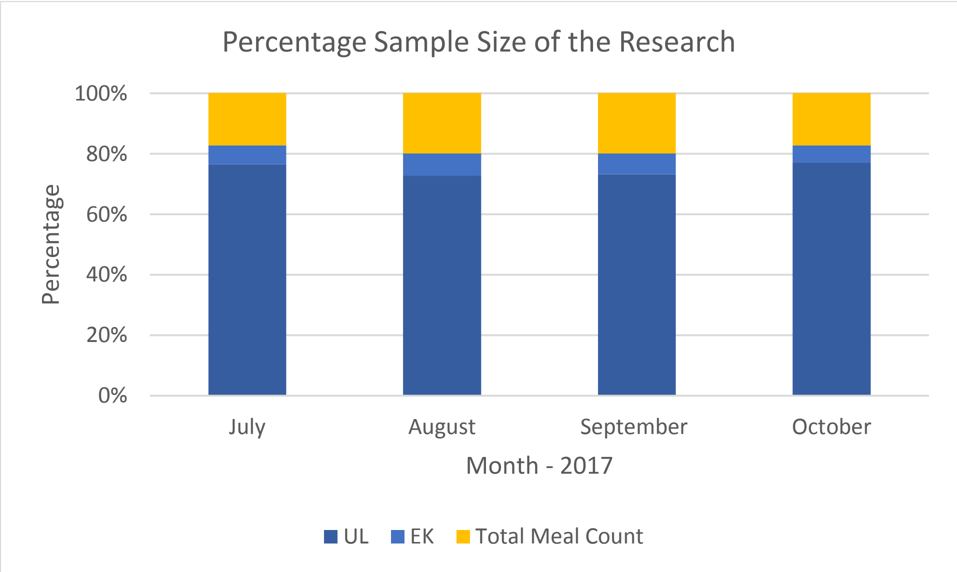


Figure 4.2: Percentage - Sample Size of the Research

4.2. Descriptive Analysis of the Population

The below figure (Figure 4.3) Represent the Daily meal count fluctuation of the Period from July to October 2017. The Daily meal Count Fluctuated from 24861 (Maximum) on 10th August 2017 to 14156 (Minimum) 07th July 2017.

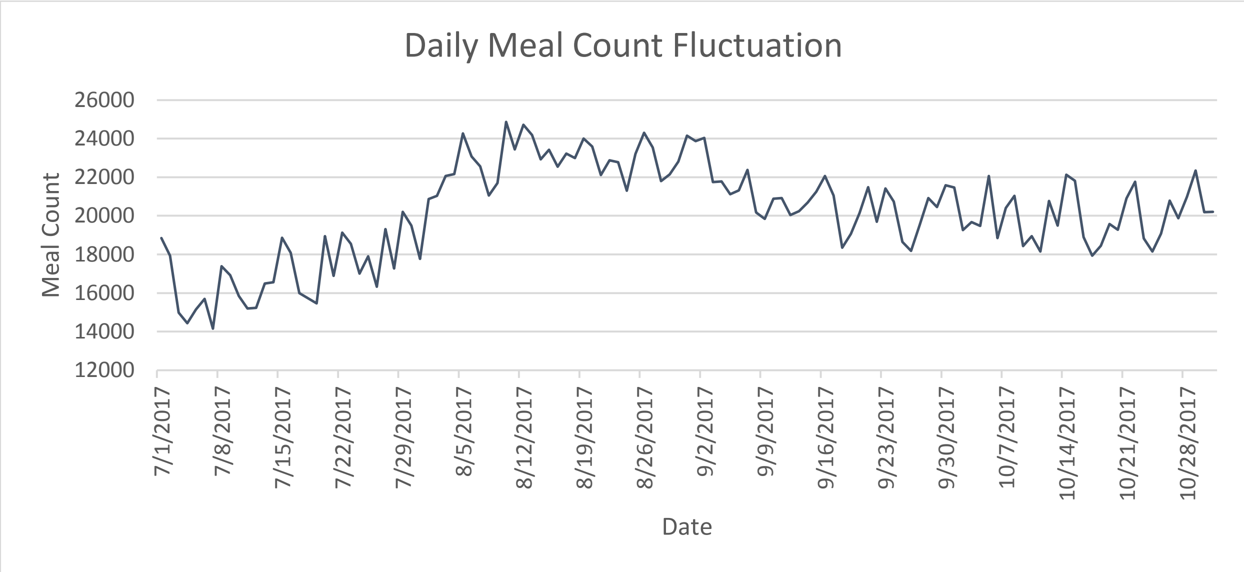


Figure 4.3: Daily Meal Count Fluctuation

The Relationship of the daily meal count Fluctuation with the Week day number is represent below. According to the Graph (Figure 5.4) each month the pattern of the meal count fluctuation with the Week Day Number can be observed. The highest average daily meal count has catered on the week day number 07 (Saturday). There is a peak in both Week day Number 01 (Sunday) and 05 (Thursday).

Table 4.3: Daily Average Meal Count of the Population – Week Day Wise

Month	**Total**	**Week Day**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
July	17066	18194	16320	15846	15540	17607	16218	18885
August	22891	23595	22345	22072	22173	23118	22947	24317
September	20785	21103	19925	19599	20308	21364	21087	21784
October	19973	21682	19121	18982	18784	20797	19370	21105
Grand Total	**20236**	**21010**	**19238**	**19483**	**19376**	**20863**	**19975**	**21639**

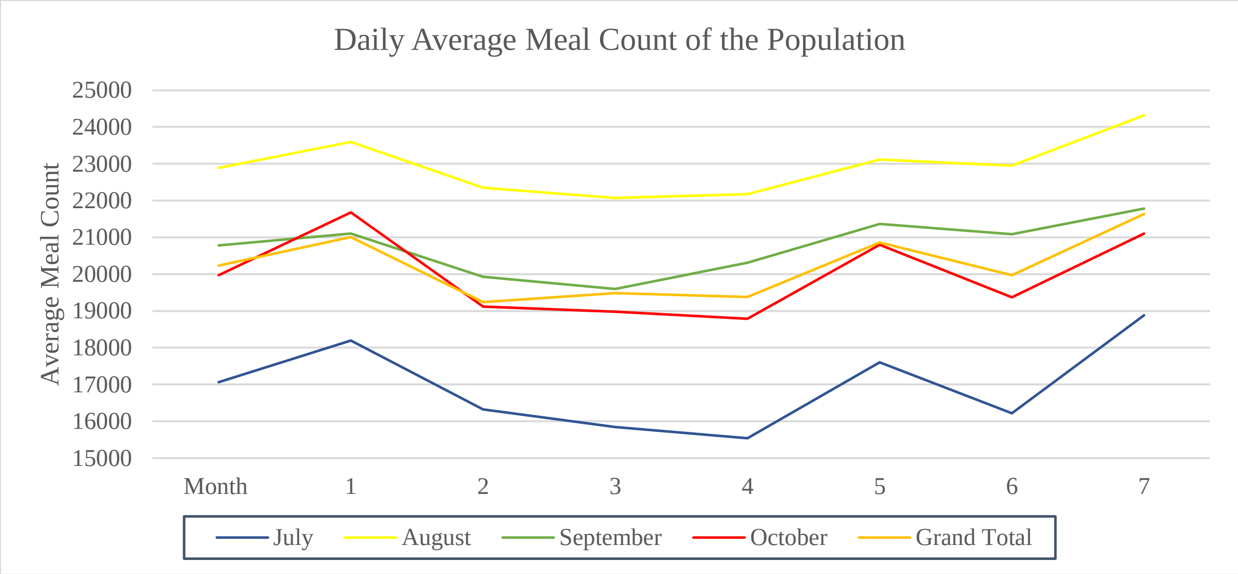


Figure 4.4: Daily Average Meal Count of the Population- Week Day Wise

Irrespective of the month the Pattern of the Average daily meal count of the Week Day has continued over the period of the research.

The below figure (Figure 4.5) represents the fluctuation of the Total daily waste in each Sub-kitchen in the production Department in kilograms (kg).

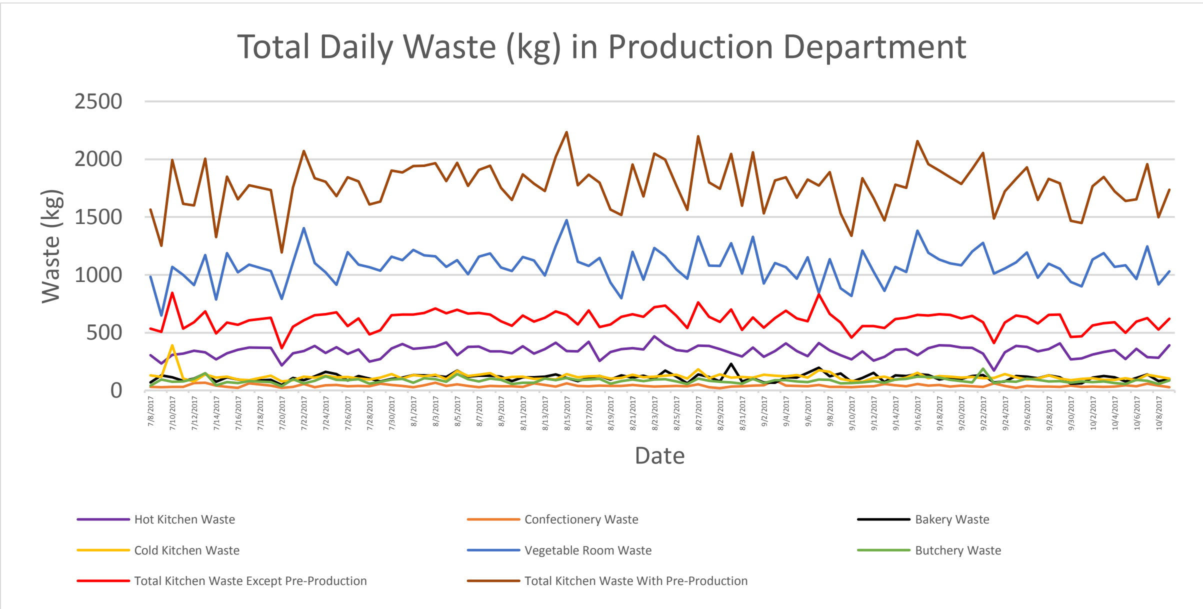


Figure 4.5: Total Daily Waste (kg) in Production Department

4.3. Descriptive Analysis of Data

The Descriptive Analysis of both dependent and Independent Variables (Independent Variable: Load Factor Variability (%), No of Meals Catered per Day, Dependent Variable: Production Waste per Meal (kg) of the Research are represented in this section.

4.3.1. Descriptive Analysis of Load Factor Data – Airline Wise

XY Airline has Fist Class, Business Class and the Economy class whereas AB Airline has only Business Class and Economy Class in their Flights. There are Total 8223 Data Points (Sectors) has analyzed in the research Sample. Out of the 8223 data points (Sectors) 95% represent AB Airline and XY Airline represent 5%.

Within the Period of the research (July to October 2017) The Average total Variance between First Class initial and the Final pax Load is +4%, the Business Class pax Load Variance is also +4% and the Economy Class Pax Load Variance is +1%.

AB Airlines has generated more Variance in Business Class Pax Load Variance +4% compared to XY Airline Variance +2%.

The Average Pax Loads for all the Classes of the both Airlines has Increased (Positive variance only) represent that the Risk of the increasing of the Loads within Last 24 hours has transferred to the Caterer by the Airline. Airline has not given a significant provision for potential Load Increases when they place the initial Order (Initial Load) to the Caterer. This creates Production Uncertainty whereas the caterer has to take the risk of Last minutes top-ups in advance and produce more than the Initial Order Placed by the Airline creating the Supply Chain Bullwhip effect. If the top-ups not received the caterer has to bear the Cost of Overproduction.

Table 4.4: Airline Load Factor Summary – Total

Airline	**Data Points**	**FC- Initial**	**FC- Final**	**FC- Variance**	**BC- Initial**	**BC- Final**	**BC- Variance**	**EY- Initial**	**EY- Final**	**EY- Variance**
XY Airlines	449	26%	30%	4%	62%	63%	2%	79%	80%	1%
AB Airlines	7774	-	-	-	46%	50%	4%	71%	72%	1%
Grand Total	**8223**	**26%**	**30%**	**4%**	**46%**	**50%**	**4%**	**72%**	**72%**	**1%**

The below table (Table 4.5) Represent the Average Monthly Load Factor Fluctuation. The 12% XY Airline First Class Load factor fluctuation in August has significantly affect the 4% average First Class Load Factor Fluctuation for the Period. In July and October there is a Negative (-2%) First Class Load Factor Fluctuation for XY Airlines. XY Airline Business Class Average Load Factor has fluctuated positive on August (+4%) and September (+2%). In October the XY Airline Business Class Load factor has Fluctuated Negative (-2%). Except October XY Airline Economy Class Load Factor has fluctuated positive (+1%).

Table 4.5: Airline Load Factor Summary – Monthly

Airline	Month	Data Points	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
XY Airlines	July	111	24%	21%	-2%	57%	57%	0%	72%	72%	1%
XY Airlines	August	149	27%	39%	12%	68%	72%	4%	91%	92%	1%
XY Airlines	September	146	27%	29%	3%	62%	64%	2%	78%	79%	1%
XY Airlines	October	43	24%	22%	-2%	51%	49%	-2%	56%	60%	4%
XY AIRLINE Total		**449**	**26%**	**30%**	**4%**	**62%**	**63%**	**2%**	**79%**	**80%**	**1%**
AB Airlines	July	1884	-	-	-	47%	50%	3%	71%	71%	0%
AB Airlines	August	2555	-	-	-	52%	54%	2%	77%	77%	0%
AB Airlines	September	2568	-	-	-	41%	47%	6%	67%	69%	1%
AB Airlines	October	767	-	-	-	34%	44%	10%	65%	67%	2%
AB Airlines Total		**7774**	-	-	-	**46%**	**50%**	**4%**	**71%**	**72%**	**1%**
Grand Total		**8223**	**26%**	**30%**	**4%**	**46%**	**50%**	**4%**	**72%**	**72%**	**1%**

The Variability of Average Business Class Load Factor Fluctuation is high compare to XY Airline for all for month of the Research from +2% to +10%. AB Airline has only generated positive Load Factor fluctuations in all for months. AB Airline also has generated positive +1% Load Factor Fluctuation except October (+2%) and July (0%).

The highest First Class Average Load factor fluctuation (+12) has occurred on August, and the Highest Business Class and Economy Class Average Load factor fluctuation is on October. The Lowest Average First Class Load factor Fluctuation is in July and October (-2%), the Lowest Business Class Average Load factor fluctuation is in July (0%), the Lowest Economy Class Average Load factor fluctuation is in both July and August (0%).

Table 4.6: Airline Load Factor Summary – Week Day

Airline	Week Day No	Data Points	FC-Initial	FC-Final	FC-Variance	BC-Initial	BC-Final	BC-Variance	EY-Initial	EY-Final	EY-Variance
XY Airlines	1	69	25%	28%	3%	64%	66%	1%	83%	83%	0%
XY Airlines	2	69	27%	27%	0%	62%	58%	-3%	77%	77%	0%
XY Airlines	3	59	18%	20%	3%	53%	53%	0%	75%	75%	0%
XY Airlines	4	52	29%	35%	6%	57%	61%	3%	75%	78%	2%
XY Airlines	5	65	28%	31%	3%	59%	62%	3%	77%	78%	1%
XY Airlines	6	65	19%	28%	9%	62%	67%	5%	77%	81%	4%
XY Airlines	7	70	33%	38%	5%	72%	76%	3%	84%	86%	2%
XY AIRLINE Total		**449**	**26%**	**30%**	**4%**	**62%**	**63%**	**2%**	**79%**	**80%**	**1%**
AB Airlines	1	1147	-	-	-	48%	50%	3%	73%	73%	0%
AB Airlines	2	1171	-	-	-	44%	48%	4%	70%	70%	0%
AB Airlines	3	945	-	-	-	43%	47%	5%	70%	71%	1%
AB Airlines	4	1088	-	-	-	45%	49%	4%	70%	71%	1%
AB Airlines	5	1137	-	-	-	44%	50%	6%	71%	72%	1%
AB Airlines	6	1068	-	-	-	47%	52%	6%	73%	73%	1%
AB Airlines	7	1218	-	-	-	48%	51%	3%	71%	71%	0%
AB Airlines Total		**7774**	**-**	**-**	**-**	**46%**	**50%**	**4%**	**71%**	**72%**	**1%**
Grand Total		**8223**	**26%**	**30%**	**4%**	**46%**	**50%**	**4%**	**72%**	**72%**	**1%**

The above table (Table 4.6) represent the Average Daily Load Factor Fluctuation. The highest (9%) First Class Average Load Factor has fluctuated on Friday whereas Lowest reported on Monday (0%). The Negative Business Class Average Load factor fluctuation is reported only on Monday for XY Airline and the Highest Business Class Average (6%) is reported on Thursday and Friday for AB Airlines. The Economy Class Average Load factor Fluctuation is Minimum (0%) on Sunday, Monday and Tuesday, highest on Friday (6%) for XY Airlines. The Lowest Economy Class

Average Load Factor Fluctuation (0%) is reported on Sunday, Monday and Saturday for AB Airline whereas other week days represented a 1% Load Factor Variance.

4.3.2. Descriptive Analysis of Load Factor Data – Airline Sector Wise

The below tables (Table 4.7) represent the Average Sector Wise Load Factor Fluctuations of the Data for each Airline of the Research.

The AB Airline Business Class Average Load Factor Variance has varied from 1% to 7%. Minimum +1% Variance has generated for all AB Airline Business Class Average Initial Load factor. The Business Class Average Load Factor has only generated Positive Load Factor variance. AB Airline Economy Class Load Factor Variance has generated both Positive and the negative Load Factor Variance, varying from -2% to +1%. The highest fluctuations are occurred in the AB Airline Short Sector Flights (AB Airlines 1, AB Airlines2 and AB Airlines3).

Table 4.7: Airline Sector Wise Average Load Factor Analysis – AB Airline Total

Sector	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines1	37%	41%	3%	68%	69%	1%
AB Airlines2	56%	63%	7%	81%	82%	1%
AB Airlines 3	53%	58%	5%	69%	70%	1%
AB Airlines 4	52%	54%	2%	72%	69%	-2%
AB Airlines 5	84%	86%	2%	96%	95%	-1%
AB Airlines 7	39%	41%	1%	45%	45%	0%
AB Airlines 8	51%	53%	1%	71%	69%	-1%

According to the Table 4.8, XY Airline first Class Load Factor has significantly Varied in both Positive and negative from -3% to +18%. Compared to First class Load factor Variance, the business Class Average Load Factor Variance is quite controllable which is varying from -3% to +8%. Similar to the AB Airline Economy Class Average Load Factor variance, the XY Airline also has generated minimum Average Load Factor Variance in Economy Class, but the Variability is high compared to AB Airlines. The Variability of the Average Load Factor of XY Airline is significantly high compared to AB Airline for all Classes.

Table 4.8: Airline Sector Wise Average Load Factor Analysis – XY Airline Total

Sector	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
XY Airlines-1	26%	23%	-3%	65%	63%	-2%	67%	70%	3%
XY Airlines-2	42%	46%	4%	74%	78%	4%	91%	90%	0%
XY Airlines-3	17%	19%	2%	70%	72%	2%	88%	87%	-1%
XY Airlines-4	13%	11%	-2%	29%	26%	-3%	63%	63%	0%
XY Airlines-5	30%	48%	18%	73%	80%	8%	87%	91%	4%

The below Analysis represent the Monthly Variation of the Load factor variance in Each Sector of both Airlines. The objective of the analysis is to identify the Monthly impact of Each Sector Load factor Variability in order to consider the monthly impact of Waste.

Table 4.9: Airline Sector Wise Average Load Factor Analysis – AB Airline 1- Monthly

Sector	Month	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines 1	July	37%	39%	3%	65%	66%	1%
AB Airlines 1	August	42%	43%	1%	73%	73%	0%
AB Airlines 1	September	35%	40%	5%	66%	67%	2%
AB Airlines 1	October	29%	37%	8%	62%	64%	1%

Referring to the Table 4.9, the Business Class Load factor Variance is Minimum in August which also represent the highest Load Factor of the Period of the Research with 43%. Economy Class Load Factor Variability also Lowest (0%) in August following the highest Load factor with 73%.

Similar to the AB Airlines 1 Sector, AB Airlines 2 Sector also has reported minimum Load factor variance in August following the Highest Load Factor of the Period with approximately 89%. There is a negative Load Factor Variance for Economy Class in August which is significant since all other Variances are Positive for the Sector.

Table 4.10: Airline Sector Wise Average Load Factor Analysis – AB Airline 2- Monthly

Sector	Month	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines 2	July	61%	67%	6%	83%	83%	0%
AB Airlines 2	August	68%	72%	3%	90%	89%	-1%
AB Airlines 2	September	48%	56%	8%	74%	77%	3%
AB Airlines 2	October	26%	44%	19%	67%	74%	6%

According to the below table 4.11, the sector has generated only Positive Variance only for both Business and Economy classes in all the Months of the Research. The minimum Variance in August with highest Average Load factor has continued for AB Airlines 3 sector also. Economy Class Variability is marginal Compared to Business Class variance.

Table 4.11: Airline Sector Wise Average Load Factor Analysis – AB Airline 3- Monthly

Sector	Month	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines 3	July	57%	61%	4%	72%	72%	1%
AB Airlines 3	August	58%	63%	4%	75%	75%	0%
AB Airlines 3	September	45%	51%	6%	63%	65%	1%
AB Airlines 3	October	49%	58%	8%	67%	69%	3%

Referring to the Table 4.12, The AB Airlines 4 Sector has incurred significant amount of negative Variances in both Classes. The Economy Class has only generated negative variances varying from -1% to -3%. The Only Negative Variance for Business Class has incurred in the month of

July. The Minimum Variability followed by highest Load Factor has only continued for Business Class only. The Average Load factor Variability has reported in October with -1%.

Table 4.12: Airline Sector Wise Average Load Factor Analysis – AB Airline 4- Monthly

Sector	**Month**	**BC- Initial**	**BC- Final**	**BC- Variance**	**EY- Initial**	**EY- Final**	**EY- Variance**
AB Airlines 4	July	57%	56%	-1%	76%	74%	-2%
AB Airlines 4	August	57%	57%	0%	72%	70%	-3%
AB Airlines 4	September	47%	51%	4%	70%	68%	-2%
AB Airlines 4	October	46%	51%	5%	64%	64%	-1%

According to the Table 4.13 the Business Class average Load Factor Variance has minimum Compared to the above Short Sectors. Both July and August have reported 0% Business Class Average Load Factor Variance with +3% Variance in September. The Economy Class Average Load Factor Variance represents only negative Variance with -2% maximum and -1% minimum. The AB Airlines 5 Sector (Long Haul) has generated only a marginal Variance for both Business Class Load Factor and Economy Class Load Factor.

Table 4.13: Airline Sector Wise Average Load Factor Analysis – AB Airline 5- Monthly

Sector	**Month**	**BC- Initial**	**BC- Final**	**BC- Variance**	**EY- Initial**	**EY- Final**	**EY- Variance**
AB Airlines 5	July	86%	86%	0%	96%	94%	-2%
AB Airlines 5	August	85%	86%	0%	99%	98%	-1%
AB Airlines 5	September	86%	89%	3%	98%	97%	-1%
AB Airlines 5	October	69%	78%	8%	74%	74%	-1%

AB Airlines 7 Sector (Medium Haul) also represents a marginal Average Load Factor fluctuation compared to the AB Airline Short Sectors. Both August and September months Reported a 0% to +1% variance for both Business Class and Economy Class Load Factors. The Load Factors for both Economy Class and Business Class have operated with equal or Less than 50% Average Passenger Load Factor in all four months of the Research.

Table 4.14: Airline Sector Wise Average Load Factor Analysis – AB Airline 7- Monthly

Sector	**Month**	**BC- Initial**	**BC- Final**	**BC- Variance**	**EY- Initial**	**EY- Final**	**EY- Variance**
AB Airlines 7	July	30%	33%	3%	40%	41%	1%
AB Airlines 7	August	44%	46%	1%	47%	48%	1%
AB Airlines 7	September	38%	38%	0%	45%	45%	0%
AB Airlines 7	October	48%	50%	3%	52%	46%	-5%

Referring to the Table 4.15 the AB Airlines 8 sector (Long Hauls) has generated both positive and Negative Average Passenger Load Factor Variances in both Business Class and the Economy Class. Following the AB Airlines 5 Sector (Long Haul), AB Airlines 8 sector also has incurred marginal Average Passenger Load factor Variance Compared to Short Haul Flights in both Classes. The Variability of the business Class and the Economy Class Average Passenger Load Factor Variance is not Significant.

Table 4.15: Airline Sector Wise Average Load Factor Analysis – AB Airline 8- Monthly

Sector	**Month**	**BC- Initial**	**BC- Final**	**BC- Variance**	**EY- Initial**	**EY- Final**	**EY- Variance**
AB Airlines 8	July	52%	52%	0%	68%	65%	-3%
AB Airlines 8	August	58%	57%	-1%	81%	79%	-1%
AB Airlines 8	September	43%	45%	3%	61%	60%	-1%
AB Airlines 8	October	58%	64%	7%	76%	76%	0%

The below Table 4.16 represents the AB Airline sector wise Average Passenger Load Factor Variance with reference to the Week Day. The impact of a single flight can be significant for the final output based on the total number of observations collected in the sample (Please refer the number of Data Points). The AB Airlines 1 and AB Airlines 2 Short Haul sectors has generated a significant Variability in Average Economy Class Passenger Load Factor Variance with respect to week day (AB Airlines 1 form +1% to +6%, AB Airlines 2 from +5% to +9%). The Economy Class Average Passenger Load factor Variance is Varying from 0% to +2% in AB Airlines 1 and AB Airlines 2 Sectors (Short Haul).The Average Passenger Load Factors of both Business Class and Economy Class have only reported Positive Variance in all Weekdays for both AB Airlines 1 and AB Airlines 2 Sectors(Short Haul).

AB Airlines-3 sector also has generated Positive variance in both Business Class and the Economy Class for all Week Days. The Variability of the Average Passenger Load factor in AB Airlines 3 (Medium Haul) sector also approximately similar to AB Airlines 1 and AB Airlines 2 Sectors (Short Haul) following significant Average Passenger Load Factor Fluctuation in Business Class and slight Average Passenger Load Factor Fluctuation in Economy Class.

The Observation in AB Airlines-4 Sector has significant difference compared to the above sectors, incurring negative Variance in all week days for Economy class average Load factor Variance with Negative Variance in Wednesday in Average Business Class Passenger Load Factor Variance. The number of data points is significantly high in AB Airlines 1, AB Airlines 2 and AB Airlines 3 compared to the Other Sectors. The accuracy of the findings and the Conclusion will more accurate because of that in those sectors compared to Other Sectors, because the impact of a single flight, single day will not significantly affect the final output.

Table 4.16: Airline Sector Wise Average Load Factor Analysis – AB Airline - Week Day

Sector	Day	Data Points	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines 1	1	636	40%	40%	1%	68%	68%	0%
AB Airlines 1	2	593	37%	39%	3%	68%	69%	0%
AB Airlines 1	3	529	35%	39%	4%	66%	66%	1%
AB Airlines 1	4	544	36%	40%	4%	67%	69%	2%
AB Airlines 1	5	604	36%	41%	5%	69%	70%	2%
AB Airlines 1	6	567	38%	44%	6%	69%	71%	1%
AB Airlines 1	7	626	39%	41%	2%	67%	67%	0%
AB Airlines 2	1	249	55%	63%	8%	81%	83%	2%
AB Airlines 2	2	222	53%	60%	6%	78%	80%	2%
AB Airlines 2	3	213	54%	63%	8%	81%	83%	2%
AB Airlines 2	4	206	59%	64%	5%	82%	83%	1%
AB Airlines 2	5	233	58%	66%	9%	84%	85%	1%
AB Airlines 2	6	204	54%	63%	9%	81%	82%	0%
AB Airlines 2	7	247	56%	61%	5%	81%	81%	0%
AB Airlines 3	1	148	59%	63%	5%	74%	74%	1%
AB Airlines 3	2	154	50%	57%	7%	70%	70%	0%
AB Airlines 3	3	130	51%	54%	3%	69%	70%	1%
AB Airlines 3	4	137	50%	56%	6%	65%	67%	2%
AB Airlines 3	5	143	49%	55%	6%	68%	69%	1%
AB Airlines 3	6	142	53%	58%	6%	70%	71%	1%
AB Airlines 3	7	150	57%	61%	4%	70%	71%	1%
AB Airlines 4	1	68	55%	55%	0%	76%	73%	-3%
AB Airlines 4	2	40	35%	36%	1%	60%	59%	-1%
AB Airlines 4	3	34	31%	37%	6%	59%	58%	-1%
AB Airlines 4	4	63	59%	57%	-3%	76%	72%	-4%
AB Airlines 4	5	37	46%	51%	4%	63%	61%	-2%

AB Airlines 4	6	63	62%	63%	1%	75%	73%	-1%
AB Airlines 4	7	68	59%	63%	4%	78%	76%	-2%
AB Airlines 7	1	-	-	-	-	-	-	-
AB Airlines 7	2	48	41%	41%	0%	47%	46%	0%
AB Airlines 7	3	-	-	-	-	-	-	-
AB Airlines 7	4	47	34%	34%	0%	36%	36%	0%
AB Airlines 7	5	40	34%	38%	5%	41%	43%	1%
AB Airlines 7	6	2	25%	25%	0%	42%	42%	0%
AB Airlines 7	7	45	49%	50%	1%	56%	55%	0%
AB Airlines 5	1	28	91%	94%	3%	99%	98%	-2%
AB Airlines 5	2	28	84%	81%	-3%	95%	92%	-2%
AB Airlines 5	3	24	78%	83%	5%	95%	94%	-2%
AB Airlines 5	4	26	79%	77%	-2%	94%	93%	-1%
AB Airlines 5	5	26	79%	87%	7%	93%	95%	1%
AB Airlines 5	6	26	85%	87%	2%	93%	92%	-2%
AB Airlines 5	7	28	91%	91%	0%	99%	98%	0%
AB Airlines 8	1	18	48%	46%	-2%	66%	65%	-1%
AB Airlines 8	2	86	54%	55%	1%	72%	70%	-2%
AB Airlines 8	3	15	37%	35%	-2%	62%	60%	-2%
AB Airlines 8	4	65	53%	51%	-1%	77%	74%	-2%
AB Airlines 8	5	54	47%	50%	3%	64%	64%	-1%
AB Airlines 8	6	64	51%	55%	3%	72%	71%	-1%
AB Airlines 8	7	54	54%	57%	3%	70%	69%	-1%

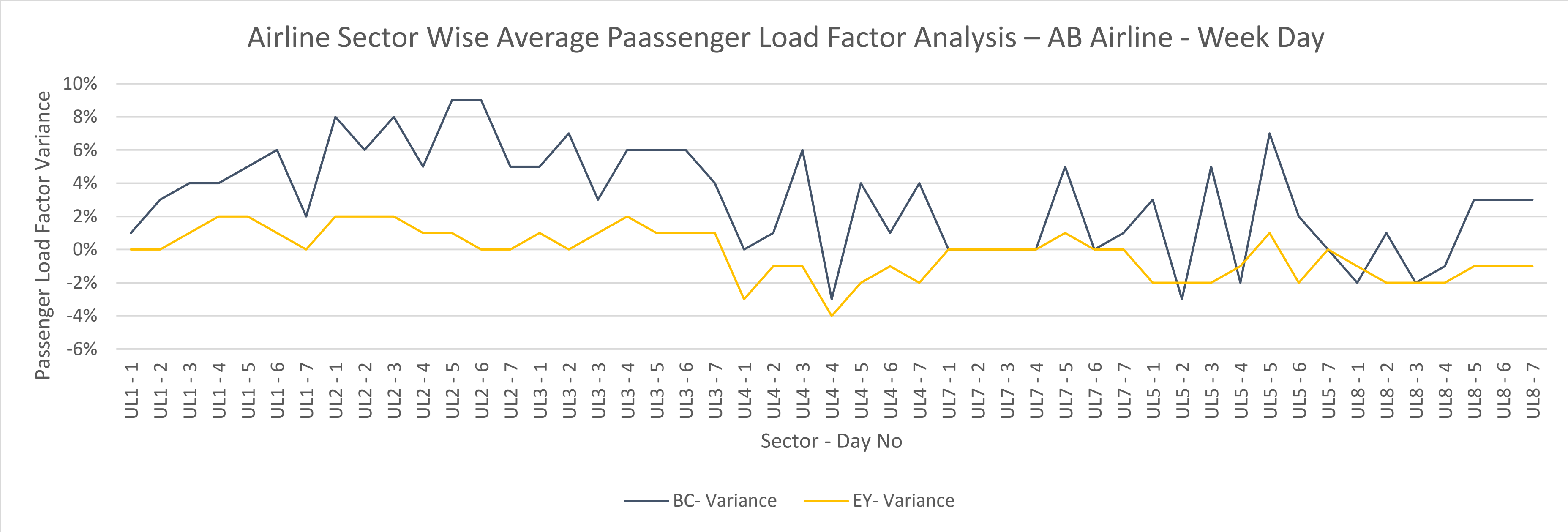


Figure 4.6: Airline Sector Wise Average Passenger Load Factor Analysis – AB Airline - Week Day

The AB Airlines 7 sector has not operated in Week Day number 1 (Sunday) and 3(Tuesday). The Variability of the Average Passenger Load Factor Variance is significantly less with respect to week day in both Classes (Business and Economy), also it is important to identify that the average Passenger Load factor has only Exceed 50% on week number 7 (Saturday) for both Classes.

The Long Haul (AB Airlines 5 and AB Airlines 8) have incurred both positive and negative Passenger Load factor Variance but that is significantly less compared to Short haul sectors. The variability of Business Class and the Economy class Percentage Variance is not significant in AB Airlines 5 and AB Airlines 8.

The below data analysis represent the Average Passenger Loads Variance of XY Airline for the Period of July to October 2017. The Objective of the below analysis is to identify the impact of Customer Airlines on Average Passenger Flight Load Factor Variance. To identify whether the Negotiation for meal Prices conduct with a common platform for all the Airlines or customized based on the Individual Customer Airline performances.

Table 4.17: Airline Sector Wise Average Load Factor Analysis – XY Airline - Monthly

Sector	Month	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
XY Airlines-1	July	25%	21%	-4%	65%	64%	-1%	65%	66%	1%
XY Airlines-1	August	27%	28%	1%	59%	56%	-2%	74%	76%	2%
XY Airlines-1	September	23%	17%	-6%	68%	65%	-3%	64%	66%	2%
XY Airlines-1	October	31%	29%	-1%	79%	78%	-1%	60%	71%	11%
XY Airlines-2	July	34%	34%	0%	64%	64%	0%	88%	88%	0%
XY Airlines-2	August	48%	54%	7%	80%	87%	8%	98%	98%	0%
XY Airlines-2	September	45%	52%	7%	81%	86%	5%	91%	91%	0%
XY Airlines-2	October	33%	32%	-1%	55%	54%	-1%	71%	70%	-1%
XY Airlines-3	July	2%	6%	4%	59%	58%	-2%	81%	81%	-1%
XY Airlines-3	August	26%	28%	2%	90%	94%	4%	100%	100%	0%
XY Airlines-3	September	16%	20%	3%	67%	70%	3%	91%	89%	-2%
XY Airlines-3	October	25%	18%	-7%	35%	36%	1%	55%	52%	-2%
XY Airlines-4	July	24%	9%	-15%	27%	22%	-5%	48%	46%	-2%
XY Airlines-4	August	7%	14%	7%	36%	35%	0%	86%	86%	0%
XY Airlines-4	September	14%	12%	-3%	25%	23%	-2%	60%	62%	2%
XY Airlines-4	October	1%	1%	0%	25%	13%	-12%	28%	29%	0%
XY Airlines-5	July	31%	34%	3%	69%	77%	8%	78%	83%	5%
XY Airlines-5	August	27%	67%	40%	82%	92%	10%	97%	100%	3%
XY Airlines-5	September	33%	44%	12%	71%	77%	6%	88%	91%	3%
XY Airlines-5	October	32%	31%	-1%	57%	60%	3%	68%	77%	9%

The XY Airlines-1 sector has negative variance for Business Class Average Load factor Variance for all the months Except August +1% Variance in First Class. Economy Class Average Load Factor Variance has generated positive Variance for the Period of the Research. The Economy Class Load Factor reported highest in August following AB Airline but the Business Class Load Factor has not Followed AB Airlines, recording Lowest Load Factor in August. Business Class Average Passenger Load Factor Variance is not significant compared to AB Airline for the period

The XY Airlines-2 Sector has marginal Economy Class Load factor Variance following 0% in July, August and September. The Negative Variance for XY Airlines-2 has only reported in October. The both First Class and the Business Class Passenger Load factor Variance is significantly high in XY Airlines-2 compared to XY Airlines-1. Overall all Fist Class, Business Class and Economy Class Passenger Load factors are high in XY Airlines-2 compared to XY Airlines-1 in whole period of the research.

Majority of the Average Passenger Load Factor Variances are Positive for Both First Class and the Business Class of XY Airlines-3 Sector, but Contradicting with all other XY Airline Sectors XY Airlines-3 had generated majority of Negative Average Passenger factor Variance in Economy Class. Important Observation that the sector has Reported 100% Passenger Load Factor for Economy Class in August.
The XY Airlines-4 has reported majority of negative Passenger Load Factor Variance for both Fist Class and the Business Class. The XY Airlines-5 sector has generated majority of Positive Passenger Load factor variance for all First Class, Business Class and the Economy Class. The highest reported Average Passenger Load factor Variance for any Class of Any Airline of the Sample Data Collected is reported for XY Airlines-5 Sector First Class in August with +40% varying from 27% to 67%.

Airline Sector Wise Average Load Factor Analysis – Week Day

The below analysis of XY Airline Passenger Loads represent the interaction of week day on Average Passenger Load factor Variance for Individual Classes. The First Class Average Passenger Load factor Variance is significant in all the sectors of XY Airline for the Period from July to October 2017 varying from -16% to +25%. Compare to the First Class the Average Passenger Load Factor Variance is Less in Business Class but that also Varying from -13% to +19%. Highest Variability is reported with XY Airlines-5 Sector with +19% in Business Class. Average Economy Class passenger Load Factor variance is significantly marginal except +10% in week day 6 (Friday) of XY Airlines-5 sector. Out of all the XY Airline sectors the XY Airlines-5 sector is reported the highest Variability of the Average passenger Load Factor for all three Classes.

Table 4.18: Airline Sector Wise Average Load Factor Analysis – XY Airline - Week Day

Sector	Day	Data Points	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
XY Airlines-1	1	14	32%	29%	-3%	86%	84%	-3%	88%	89%	1%
XY Airlines-1	2	14	18%	17%	-1%	61%	60%	-1%	64%	65%	1%
XY Airlines-1	3	12	23%	21%	-2%	48%	47%	-1%	55%	59%	4%
XY Airlines-1	4	13	29%	22%	-7%	58%	60%	3%	57%	62%	5%
XY Airlines-1	5	13	39%	26%	-13%	62%	53%	-9%	62%	65%	4%
XY Airlines-1	6	13	14%	19%	5%	57%	61%	4%	63%	70%	7%
XY Airlines-1	7	14	23%	26%	3%	81%	73%	-8%	77%	77%	0%
XY Airlines-2	1	14	38%	46%	7%	73%	74%	1%	93%	93%	0%
XY Airlines-2	2	14	48%	44%	-4%	77%	76%	-1%	92%	90%	-2%
XY Airlines-2	3	11	44%	28%	-16%	62%	63%	1%	86%	85%	-1%
XY Airlines-2	4	13	44%	53%	9%	65%	71%	6%	88%	88%	0%
XY Airlines-2	5	13	38%	46%	8%	75%	88%	13%	92%	92%	0%

XY Airlines-2	6	13	34%	43%	10%	76%	79%	3%	89%	90%	1%
XY Airlines-2	7	14	46%	60%	13%	85%	90%	5%	93%	94%	0%
XY Airlines-3	1	14	13%	15%	2%	64%	67%	3%	86%	86%	-1%
XY Airlines-3	2	13	22%	18%	-4%	66%	62%	-4%	85%	84%	-1%
XY Airlines-3	3	12	5%	15%	9%	58%	63%	5%	82%	83%	0%
XY Airlines-3	4	-	-	-	-	-	-	-	-	-	-
XY Airlines-3	5	13	13%	21%	8%	62%	69%	6%	88%	87%	0%
XY Airlines-3	6	13	17%	17%	0%	84%	86%	2%	92%	92%	0%
XY Airlines-3	7	14	27%	27%	0%	82%	82%	0%	94%	91%	-3%
XY Airlines-4	1	14	13%	4%	-10%	20%	24%	3%	60%	60%	0%
XY Airlines-4	2	14	11%	12%	1%	35%	25%	-9%	61%	60%	-1%
XY Airlines-4	3	12	7%	11%	4%	30%	17%	-13%	66%	62%	-4%
XY Airlines-4	4	13	14%	12%	-3%	30%	29%	-1%	63%	65%	2%
XY Airlines-4	5	13	12%	8%	-4%	23%	19%	-4%	56%	55%	0%
XY Airlines-4	6	13	5%	13%	8%	26%	26%	0%	63%	63%	1%
XY Airlines-4	7	14	27%	16%	-11%	40%	40%	0%	69%	73%	3%
XY Airlines-5	1	13	29%	48%	19%	79%	81%	2%	88%	89%	1%
XY Airlines-5	2	14	35%	42%	7%	70%	68%	-2%	82%	87%	5%
XY Airlines-5	3	12	11%	27%	16%	70%	76%	6%	87%	87%	0%
XY Airlines-5	4	13	28%	53%	25%	77%	82%	5%	93%	95%	2%
XY Airlines-5	5	13	38%	54%	15%	74%	81%	7%	90%	91%	1%
XY Airlines-5	6	13	27%	49%	22%	66%	84%	17%	81%	91%	10%
XY Airlines-5	7	14	40%	62%	21%	73%	92%	19%	87%	94%	7%

The below figure (Figure 4.7) graphically represents the Average Passenger Load factor variance of XY Airline with respect to Week Day of Each Sector for the Period from July to October 2017.

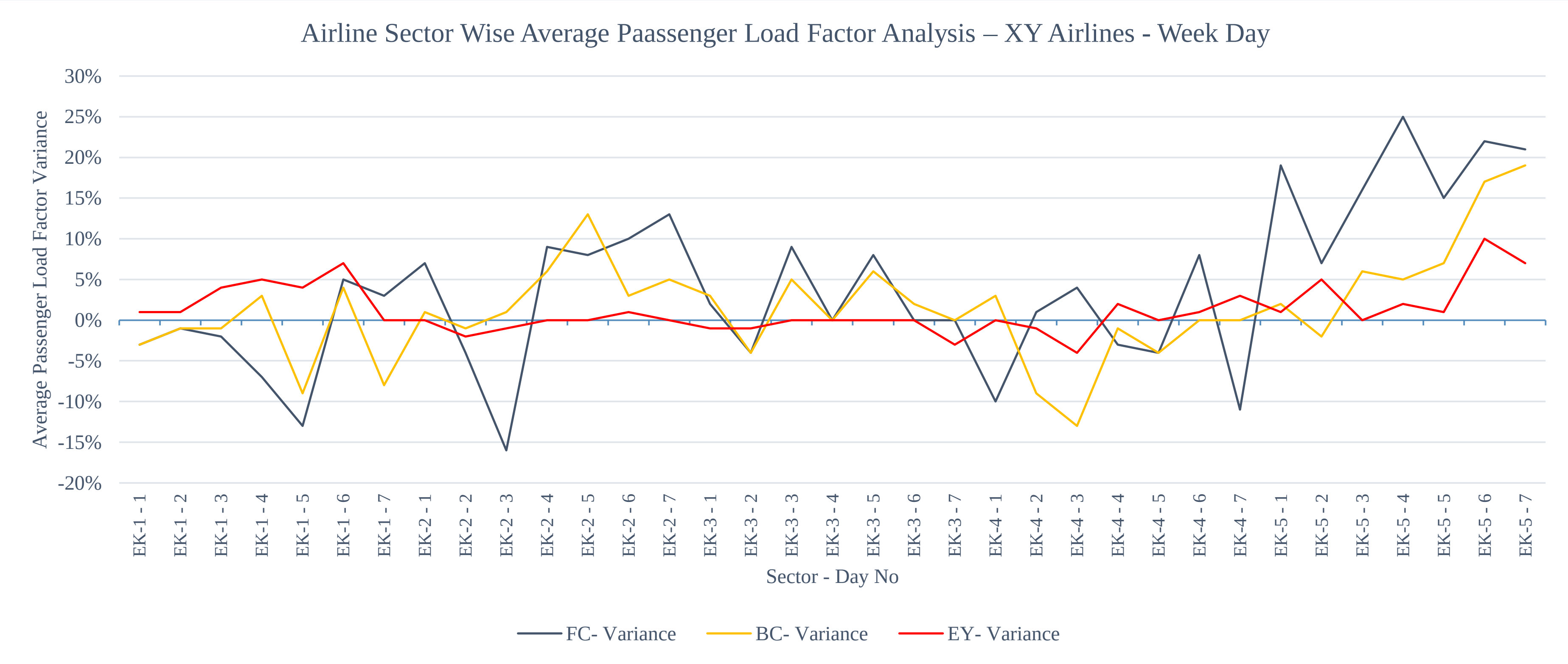


Figure 4.7: Airline Sector Wise Average Passenger Load Factor Analysis – XY Airline - Week Day

4.3.3. Descriptive Analysis of Waste per Meal Data

This section of the thesis presents the analysis of the Daily Waste per meal data which is calculated based on the Collected Daily waste from individual Sub kitchens in the Production department of the company and the daily meal count collected from the ERP system- Inflair. Per meal highest waste is represented by Pre Production area, Vegetable Room which is 0.053 kg per meal. Minimum waste per Meal is represented by the Confectionery which is 0.002 kg per meal. The highest Standard deviation also recorded in pre-production area, Vegetable room which is 0.009 kg per meal. Minimum standard deviation is represented by both Confectionery and the Butchery which is 0.001 kg per meal. The difference between minimum and the maximum Waste per meal is significant in all the Kitchens. Maximum Total Waste per meal has reported 200% compared to the minimum waste per meal 0.063 kg per meal.

Table 4.19: Waste Analysis in Area Wise

	Waste (kg)							
	Hot Kitchen	**Confectionery**	**Bakery**	**Cold Kitchen**	**Vegetable Room**	**Butchery**	**Total Kitchen Except Pre-Production**	**Total Kitchen With Pre-Production**
Average	0.017	0.002	0.006	0.006	0.053	0.004	0.030	0.087
Max	0.024	0.004	0.010	0.025	0.073	0.010	0.053	0.126
Min	0.008	0.001	0.002	0.004	0.034	0.002	0.019	0.063
Std. Dev	0.003	0.001	0.002	0.002	0.009	0.001	0.005	0.013

The below figure (Figure 5.8) graphically represent the daily area wise average Waste per meal for the period from July to October 2017. According to the below area Chart the highest portion of the average Waste per meal is generated by the Vegetable room then the Hot Kitchen. Minimum Proportion has incurred by the Confectionery.

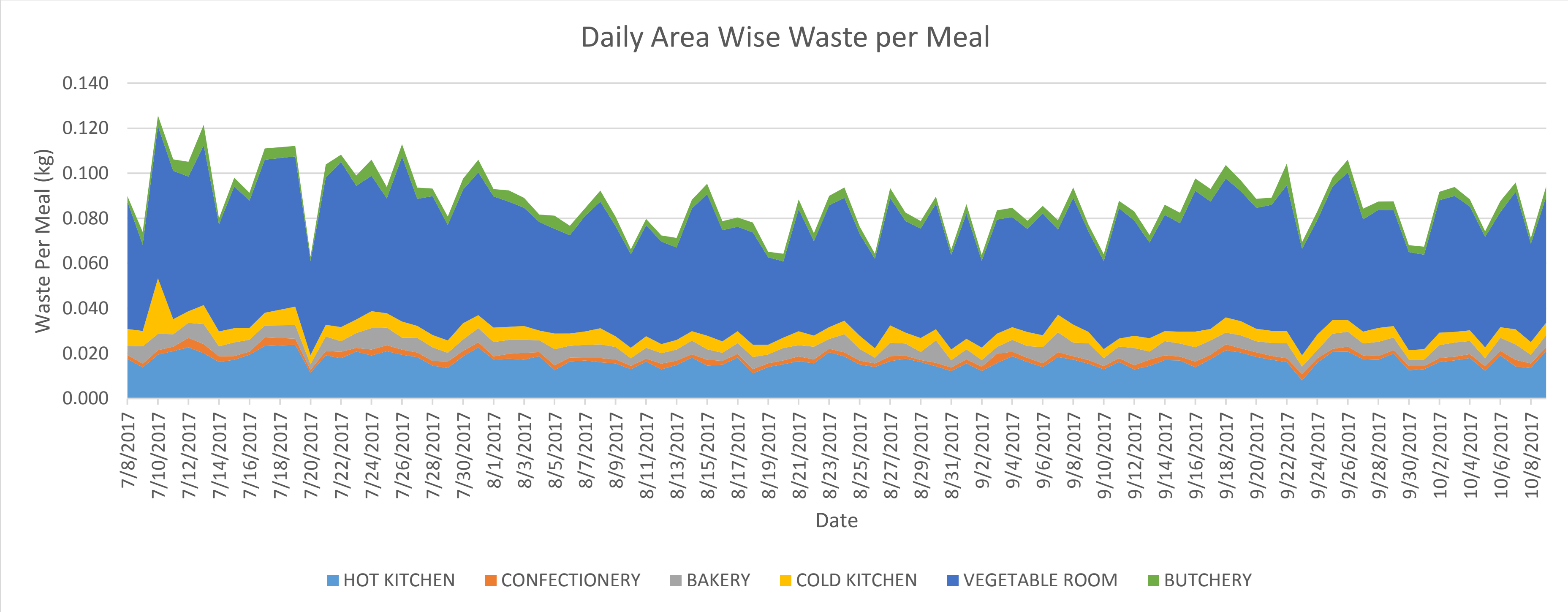


Figure 4.8: Daily Area Wise Waste per Meal

Referring to the below figure (Figure 4.9) the Comparison of the Pre-Production (Vegetable Room and Butchery) and the Production (Hot Kitchen, Cold Kitchen, Confectionery and the Bakery) contribution for the Total Average Waste per meal has followed the popular Pareto Theory which is 80% of the Average Waste per meal has generated from the Pre-Production (Vegetable Room and Butchery) and the balance 20% has generated for the Other Kitchens (Hot Kitchen, Cold Kitchen, Confectionery and the Bakery).

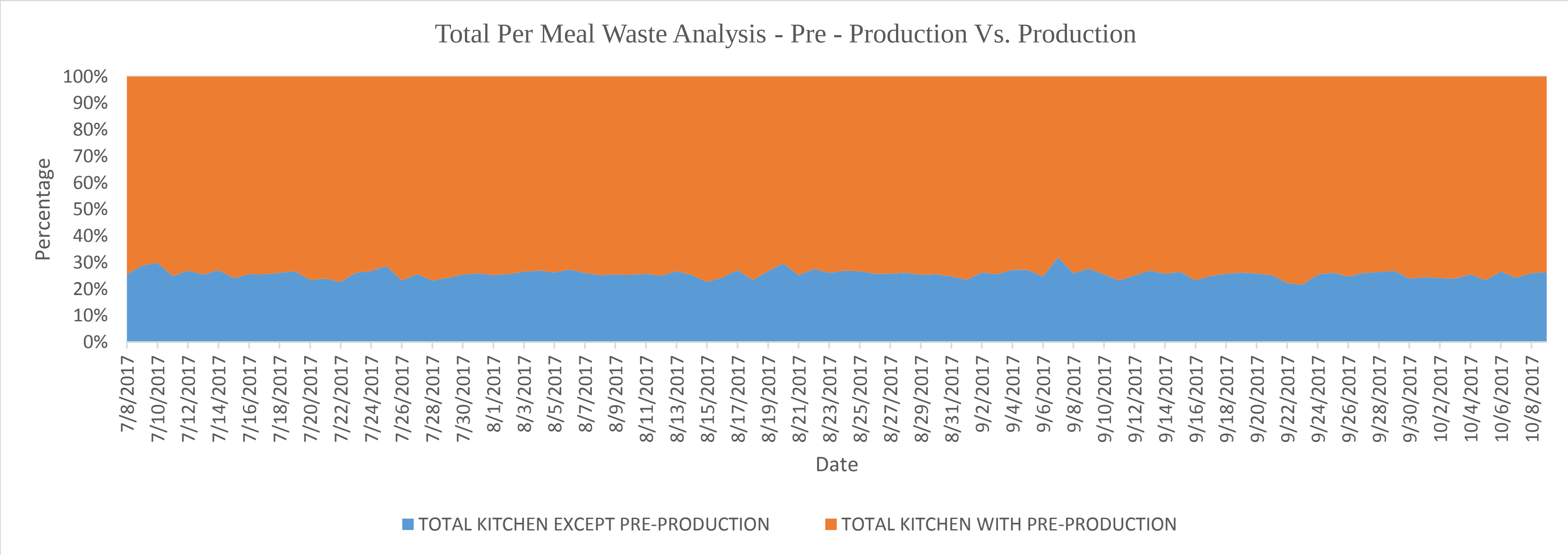


Figure 4.9: Total Waste Analysis - Per Production vs. Production

The below figure (Figure 4.10) represent the variation of the Average per meal waste from July to October 2017. Each sub kitchens has reported the Lowest Average Waste per meal on August which is the Peak period with highest Meal Count of the Research period. The Highest waste has reported in the month of October. The provision for the potential increases might cause the Average waste per meal due to the uncertainty in the production line without accurate forecast for the Final pax Counts. The impact of the upstream in the supply chain can be seen that the waste has increased significantly in the Upstream (Pre- production) due to the Supply Chain bullwhip Effect.

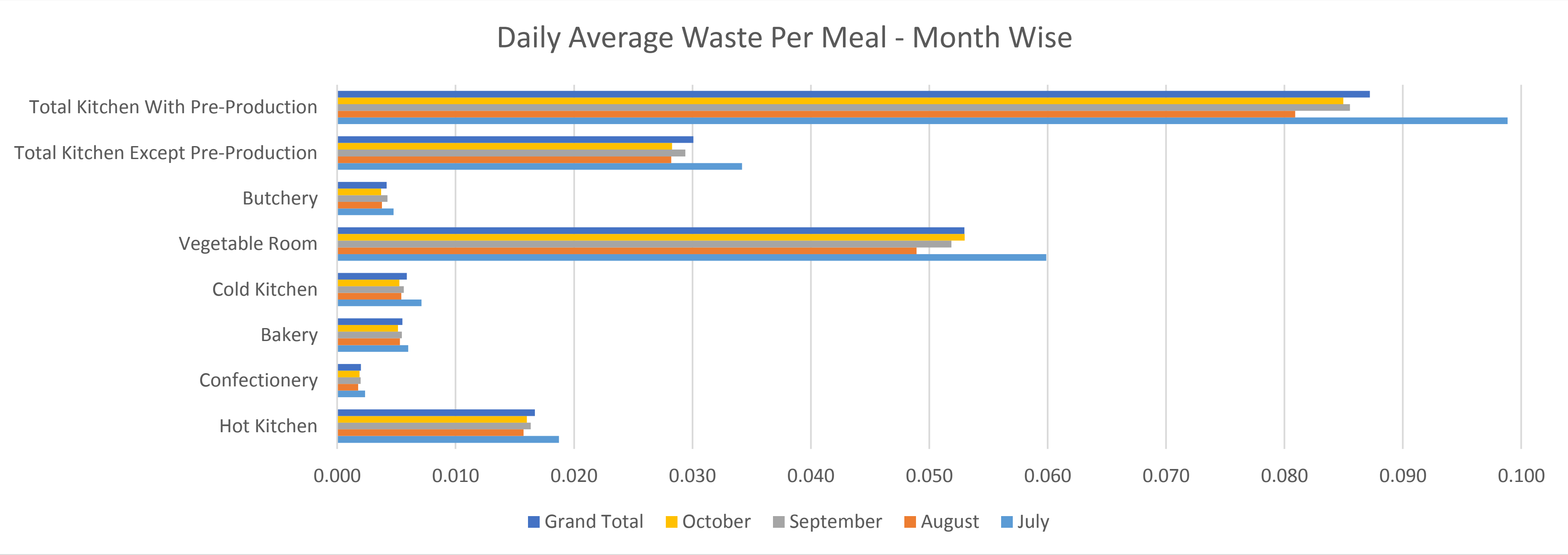
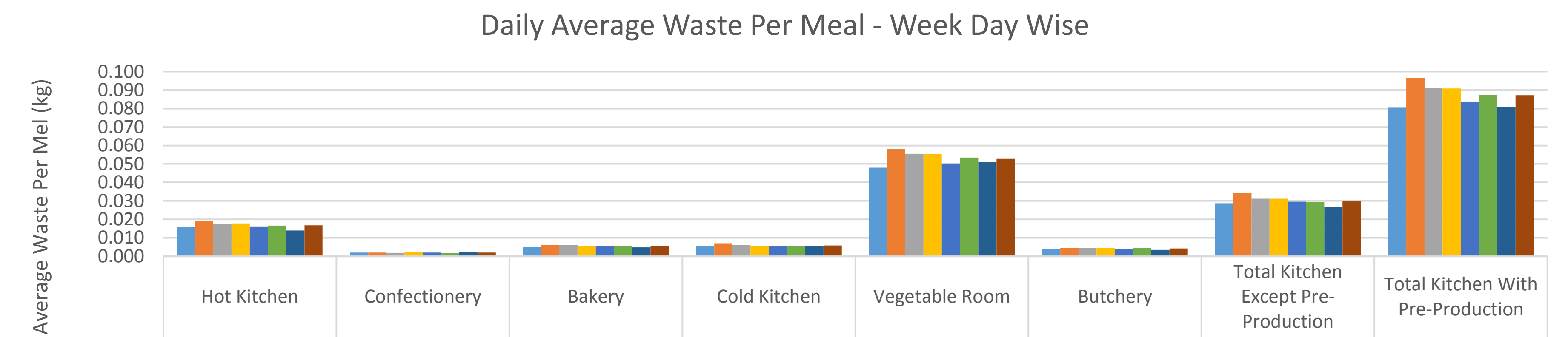


Figure 4.10: Daily Area Wise Average Waste per Meal - Monthly

The below figure (Figure 4.11) graphically represent the Daily Fluctuation of the Average waste per meal in the period of July to October 2017 with respect to each week day for each sub kitchens. The highest average waste per meal 0.019 kg/ per meal has generated on Day Number 2 (Monday) in Hot Kitchen, Highest average waste per meal in Bakery has reported on Day number 02/03/04/05/06 (Monday, Tuesday, Wednesday, Thursday and Friday) as 0.005 kg per meal, for Cold Kitchen Highest average Waste per Meal is generated on Day Number 2 (Monday), in Vegetable room the Highest average Waste per meal 0.058 kg per meal on Day Number 02 (Monday), butchery the 0.005 kg waste per meal on day number 02 (Monday). The total Average waste Per Meal with and Without Pre production has generated on Day Number 02 (Monday) following 0.034 kg per meal and 0.097 kg per meal.



	Hot Kitchen	Confectionery	Bakery	Cold Kitchen	Vegetable Room	Butchery	Total Kitchen Except Pre-Production	Total Kitchen With Pre-Production
D1	0.016	0.002	0.005	0.006	0.048	0.004	0.029	0.081
D2	0.019	0.002	0.006	0.007	0.058	0.005	0.034	0.097
D3	0.017	0.002	0.006	0.006	0.055	0.004	0.031	0.091
D4	0.018	0.002	0.006	0.006	0.055	0.004	0.031	0.091
D5	0.016	0.002	0.006	0.006	0.050	0.004	0.030	0.084
D6	0.017	0.002	0.006	0.005	0.053	0.004	0.029	0.087
D7	0.014	0.002	0.005	0.006	0.051	0.003	0.027	0.081
Grand Total	0.017	0.002	0.006	0.006	0.053	0.004	0.030	0.087

Figure 4.11: Daily Average Waste per Meal – Week Day Wise

Minimum waste per meal are reported as, Hot Kitchen Day Number 07 (Saturday) with 0.014 kg per meal, Bakery Day number 01/07(Saturday/ Sunday) with 0.005 kg per Meal, Vegetable Room 0.048 kg per meal on day number 01 (Sunday), Butchery day Number 07(Saturday), Total Kitchen Except Pre Production on day Number 07 (Saturday) with 0.027 kg per meal and finally total Production with Pre-Production on day Number 01/ 07 (Sunday and Saturday) with 0.081 kg per meal.

4.4. Results of Statistical Analysis

In this Section the data collected from Flight Catering Company are explored and presented to discover underlying scientific patterns and trends Using Statistical methods.

4.4.1. One-Way ANOVA

In this Research the Analysis of Variance (ANOVA) is Used to determine whether any of the differences between the means are statistically significant, compare the p-value to of the significance level (α) of 0.05 (A significance level of 0.05 indicates a 5% risk of concluding that a difference exists when there is no actual difference) to assess the null hypothesis. The null hypothesis states that the population means are all equal.

Null Hypothesis 1 (H_0): *The Mean Waste per Meal values of Different Sectors are Equal*

Alternative Hypothesis 1(H_1): *The Mean Waste per Meal values of Different Sectors are not equal*

Null Hypothesis 2 (H_0): *The Mean Waste per Meal values of Different Months are Equal*

Alternative Hypothesis 2 (H_1): *The Mean Waste per Meal values of Different Months are Not Equal*

Null Hypothesis 3 (H_0): *The Mean Waste per Meal values of Different Week Days are Equal*

Alternative Hypothesis 3 (H_1): *The Mean Waste per Meal values of Week Days are Not Equal*

Decision Rule - One- Way ANOVA of the Variables

P-Value ≤ α (0.05): The differences between some of the means are statistically significant - Reject the Null Hypothesis

P-Value > α (0.05): The differences between the means are not statistically significant – Not Reject the Null Hypothesis

Table 4.20: One- Way ANOVA of the Variables

One- Way ANOVA		P- Value							
Airline	**Statistic**	**Hot Kitchen**	**Confectionery**	**Bakery**	**Cold Kitchen**	**Vegetable Room**	**Butchery**	**Total Kitchen Except Pre-Production**	**Total Kitchen With Pre-Production**
AB Airlines	Sector_1	0.56	0.71	0.85	0.82	0.75	0.98	0.47	0.63
	Month	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Day No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
XY Airlines	Sector_1	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Month	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Day No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

According to the ANOVA Test p-Values the of the Hypothesis test above the Sector_1, p- Values are > α (0.05): The differences between the means are not statistically significant – Not Reject the Null Hypothesis. The Conclusions ***Null Hypothesis 1 (H_0):*** *The Mean Waste per Meal values of Different Sectors are Equal.*

According to the ANOVA Test p-Values the of the Hypothesis test above the Month and the Day Number, P-Values are ≤ α (0.05): The differences between some of the means are statistically significant - Reject the Null Hypothesis. The Conclusions are as below,

***Alternative Hypothesis 2 (H_1):** The Mean Waste per Meal values of Different Months are Not Equal*

***Alternative Hypothesis 3 (H_1):** The Mean Waste per Meal values of Week Days are Not Equal*

4.4.2. Correlations

The Research was used the Pearson correlation coefficient to examine the strength and direction of the linear relationship between two continuous variables (Passenger Load factor and the Average Waste per Meal).To determine whether the correlation between variables (Passenger Load factor and the Average Waste per Meal) was significant, compare the p-value to the significance level (α) 0.05 (An α of 0.05 indicates that the risk of concluding that a correlation exists—when, actually, no correlation exists—is 5%). A coefficient of 0 indicates that there is no linear relationship.

P-value ≤ α (0.05): The correlation is statistically significant
P-value > (0.05) α: The correlation is not statistically significant

Referring to the below Table (Table 4.21) for XY Airlines, Flights FC- Initial Load Factor, FC- Final Load Factor, FC- Load Factor Variance, BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance, Daily Meal Count have negative Correlation with Hot Kitchen Average Waste per meal which means the increase in these factors will decrease the Waste per Meal and the decrease in these factors will increase the waste per Meal but only FC- Final Load Factor, FC- Load Factor Variance, BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, Daily Meal Count are Scientifically significant for the Hot Kitchen average Load Factor variance. FC- Initial Load Factor and EY- Load Factor Variance are not Scientifically Significant for the Hot Kitchen Average Waste per Meal.

Table 4.21: Correlation Analysis of the Variables - XY Airlines

Correlations	**Hot Kitchen**		**Confectionery**		**Bakery**		**Cold Kitchen**		**Vegetable Room**		**Butchery**		**Total Kitchen Except Pre-Production**		**Total Kitchen With Pre-Production**	
Statistic	**C**	**P**	**C**	**P**	**C**	**P**	**C**	**P**	**C**	**P**	**C**	**P**	**C**	**P**	**C**	**P**
FC- Initial Load Factor	-0.06	0.23	0.02	0.73	-0.09	0.07	-0.04	0.41	-0.08	0.10	-0.08	0.08	-0.07	0.13	-0.09	0.07
FC- Final Load Factor	-0.13	0.01	-0.01	0.83	-0.08	0.11	-0.09	0.05	-0.18	0.00	-0.13	0.01	-0.14	0.00	-0.18	0.00
FC- Load Factor Variance	-0.10	0.04	-0.03	0.53	0.00	0.99	-0.07	0.14	-0.13	0.00	-0.07	0.16	-0.09	0.06	-0.13	0.01
BC- Initial Load Factor	-0.14	0.00	0.00	0.96	-0.13	0.01	-0.07	0.14	-0.14	0.00	-0.12	0.01	-0.15	0.00	-0.16	0.00
BC- Final Load Factor	-0.22	0.00	0.01	0.85	-0.15	0.00	-0.11	0.02	-0.20	0.00	-0.16	0.00	-0.22	0.00	-0.22	0.00
BC- Load Factor Variance	-0.15	0.00	0.02	0.67	-0.04	0.44	-0.08	0.11	-0.11	0.02	-0.08	0.07	-0.13	0.01	-0.13	0.01
EY- Initial Load Factor	-0.22	0.00	-0.06	0.21	-0.13	0.01	-0.13	0.01	-0.26	0.00	-0.13	0.01	-0.23	0.00	-0.26	0.00
EY- Final Load Factor	-0.24	0.00	-0.05	0.26	-0.13	0.01	-0.12	0.01	-0.26	0.00	-0.15	0.00	-0.23	0.00	-0.27	0.00
EY- Load Factor Variance	-0.03	0.51	0.02	0.66	0.01	0.78	0.04	0.42	0.01	0.77	-0.04	0.42	0.01	0.91	0.01	0.88
Daily Meal Count	-0.59	0.00	-0.32	0.00	-0.35	0.00	-0.36	0.00	-0.63	0.00	-0.44	0.00	-0.63	0.00	-0.69	0.00

Note: C: Pearson correlation, P: P-Value

Average Waste per meal in confectionery has negative Correlation with FC- Final Load Factor, FC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, Daily Meal Count and Positive Correlation with FC- Initial Load Factor, BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Load Factor Variance but only the Daily Meal Count is Scientifically significant ($P < 0.05$) out of all the Factors analyzed against the average Waste per meal in Confectionery.

Except FC- Load Factor Variance and EY- Load Factor Variance, all the other Factors above has negative Correlation with Bakery Waste per Meal. BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for Bakery average Waste per meal.

Cold Kitchen Average Waste per meal has Positive correlation with EY- Load Factor Variance only out of all the factors. Factors FC- Final Load Factor, BC- Final Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for Cold Kitchen Average waste Per Meal.

EY- Load Factor Variance is only has positive Correlation with Average Waste per meal in Vegetable room, with Scientifically not significant two factors of FC- Initial Load Factor, EY- Load Factor Variance.

Butchery Average Waste per Meal has negative Correlation with all the factors analyzed and FC- Final Load Factor, BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are only scientifically significant with P-Value < 0.005 (α).

For Total Kitchen except Pre-Production waste per Meal has Positive Correlation with EY- Load Factor Variance with Scientifically Significant factors such as FC- Initial Load Factor, FC- Load Factor Variance, and EY- Load Factor Variance.

Total Kitchen with Pre-Production has Positive Correlation with EY- Load Factor Variance only with scientifically not significant two factors which are FC- Initial Load Factor, EY- Load Factor Variance.

The below table represent the Pearson Correlation the respective P-Values of BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance and Daily Meal Count with Average Waste Per Meal in Hot Kitchen, Confectionery, Bakery, Cold Kitchen, Vegetable Room, Butchery, Total Kitchen Except Pre-Production, Total Kitchen With Pre-Production.

The Hot Kitchen Waste per Meal has positive Correlation with BC- Load Factor Variance, EY- Load Factor Variance and only BC- Load Factor Variance is not scientifically significant for average Hot Kitchen waste per meal. All the Factors have negative Correlation with Confectionery Waste per meal but only BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor, Daily Meal Count are Scientifically significant.

Table 4.22: Correlation Analysis of the Variables - AB Airlines

Correlations	**Hot Kitchen**		**Confectionery**		**Bakery**		**Cold Kitchen**		**Vegetable Room**		**Butchery**		**Total Kitchen Except Pre-Production**		**Total Kitchen With Pre-Production**	
Statistic	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P
BC- Initial Load Factor	-0.05	0.00	-0.01	0.22	-0.03	0.01	-0.02	0.15	-0.06	0.00	-0.06	0.00	-0.04	0.00	-0.06	0.00
BC- Final Load Factor	-0.04	0.00	-0.02	0.04	0.00	0.76	0.00	0.75	-0.04	0.00	-0.03	0.00	-0.02	0.04	-0.04	0.00
BC- Load Factor Variance	0.02	0.16	-0.02	0.15	0.05	0.00	0.02	0.06	0.02	0.09	0.04	0.00	0.03	0.01	0.03	0.01
EY- Initial Load Factor	-0.06	0.00	-0.05	0.00	-0.04	0.00	-0.02	0.12	-0.07	0.00	-0.06	0.00	-0.06	0.00	-0.08	0.00
EY- Final Load Factor	-0.06	0.00	-0.05	0.00	-0.03	0.01	-0.02	0.13	-0.06	0.00	-0.05	0.00	-0.05	0.00	-0.06	0.00
EY- Load Factor Variance	0.02	0.03	-0.01	0.53	0.03	0.00	0.00	0.85	0.03	0.00	0.04	0.00	0.02	0.04	0.03	0.00
Daily Meal Count	-0.59	0.00	-0.32	0.00	-0.35	0.00	-0.36	0.00	-0.62	0.00	-0.45	0.00	-0.64	0.00	-0.69	0.00

Note: C: Pearson correlation, P: P-Value

BC- Final Load Factor has 0 Correlation (Means no linear relationship) with bakery Waste per Meal. BC- Load Factor Variance and EY- Load Factor Variance has positive Correlation with the Bakery Waste per Meal. Except BC- Final Load Factor all the Other Factors BC- Initial Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance, Daily Meal Count are scientifically significant for Bakery Average Waste per Meal.

Both BC- Final Load Factor, EY- Load Factor Variance Correlation with Cold Kitchen Waste per Meal is Zero (Means no linear relationship). Only BC- Load Factor Variance has Positive Correlation with Cold Kitchen Waste per Meal. Out of all the factors only Daily Meal Count is scientifically significant for Average waste per meal in Cold Kitchen.

Both BC- Load Factor Variance, EY- Load Factor Variance have Positive Variance with Average Vegetable Room Waste per meal with the factor of BC- Load Factor Variance which is not Scientifically Significant Out of all the factors for the Vegetable room Waste Per Meal.

All the analyzed factors are significant with the Butchery Waste per meal with positive correlation of two factors BC- Load Factor Variance and EY- Load Factor Variance.

Average Waste per Meal in Total Kitchen except Pre-Production has scientifically significant Correlation with all the factors with Positive Correlation with the Factors BC- Load Factor Variance and EY- Load Factor Variance.

The Total Kitchen with Pre-Production has Positive Correlation with BC- Load Factor Variance and EY- Load Factor Variance and all the Factors are scientifically significant for Average Waste per Meal in Total Kitchen except Pre-Production.

4.4.3. Coefficient Analysis

The coefficient of variation is a measure of Passenger Load Factor and the Average Waste per meal data collected that describes the amount of variability relative to the mean. Because the coefficient of variation is unit less, the researcher use it instead of the standard deviation to compare the spread of data sets that have different units or different means.

Table 4.23: XY Airline Single Variable Coefficient Analysis - Hot Kitchen Waste per Meal

Hot Kitchen Waste Per Meal				
Variable (X)	**Term**	**Coefficient**	**SE Coefficient**	**P-Value**
FC- Initial Load Factor	c	0.0168	0.0002	0.0000
	X	-0.0006	0.0005	0.2300
FC- Final Load Factor	c	0.0170	0.0002	0.0000
	X	-0.0011	0.0004	0.0050
FC- Load Factor Variance	c	0.0167	0.0001	0.0000
	X	-0.0010	0.0005	0.0410
BC- Initial Load Factor	c	0.0175	0.0003	0.0000
	X	-0.0014	0.0005	0.0020
BC- Final Load Factor	c	0.0180	0.0003	0.0000
	X	-0.0021	0.0004	0.0000
BC- Load Factor Variance	c	0.0167	0.0001	0.0000
	X	-0.0024	0.0008	0.0020
EY- Initial Load Factor	c	0.0188	0.0005	0.0000
	X	-0.0028	0.0006	0.0000
EY- Final Load Factor	c	0.0192	0.0005	0.0000
	X	-0.0032	0.0006	0.0000
EY- Load Factor Variance	c	0.0167	0.0001	0.0000
	X	-0.0010	0.0015	0.5130
Daily Meal Count	c	0.0316	0.0010	0.0000
	X	0.0000	0.0000	0.0000

Note: Y= mX + c (X: Variable, c: Constant)

The above table (Table 4.23) represents the Coefficient of the each factor with Hot Kitchen Waste per Meal. The all coefficients and the Constants are significant except FC- Initial Load Factor and EY- Load Factor Variance. All the coefficients are negative (Except the Daily Meal Count) with reference to Hot Kitchen Waste per meal which means the Hot Kitchen Waste per meal is increasing when the Factor values are increasing and when the factor Values are reducing the Hot Kitchen Waste per Meal is increasing. The highest Coefficient (absolute value) represent the EY- Final Load Factor as -0.0032 means each single increase in EY- Final Load Factor will reduce Average Hot Kitchen waste per meal by 0.0032 kg, vice versa.

Table 4.24: XY Airline Single Variable Coefficient Analysis - Confectionery Waste per Meal

Confectionery Waste Per Meal				
Variable (X)	**Term**	**Coefficient**	**SE Coefficient**	**P-Value**
FC- Initial Load Factor	c	0.00199	0.00004	0.000
	X	0.00003	0.00009	0.725
FC- Final Load Factor	c	0.00200	0.00004	0.000
	X	-0.00002	0.00008	0.833
FC- Load Factor Variance	c	0.00200	0.00003	0.000
	X	-0.00006	0.00010	0.532
BC- Initial Load Factor	c	0.00200	0.00007	0.000
	X	-0.00001	0.00010	0.956
BC- Final Load Factor	c	0.00198	0.00007	0.000
	X	0.00002	0.00009	0.848
BC- Load Factor Variance	c	0.00199	0.00003	0.000
	X	0.00007	0.00016	0.670
EY- Initial Load Factor	c	0.00212	0.00010	0.000
	X	-0.00016	0.00013	0.207
EY- Final Load Factor	c	0.00211	0.00011	0.000
	X	-0.00015	0.00013	0.255
EY- Load Factor Variance	c	0.00199	0.00003	0.000
	X	0.00014	0.00031	0.659
Daily Meal Count	c	0.00366	0.00023	0.000
	X	0.00000	0.00000	0.000

Note: Y= mX + c (X: Variable, c: Constant)

The above table (Table 4.24) represents the Coefficients of Confectionery Waste per meal vs the Independent variables of the Research. FC- Initial Load Factor, BC- Final Load Factor, EY- Load Factor Variance and Daily Meal Count Variables have positive Coefficient with the Confectionery Waste per meal, which means the increase of above mention independent Variables are increasing the Confectionery Waste per meal, vice Versa. From all the independent Variables the Daily Meal Count is the only factor which is scientifically significant. (P- Value< 0.005). The highest Coefficient (Absolute Value) is incurred by EY- Load Factor Variance of 0.00014, which means the each single increase of EY- Load Factor Variance will increase 0.00014 kg of Waste per Meal in Confectionery.

Table 4.25: XY Airline Single Variable Coefficient Analysis - Bakery Average Waste per Meal

Bakery Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.00561	0.00009	0.00000
	X	-0.00042	0.00023	0.07200
FC- Final Load Factor	c	0.00560	0.00009	0.00000
	X	-0.00033	0.00021	0.11300
FC- Load Factor Variance	c	0.00550	0.00007	0.00000
	X	0.00000	0.00025	0.99000
BC- Initial Load Factor	c	0.00590	0.00016	0.00000
	X	-0.00065	0.00023	0.00600
BC- Final Load Factor	c	0.00594	0.00016	0.00000
	X	-0.00070	0.00022	0.00200
BC- Load Factor Variance	c	0.00551	0.00007	0.00000
	X	-0.00030	0.00039	0.44100
EY- Initial Load Factor	c	0.00615	0.00025	0.00000
	X	-0.00083	0.00031	0.00700
EY- Final Load Factor	c	0.00620	0.00027	0.00000
	X	-0.00088	0.00032	0.00700
EY- Load Factor Variance	c	0.00550	0.00007	0.00000
	X	0.00022	0.00078	0.77700
Daily Meal Count	c	0.01003	0.00058	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

Except FC- Load Factor Variance, EY- Load Factor Variance and Daily Meal Count factors all the other Independent Variables have negative Coefficient against the Average Waste per meal in Bakery. Increase of these factors will increase the Average Waste per meal in Bakery while increase of other factors will decrease the Average Waste per Meal in bakery, Vice Versa. BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for Average Waste per Meal in Bakery. EY- Final Load Factor has the highest coefficient (Absolute Value) over the Average Waste in Bakery, better forecasting of this factor will significantly control the Average Waste per Meal in Bakery.

Table 4.26: XY Airline Single Variable Coefficient Analysis – Cold Kitchen Average Waste per Meal

Cold Kitchen Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.00596	0.00014	0.00000
	X	-0.00028	0.00035	0.41400
FC- Final Load Factor	c	0.00607	0.00014	0.00000
	X	-0.00061	0.00031	0.04800
FC- Load Factor Variance	c	0.00591	0.00011	0.00000
	X	-0.00055	0.00037	0.13500
BC- Initial Load Factor	c	0.00620	0.00024	0.00000
	X	-0.00052	0.00035	0.14300
BC- Final Load Factor	c	0.00638	0.00024	0.00000
	X	-0.00078	0.00033	0.02000
BC- Load Factor Variance	c	0.00590	0.00011	0.00000
	X	-0.00094	0.00059	0.10900
EY- Initial Load Factor	c	0.00691	0.00038	0.00000
	X	-0.00130	0.00046	0.00500
EY- Final Load Factor	c	0.00689	0.00040	0.00000
	X	-0.00126	0.00048	0.00900
EY- Load Factor Variance	c	0.00587	0.00011	0.00000
	X	0.00093	0.00115	0.41800
Daily Meal Count	c	0.01277	0.00085	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

Only two independent Variables EY - Load Factor Variance and Daily Meal Count have positive Coefficient against the Cold kitchen average waste per meal. All the other Independent variables are having negative coefficient over the Cold Kitchen Average Waste per Meal. FC- Final Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for the Cold kitchen Average Waste per meal. With Negative (-0.00130) coefficient of EY- Initial Load Factor has the highest coefficient (Absolute Value) on Cold kitchen Average Waste per Meal, where the company will be able to reduce the Cold Kitchen Average Waste per meal significantly with better forecasting and focusing on EY- Initial Load Factor.

Table 4.27: XY Airline Single Variable Coefficient Analysis – Vegetable Room Average Waste per Meal

Vegetable Room Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.05342	0.00053	0.00000
	X	-0.00216	0.00133	0.10400
FC- Final Load Factor	c	0.05420	0.00053	0.00000
	X	-0.00450	0.00116	0.00000
FC- Load Factor Variance	c	0.05303	0.00041	0.00000
	X	-0.00401	0.00140	0.00400
BC- Initial Load Factor	c	0.05531	0.00092	0.00000
	X	-0.00394	0.00133	0.00300
BC- Final Load Factor	c	0.05624	0.00090	0.00000
	X	-0.00531	0.00126	0.00000
BC- Load Factor Variance	c	0.05295	0.00041	0.00000
	X	-0.00519	0.00223	0.02000
EY- Initial Load Factor	c	0.06042	0.00141	0.00000
	X	-0.00960	0.00172	0.00000
EY- Final Load Factor	c	0.06112	0.00149	0.00000
	X	-0.01033	0.00180	0.00000
EY- Load Factor Variance	c	0.05285	0.00041	0.00000
	X	0.00130	0.00441	0.76900
Daily Meal Count	c	0.09873	0.00273	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

EY- Load Factor Variance and Daily Meal Count are having positive coefficient with Vegetable Room Average Waste per Meal. The Highest Absolute Coefficient has generated by EY- Final Load Factor with Negative (-0.01033) coefficient means the Increase of this Independent Variable will reduce the Average waste Per Meal in Vegetable Room. This represent the since the preparation of the Vegetables is done in advance has minimized the risk of increasing the Loads at the Last 24 hours by producing for Configuration (Full Load) or Close to Configuration by provisioning the potential increases. Coefficient of the FC- Final Load Factor, FC- Load Factor Variance, BC- Initial Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are Scientifically significant for the Average Waste Per Meal in the vegetable Room.

Table 4.28: XY Airline Single Variable Coefficient Analysis – Butchery Average Waste per Meal

Butchery Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.00425	0.00008	0.00000
	X	-0.00035	0.00020	0.07700
FC- Final Load Factor	c	0.00430	0.00008	0.00000
	X	-0.00048	0.00018	0.00600
FC- Load Factor Variance	c	0.00417	0.00006	0.00000
	X	-0.00030	0.00021	0.16200
BC- Initial Load Factor	c	0.00448	0.00014	0.00000
	X	-0.00052	0.00020	0.01000
BC- Final Load Factor	c	0.00458	0.00014	0.00000
	X	-0.00067	0.00019	0.00000
BC- Load Factor Variance	c	0.00417	0.00006	0.00000
	X	-0.00060	0.00033	0.07400
EY- Initial Load Factor	c	0.00474	0.00022	0.00000
	X	-0.00074	0.00026	0.00500
EY- Final Load Factor	c	0.00488	0.00023	0.00000
	X	-0.00091	0.00028	0.00100
EY- Load Factor Variance	c	0.00417	0.00006	0.00000
	X	-0.00053	0.00066	0.41800
Daily Meal Count	c	0.00899	0.00047	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

The above table represents the Coefficients, Standard Errors and the P- Values of the Independent Variables with the Average waste per Meal in butchery. Only Daily Meal Count has positive Coefficient with Average Waste per Meal in butchery where all the other factors has negative coefficients. EY- Final Load Factor has the highest absolute Coefficient Value from the variables, indicating that the company need to focus and Forecast more on this factor in order to reduce the Average Waste per meal in the Butchery. Independent Variables which coefficients are scientifically significant for the Average Waste per Meal in Butchery are FC- Final Load Factor, BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count. Since all the Independent Variables related to the Passenger Loads are having negative coefficient with the Average Waste per Meal in

Butchery indicates that the Pre Preparation in the Butchery has produced by keeping provision for the potential increases within last 24 hours to the ETD of the Flights without any scientific rationale. The risk of waste generated due to not increasing the Passenger Loads within last 24 hours to the Estimated Time of Departure will have to bear by the Caterer according to the Current Situation.

Table 4.29: XY Airline Single Variable Coefficient Analysis – Average Waste per Meal in Total Kitchen except Pre Production

Total Kitchen Except Pre Production Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.03035	0.00032	0.00000
	X	-0.00122	0.00080	0.12700
FC- Final Load Factor	c	0.03065	0.00032	0.00000
	X	-0.00209	0.00071	0.00300
FC- Load Factor Variance	c	0.03010	0.00025	0.00000
	X	-0.00161	0.00085	0.05900
BC- Initial Load Factor	c	0.03163	0.00055	0.00000
	X	-0.00258	0.00080	0.00100
BC- Final Load Factor	c	0.03228	0.00054	0.00000
	X	-0.00354	0.00076	0.00000
BC- Load Factor Variance	c	0.03009	0.00024	0.00000
	X	-0.00359	0.00134	0.00800
EY- Initial Load Factor	c	0.03403	0.00085	0.00000
	X	-0.00508	0.00104	0.00000
EY- Final Load Factor	c	0.03445	0.00090	0.00000
	X	-0.00553	0.00109	0.00000
EY- Load Factor Variance	c	0.03003	0.00025	0.00000
	X	0.00030	0.00265	0.91100
Daily Meal Count	c	0.05804	0.00163	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

According to the above table (Table 4.29) which analyses the Coefficients of the Independent Variables of the Research against the Average Waste per Meal generated in the Total Kitchen except Pre Production (Vegetable Room and Butchery), the positive Coefficients are generated by the EY- Load Factor Variance and Daily Meal Count, all the other Independent Variables have generated a negative Coefficients. The coefficients of the FC- Final Load Factor, BC-

Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for the Average Waste per meal (Vegetable Room and Butchery). The Highest Absolute Value Coefficient is represented by the Independent Variable EY- Final Load Factor with negative (-0.00553) Coefficient.

Table 4.30: XY Airline Single Variable Coefficient Analysis – Average Waste per Meal in Total Kitchen with Pre Production

Total Kitchen With Pre Production Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
FC- Initial Load Factor	c	0.08802	0.00083	0.00000
	X	-0.00373	0.00207	0.07200
FC- Final Load Factor	c	0.08916	0.00082	0.00000
	X	-0.00708	0.00181	0.00000
FC- Load Factor Variance	c	0.08729	0.00064	0.00000
	X	-0.00591	0.00219	0.00700
BC- Initial Load Factor	c	0.09141	0.00143	0.00000
	X	-0.00704	0.00207	0.00100
BC- Final Load Factor	c	0.09310	0.00139	0.00000
	X	-0.00951	0.00196	0.00000
BC- Load Factor Variance	c	0.08721	0.00063	0.00000
	X	-0.00938	0.00347	0.00700
EY- Initial Load Factor	c	0.09919	0.00219	0.00000
	X	-0.01541	0.00267	0.00000
EY- Final Load Factor	c	0.10046	0.00231	0.00000
	X	-0.01677	0.00279	0.00000
EY- Load Factor Variance	c	0.08705	0.00064	0.00000
	X	0.00106	0.00688	0.87800
Daily Meal Count	c	0.16575	0.00396	0.00000
	X	0.00000	0.00000	0.00000

Note: Y= mX + c (X: Variable, c: Constant)

The Coefficients of the Average Waste per Meal in Total Kitchen with Pre Production (Vegetable Room and Butchery) with the Independent Variables are represented in the above Table (Table 4.30). Except EY- Load Factor Variance and Daily Meal Count, all the Other Independent Variables have Negative Coefficient, means the Increase in those factors will reduce the average Waste per meal in Total Kitchen with Pre Production. Coefficients of the

Variables, FC- Final Load Factor, BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant. The Highest Absolute Value Coefficient (-0.01677) is incurred by the EY- Final Load Factor , which the company need to focus and forecast better in order to reduce the Average Waste per Meal in Total Kitchen With Pre Production.

Table 4.31: AB Airline Single Variable Coefficient Analysis – Hot Kitchen Waste per Meal.

Hot Kitchen Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.017	0.000	0.000
	X	0.000	0.000	0.000
BC- Final Load Factor	c	0.017	0.000	0.000
	X	0.000	0.000	0.002
BC- Load Factor Variance	c	0.017	0.000	0.000
	X	0.000	0.000	0.157
EY- Initial Load Factor	c	0.017	0.000	0.000
	X	-0.001	0.000	0.000
EY- Final Load Factor	c	0.017	0.000	0.000
	X	-0.001	0.000	0.000
EY- Load Factor Variance	c	0.017	0.000	0.000
	X	0.001	0.000	0.034
Daily Meal Count	c	0.032	0.000	0.000
	X	0.000	0.000	0.000

The above table (Table 4.31) represents the coefficients of the Average Waste per meal in Hot Kitchen with the Independent Variables calculated Based on the AB Airline Flight Figures. Coefficients of the BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Load Factor Variance and Daily Meal Count with Average Waste per meal in Hot Kitchen are Positive and the other factors have negative Coefficients. All the factors, BC- Initial Load Factor

BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance and Daily Meal Count are scientifically significant except BC- Load Factor Variance. Coefficients of all the factors are close to zero are represented that the increase or decrease in individual factors will not significantly affect the Average Waste per meal in hot kitchen whereas collective increase or decrease will affect the Dependent Variable (Average Waste per meal) significantly.

According to the below table (Table 4.32) the coefficients of the all the Independent variables are Positive (Not Negative) which means that the Increase of this Variables will decrease the Average waste per meal in confectionery vice Versa, but the values are close to zero this represent that the individual Independent Variable will not significantly change the Average Waste per meal in Confectionery. But Collective focus and Forecast on the Scientifically Significant Variables (P- Value <0.05) BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count will be able to control the Average Waste per meal in confectionery.

Table 4.32: AB Airline Single Variable Coefficient Analysis – Confectionery Waste per Meal

Confectionery Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.002	0.000	0.000
	X	0.000	0.000	0.217
BC- Final Load Factor	c	0.002	0.000	0.000
	X	0.000	0.000	0.038
BC- Load Factor Variance	c	0.002	0.000	0.000
	X	0.000	0.000	0.149
EY- Initial Load Factor	c	0.002	0.000	0.000
	X	0.000	0.000	0.000
EY- Final Load Factor	c	0.002	0.000	0.000
	X	0.000	0.000	0.000
EY- Load Factor Variance	c	0.002	0.000	0.000
	X	0.000	0.000	0.530
Daily Meal Count	c	0.004	0.000	0.000
	X	0.000	0.000	0.000

Referring to the below table (Table 4.33) the coefficient of all Independent variables are positive but close to zero, means the individual factor increases or decreases will not significantly affect the increases or decreases of the Average Waste per meal in Bakery. Coefficients of BC- Initial Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance and Daily Meal Count are scientifically significant for the dependent variable average Waste per meal in bakery except the Independent variable BC- Final Load Factor. EY- Load Factor Variance is the most significantly affect variable for the Average Waste per meal in bakery. Increase of EY- Load Factor Variance will increase the Average Waste per meal, vice Versa. The supply chain uncertainty has created the producer to produce more than the Initial Passenger Loads to cater the passenger load increases in last 24 hours to the estimated time of Departure (ETD). But the risk is if the loads do not increase as expected the Waste will have to bear by the Caterer.

Table 4.33: AB Airline Single Variable Coefficient Analysis – Bakery Waste per Meal

Bakery Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.013
BC- Final Load Factor	c	0.005	0.000	0.000
	X	0.000	0.000	0.756
BC- Load Factor Variance	c	0.005	0.000	0.000
	X	0.000	0.000	0.000
EY- Initial Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.000
EY- Final Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.010
EY- Load Factor Variance	c	0.005	0.000	0.000
	X	0.001	0.000	0.004
Daily Meal Count	c	0.010	0.000	0.000
	X	0.000	0.000	0.000

The below table (Table 4.34) Summarizes the coefficients of the Independent variables with reference to the Average Waste per meal in Cold kitchen. The Coefficients of all the Variables are Positive and close to the Zero with minimum impact to the Dependent variable- Average waste per meal in Cold Kitchen. Contradicting to the other sub kitchens only Daily meal count is scientifically significant. Increase of the each factor will increase the average waste per meal in cold kitchen. This represents the better forecasting and focusing on the potential passenger loads in Cold Kitchen.

Table 4.34: AB Airline Single Variable Coefficient Analysis – Cold Kitchen Waste per Meal

Cold Kitchen Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.152
BC- Final Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.753
BC- Load Factor Variance	c	0.006	0.000	0.000
	X	0.000	0.000	0.062
EY- Initial Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.124
EY- Final Load Factor	c	0.006	0.000	0.000
	X	0.000	0.000	0.128
EY- Load Factor Variance	c	0.006	0.000	0.000
	X	0.000	0.000	0.853
Daily Meal Count	c	0.012	0.000	0.000
	X	0.000	0.000	0.000

Coefficient analysis of the Vegetable room Table (Table 4.35) represents the Positive Coefficients are exists for BC- Load Factor Variance, EY- Load Factor Variance and Daily Meal Count and all the other independent variables are Negative with dependent variable of Average Waste per meal in Vegetable Room. The Highest absolute value coefficient is incurred by EY- Load Factor Variance, which need to minimize to reduce the vegetable room waste which is approximately 70-80% of the Average Total Waste (Quantity Wise) of the Production Department. Coefficients of BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor, EY- Load Factor Variance and Daily Meal Count are more scientifically significant on Average Waste per meal in Vegetable room.

Table 4.35: AB Airline Single Variable Coefficient Analysis – Vegetable Room Waste per Meal

Vegetable Room Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.054	0.000	0.000
	X	-0.002	0.000	0.000
BC- Final Load Factor	c	0.054	0.000	0.000
	X	-0.001	0.000	0.000
BC- Load Factor Variance	c	0.053	0.000	0.000
	X	0.001	0.001	0.088
EY- Initial Load Factor	c	0.055	0.000	0.000
	X	-0.003	0.000	0.000
EY- Final Load Factor	c	0.055	0.000	0.000
	X	-0.002	0.000	0.000
EY- Load Factor Variance	c	0.053	0.000	0.000
	X	0.003	0.001	0.004
Daily Meal Count	c	0.099	0.001	0.000
	X	0.000	0.000	0.000

The below table (Table 4.36) represents the coefficients of the individual, independent variable with the Dependent Variable- Average waste per meal in butchery based on the AB Airline Flight figures for July to October 2017. All the Variables have positive Coefficient s (Close to Zero) which means the Increase of the above factors will increase the average waste per meal in Butchery. The Highest coefficient is represented by the EY- Load Factor Variance as 0.001, the each increase of EY- Load Factor Variance will increase the average waste per meal in butchery by 0.001 kg. All the factors are scientifically significant for the average waste per meal in butchery. This indicates that the focusing of the better forecasting has practiced by the Butchery also the ability of keep the cut meat and fish in freezes for multiple days also has directly impact the lower waste compare to the other pre-production kitchen- Vegetable room which outputs are more perishable.

Table 4.36: AB Airline Single Variable Coefficient Analysis – Butchery Waste per Meal

Butchery Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.004	0.000	0.000
	X	0.000	0.000	0.000
BC- Final Load Factor	c	0.004	0.000	0.000
	X	0.000	0.000	0.003
BC- Load Factor Variance	c	0.004	0.000	0.000
	X	0.000	0.000	0.001
EY- Initial Load Factor	c	0.004	0.000	0.000
	X	0.000	0.000	0.000
EY- Final Load Factor	c	0.004	0.000	0.000
	X	0.000	0.000	0.000
EY- Load Factor Variance	c	0.004	0.000	0.000
	X	0.001	0.000	0.001
Daily Meal Count	c	0.009	0.000	0.000
	X	0.000	0.000	0.000

Average waste per meal in Total Kitchen except Pre Production has analyzed against the independent Variables for the Coefficients and the respective P- Values in below Table (Table 4.37). BC- Final Load Factor, BC- Load Factor Variance, EY- Load Factor Variance and Daily Meal Count have positive Coefficients and the other factors have negative coefficients. Both Coefficients of BC- Load Factor Variance and the EY- Load Factor Variance have the highest coefficient Value 0.001 (Positive) with the Average Waste per meal in Total Kitchen except Pre Production indicating that the impact of Passenger Loads Uncertainty on the Waste in Production. The company has to invest for a better Forecasting system or search for another options such as Standard meals for the Increases (Meal Bank), standard Uplift with the agreement of the Customer Airline to Uplift standard Quantity of meals for each Class (E.g.: Business Class 5 Nos. and Economy Class 10 Nos.) by charging a Standard percentage (E.g. – Cost of the Meals) if the actual Passenger Loads not increased, if increased the Normal Price of the Meals. All the Independent variables are scientifically significant (P- Value < 0.05) for the Average Waste per meal in Total Kitchen except Pre Production (Vegetable Room and Butchery) indicating that the importance of focusing on passenger Loads Forecasting in order to reduce the Production Waste.

Table 4.37: AB Airline Single Variable Coefficient Analysis – Total Kitchen except Pre Production Waste per Meal

Total Kitchen Except Pre Production Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.030	0.000	0.000
	X	-0.001	0.000	0.000
BC- Final Load Factor	c	0.030	0.000	0.000
	X	0.000	0.000	0.035
BC- Load Factor Variance	c	0.030	0.000	0.000
	X	0.001	0.000	0.005
EY- Initial Load Factor	c	0.031	0.000	0.000
	X	-0.001	0.000	0.000
EY- Final Load Factor	c	0.031	0.000	0.000
	X	-0.001	0.000	0.000
EY- Load Factor Variance	c	0.030	0.000	0.000
	X	0.001	0.001	0.036
Daily Meal Count	c	0.058	0.000	0.000
	X	0.000	0.000	0.000

Table 4.38: AB Airline Single Variable Coefficient Analysis – Total Kitchen with Pre Production Waste per Meal

Total Kitchen With Pre Production Waste Per Meal				
Coefficients	**Term**	**Coefficient**	**SE Coef**	**P-Value**
BC- Initial Load Factor	c	0.088	0.000	0.000
	X	-0.003	0.001	0.000
BC- Final Load Factor	c	0.088	0.000	0.000
	X	-0.002	0.001	0.000
BC- Load Factor Variance	c	0.087	0.000	0.000
	X	0.002	0.001	0.012
EY- Initial Load Factor	c	0.090	0.000	0.000
	X	-0.004	0.001	0.000
EY- Final Load Factor	c	0.090	0.001	0.000
	X	-0.004	0.001	0.000
EY- Load Factor Variance	c	0.087	0.000	0.000
	X	0.005	0.002	0.003
Daily Meal Count	c	0.166	0.001	0.000
	X	0.000	0.000	0.000

Average meal per Waste in Total Kitchen with Pre Production (Vegetable Room and Butchery) has analyzed with the independent variables for the respective Coefficients to understand the impact of individual factor Variability for the Average Waste of the Production Department in the Flight Catering Company. Both Coefficients of BC- Load Factor Variance, Daily Meal Count and EY- Load Factor Variance have positive coefficients and the other factors have negative coefficients. Increase of the BC- Load Factor Variance and the EY- Load Factor Variance will increase the Average Waste per Meal. Increases in the Last 24 Hours to the Estimated Time of Departure (ETD) is generating significant pressure in the production floor which leads to an unnecessary waste. All the factors analyzed are scientifically significant for the total Waste in Production Department, indicates that the importance of developing a method to control the Uncertainty in the Production department on Passenger Loads of Customer Airlines.

4.4.4. Linear Regression Analysis with Scatterplot

The researcher has used Scatterplot to investigate the relationship between the pair of continuous variables (Dependent Variable- Average Waste per meal with an Independent Variable of the Research). A scatterplot displays ordered pairs of independent and dependent variables in a coordinate plane. After creating the scatterplot, has used a fitted linear regression to further Annalise the relationship.

Linear Regression – Daily Meal Count

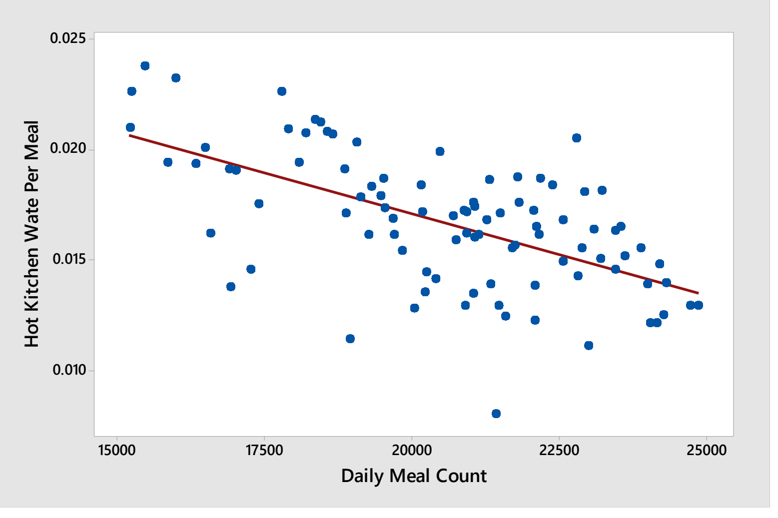


Figure 4.12: Scatterplot of Hot Kitchen Waste per Meal Vs Daily Meal Count

The above Scatterplot of Hot Kitchen Waste per Meal Vs Daily Meal Count represents a Weak negative linear relationship with Daily Meal Count. According to the Linear Regression of Average Waste per Meal in Hot Kitchen with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline.

Linear Regression of Average Waste per Meal in Hot Kitchen with Daily Meal Count

Average Waste per Meal in Hot Kitchen = 0.031907 - 0.000001 Daily Meal Count

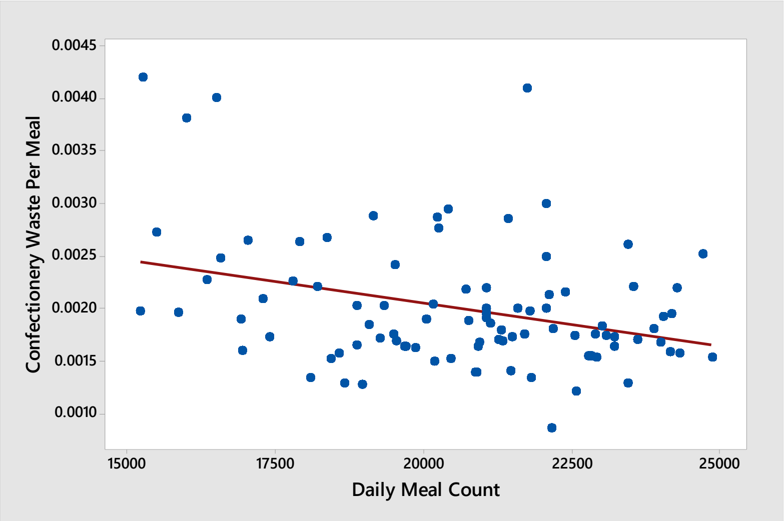


Figure 4.13: Scatterplot of Confectionery Waste per Meal Vs Daily Meal Count

Referring to the above Scatterplot the Average Waste per Meal in Confectionery with Daily Meal Count has Weak Negative Linear relationship. Based on the linear regression analysis below the impact is very minimum for the Average Waste per Meal in Confectionery by the Daily Meal Count. The Production Output in the Confectionery is not sensitive as the Outputs of the Hot Kitchen or Cold Kitchen. The components of a Product producing the Confectionery is Less compared to the Products in Hot Kitchen and Confectionery. Provides the opportunity to reduce the waste. The Specific requirements such as Blast Chilling in Hot Kitchen which required approximately four Hours are not in Confectionery which minimize the average production time providing more flexibility for the last 24 Hour passenger Loads Increases, finally reduce the Waste by not keeping more provision for the potential Increases.

Linear Regression of Average Waste per Meal in Confectionery with Daily Meal Count

Average Waste per Meal in Confectionery = 0.003687 - 0.000000 Daily Meal Count

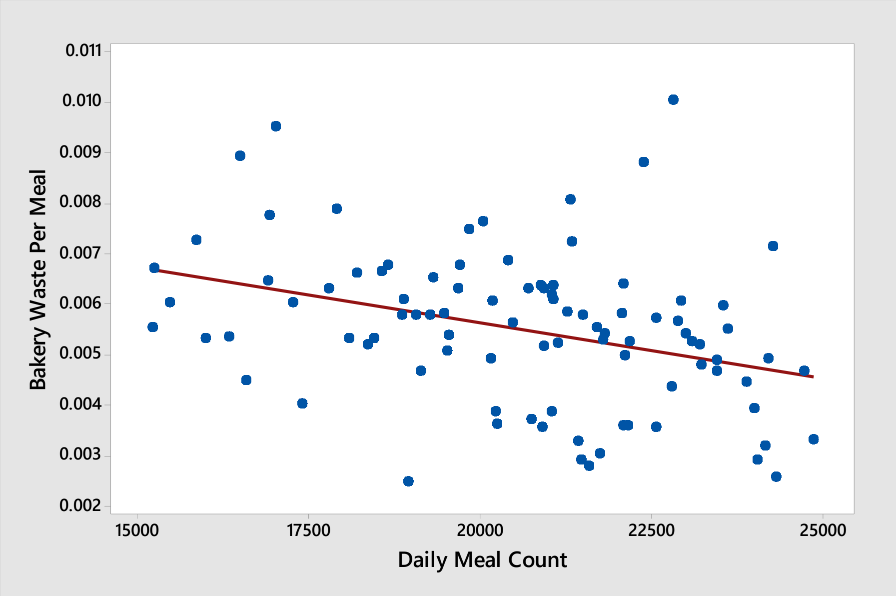


Figure 4.14: Scatterplot of Bakery Waste per Meal Vs Daily Meal Count

According to the above Scatterplot the Average Waste per Meal in Bakery with Daily Meal Count has Weak Negative Linear relationship. Based on the linear regression analysis below the impact is very minimum for the Average Waste per Meal in Confectionery by the Daily Meal Count. The Production Output in the Bakery is not sensitive as the Outputs of the Hot Kitchen or Cold Kitchen. The components of a Product producing the Bakery is Less compared to the Products in Hot Kitchen and Confectionery. Provides the opportunity to reduce the waste.

Linear Regression of Average Waste per Meal in Bakery with Daily Meal Count

Average Waste per Meal in Bakery = 0.010014 - 0.000000 Daily Meal Count

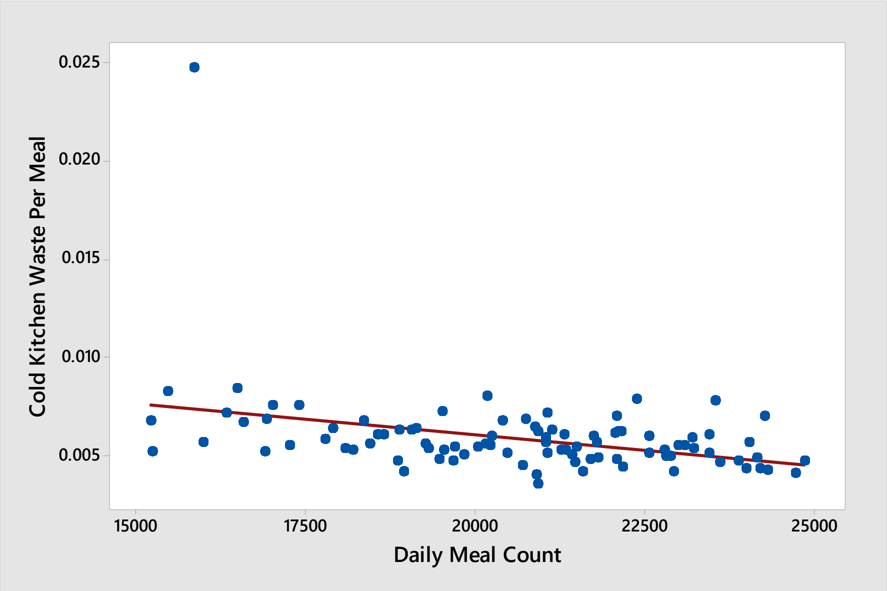


Figure 4.15: Scatterplot of Cold Kitchen Waste per Meal Vs Daily Meal Count

The above Scatterplot of Cold Kitchen Waste per Meal Vs Daily Meal Count represents a Weak negative linear relationship with Daily Meal Count. According to the Linear Regression of Average Waste per Meal in Cold Kitchen with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline.

Linear Regression of Average Waste per Meal in Cold Kitchen with Daily Meal Count

Average Waste per Meal in Cold Kitchen = 0.012425 - 0.000001 Daily Meal Count

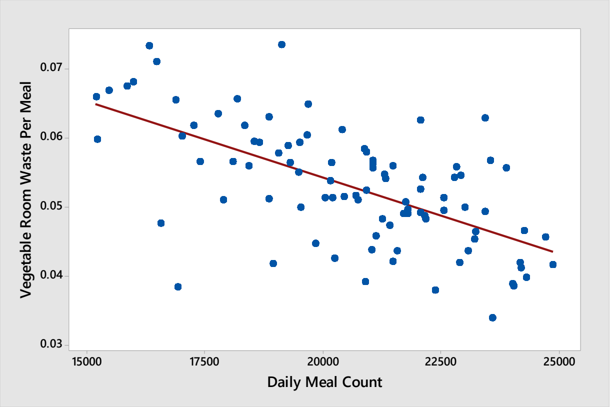


Figure 4.16: Scatterplot of Vegetable Room Waste per Meal Vs Daily Meal Count

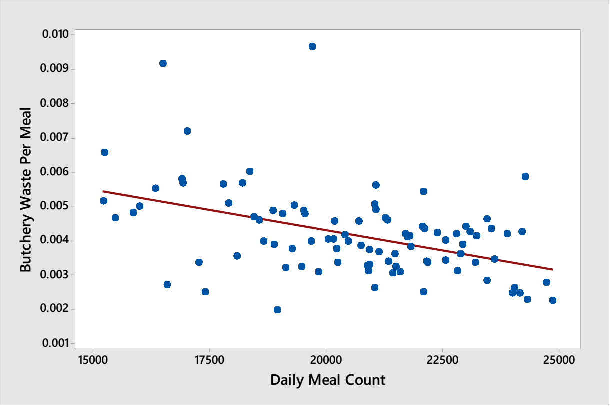


Figure 4.17: Scatterplot of Butchery Waste per Meal Vs Daily Meal Count

The above two scatterplots graphically represents the relationship of the Average Waste per Meal in Pre- Production (Vegetable Room and Butchery) with Daily Meal Count. Compare to the other Sub-Kitchens' Scatter plots the spreading (Deviation/ Variation) is high in Pre-Production (Vegetable Room and Butchery) Scatterplots. This is because there are multiple characters affect the Pre- Production Waste such as Seasonality, Quality of the Raw Material Received, etc. The impact of the passenger Loads is less in some seasons due to the Quality of the Products received (E.g.: Melon, Pineapple, Grapes, Potato, Carrot, Chicken waste percentage significantly increase due to the Seasonality or Supplier Effect). But there is a Weak Negative relationship with the Daily meal Count according to the below two linear regression Equations.

Linear Regression of Average Waste per Meal in Pre- Production (Vegetable Room and Butchery) with Daily Meal Count

Average Waste per Meal in Vegetable Room Total = 0.098818 - 0.000002 Daily Meal Count

Average Waste per Meal in Butchery Total = 0.009056 - 0.000000 Daily Meal Count

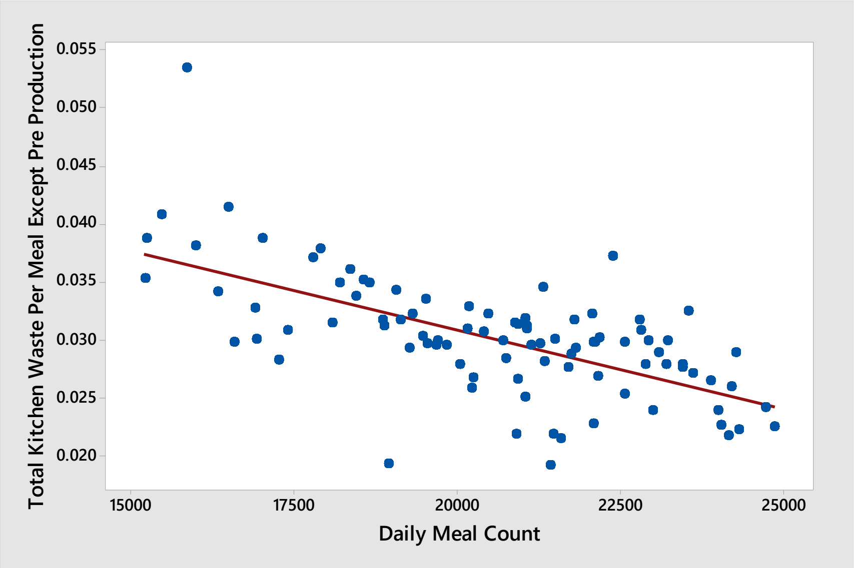


Figure 4.18: Scatterplot of Total Kitchen except Pre-Production Waste per Meal Vs Daily Meal Count

The above Scatterplot of Average Total Kitchen except Pre-Production (Vegetable Room and Butchery) Waste per Meal Vs Daily Meal Count represents a Weak negative linear relationship with Daily Meal Count. According to the Linear Regression of Average Total Kitchen except Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline

Linear Regression of Total Kitchen except Pre-Production Waste per Meal Vs Daily Meal Count

Average Total Kitchen Waste Except Pre-Production = 0.058032 - 0.000001 Daily Meal Count

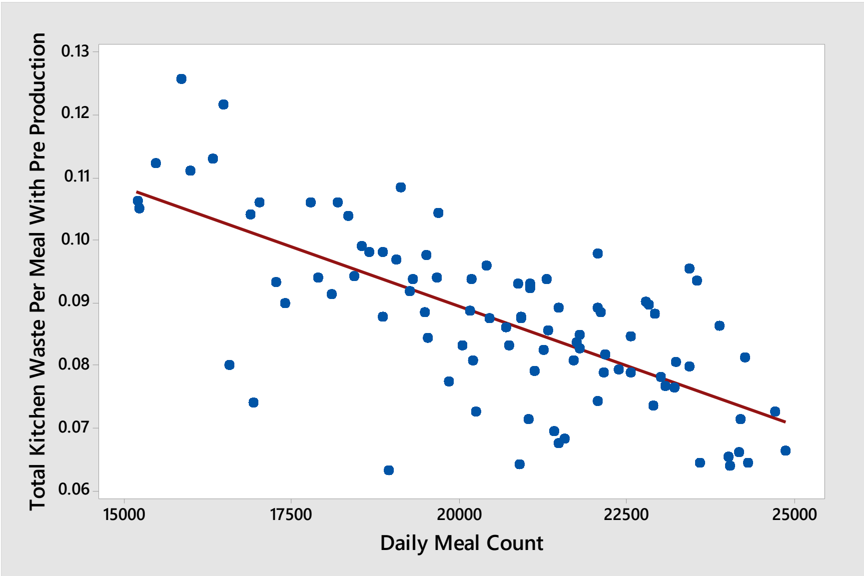


Figure 4.19: Scatterplot of Total Kitchen with Pre-Production Waste per Meal Vs Daily Meal Count

According to the above Scatterplot (Figure) of Average Total Kitchen with Pre-Production (Vegetable Room and Butchery) Waste per Meal Vs Daily Meal Count represents a Weak negative linear relationship with Daily Meal Count. According to the Linear Regression of Average Total Kitchen with Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000004 kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline

Linear Regression of Total Kitchen with Pre-Production Waste per Meal Vs Daily Meal Count

Total Kitchen With Pre-Production = 0.165907 - 0.000004 Daily Meal Count

Linear Regression Optimization – Daily Meal Count

Waste Minimize - Solution 1

Table 4.39: Waste Minimize – Solution 1

Solution	DMC	TKWPP	TKEPP	Butchery	Vegetable Room	Cold Kitchen
1	**24861**	0.0708170	0.0242289	0.0031402	0.0434479	0.0044865

Solution	Bakery	Confectionery	Hot Kitchen	Composite Desirability
1	0.0045585	0.0016512	0.0135327	0.797551

Waste Maximization – Solution 2

Table 4.40: Waste Maximization – Solution 2

Solution	DMC	TKWPP	TKEPP	Butchery	Vegetable Room	Cold Kitchen
1	15199	0.107773	0.0373663	0.0054394	0.0649671	0.0075718

Solution	Bakery	Confectionery	Hot Kitchen	Composite Desirability
1	0.0066785	0.0024424	0.0206736	0.521177

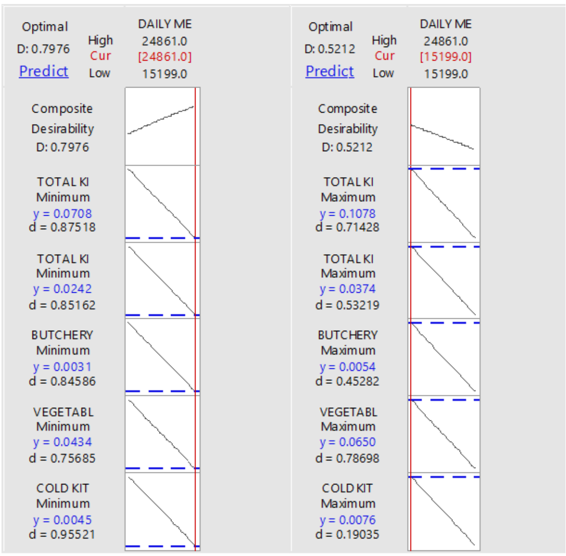


Figure 4.20: Optimization Plot- Waste Minimization and Maximization – Daily Meal Count

The Production Waste per Meal is reducing with the Increase of the Number of meals per day. The Production is Operating with minimum Waste per Meal with the Daily Meal Count of 24861, which is the Highest Production of the Period of the Research. The Demand Uncertainty has significantly affect the increase of Waste in the Production Area.

Linear Regression Optimization – Month

Waste Minimization – Solution 3

Table 4.41: Waste Minimization – Solution 3

Solution	DMC	TKWPP	TKEPP	Butchery	Vegetable Room	Cold Kitchen
1	10	0.0797709	0.0270389	0.0037651	0.0489669	0.0049022

Solution	Bakery	Confectionery	Hot Kitchen	Composite Desirability
1	0.0051008	0.0017846	0.0152513	0.708611

Waste Maximization- Solution 4

Table 4.42: Waste Maximization- Solution 4

Solution	DMC	TKWPP	TKEPP	Butchery	Vegetable Room	Cold Kitchen
1	7	0.0924840	0.0322106	0.0044374	0.0558359	0.0065438

Solution	Bakery	Confectionery	Hot Kitchen	Composite Desirability
1	0.0057800	0.0021587	0.0177280	0.384518

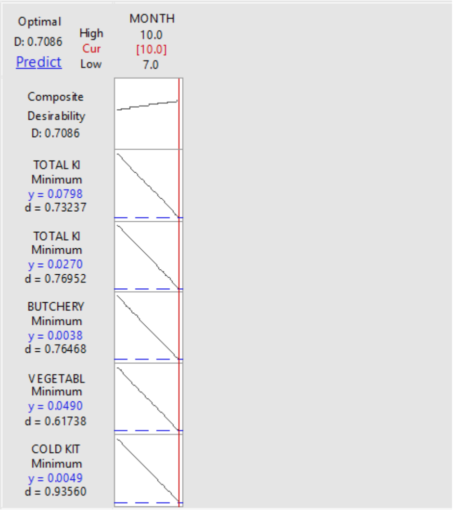


Figure 4.21: Optimization Plot- Waste Minimization – Month

The Minimum Waste per Meal is reported in the Month of July and the Maximum Waste per Meal is reported in the Month of October (Note: Based on the Research Period)

Linear Regression Optimization – Day No

Waste Minimization – Solution 5

Table 4.43: Waste Minimization – Solution 5

Solution	DMC	TKWPP	TKEPP	Butchery	Vegetable Room	Cold Kitchen
1	7	0.0842210	0.0281295	0.0038410	0.0522504	0.0054822

Solution	Bakery	Confectionery	Hot Kitchen	Composite Desirability
1	0.0052829	0.0020551	0.0153093	0.666151

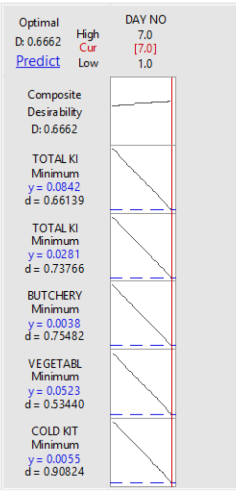


Figure 4.22: Optimization Plot- Waste Minimization – Day No

The Minimum Waste per Meal is achieving in Saturday (Week Day No 07) and the Maximum Waste per Meal is reporting on Sunday (Week Day No 1).

Linear Regression – FC Initial Load Factor

The Linear Regression analysis of Independent variable (FC Initial Load Factor) with the Dependent Variable (Average Waste in Kitchen), represents below in order to identify the impact of the FC Initial Load Factor on the Average Waste peer meal in Each kitchen.

Average Waste per Meal in Hot Kitchen = 0.016794 - 0.000551 FC Initial Load Factor

Average Waste per Meal in Confectionery = 0.001986 + 0.000033 FC Initial Load Factor

Average Waste per Meal in Bakery = 0.005608 - 0.000420 FC Initial Load Factor

Average Waste per Meal in Cold Kitchen = 0.005958 - 0.000284 FC Initial Load Factor

Average Waste per Meal in Vegetable Room = 0.053422 - 0.00216 FC Initial Load Factor

Average Waste per Meal in Butchery = 0.004250 - 0.000351 FC Initial Load Factor

Average Waste per Meal in Total Kitchen Except Pre Production = 0.030345 - 0.001222 FC Initial Load Factor

Average Waste per Meal in Total Kitchen With Pre Production = 0.088017 - 0.00373 FC Initial Load Factor

Except the Average Waste per meal in Confectionery other Dependent Variables have negative relationship with the each Independent Variable. Some components of the First Class meal which cooked as a bulk can Use for the First class Load which has Leads to reduce the Average Waste per Meal in Hot Kitchen.

The number of components (Separable Components in the Final Product) in a Confectionery Final Product is less compared to the Cold Meal or Hot Meals which the Confectionery has to specifically produce the Products for the First Class Meal which will lead to an increase of the waste with the Increase of Initial Load in First Class. All most all the kitchens have to specifically produce the Components in the First Class Meal since the there is a Significant variance in the Components in the First Class. Also the Production Team Commence the Production Once they receive the Initial Load since the No of Meals are less and to Avoid Waste and the significant Unpredictability in Forecasting the Loads in First Class.

Linear Regression – FC Load Factor Variance

The below Linear regressions summarize the relationship of Average Waste per meal in Each Sub kitchens with FC Load Factor Variance Except the Average Waste Per Meal in Bakery (That also Close to Zero + 0.000003) all the other Sub kitchens have Negative Linear relationship with the FC Load Factor Variance, indicating that the Increase of FC Load Factor Variance will marginally reduce the Average Waste Per Meal. This is due to keep a the Provision for the potential increases by the production staff when they receive the Initial Loads for the First Class, and the Possibility of Share Some Product Components with the Increased passenger Loads which have currently Prepared a bulk in Pre-Production.

Average Waste per Meal in Hot Kitchen = 0.016692 - 0.000995 FC Load Factor Variance

Average Waste per Meal in Confectionery = 0.001996 - 0.000063 FC Load Factor Variance

Average Waste per Meal in Bakery = 0.005500 + 0.000003 FC Load Factor Variance

Average Waste per Meal in Cold Kitchen = 0.005906 - 0.000553 FC Load Factor Variance

Average Waste per Meal in Vegetable Room = 0.053026 - 0.00401 FC Load Factor Variance

Average Waste per Meal in Butchery = 0.004172 - 0.000295 FC Load Factor Variance

Average Waste per Meal in Total Kitchen Except Pre Production = 0.030095 - 0.001607 FC Load Factor Variance

Average Waste per Meal in Total Kitchen With Pre Production = 0.087293 - 0.00591 FC Load Factor Variance

Linear Regression – BC Initial Load Factor

Average Waste per Meal in Hot Kitchen = 0.016882 - 0.000470 BC Initial Load Factor

Average Waste per Meal in Confectionery = 0.002012 - 0.000030 BC Initial Load Factor

Average Waste per Meal in Bakery = 0.005557 - 0.000149 BC Initial Load Factor

Average Waste per Meal in Cold Kitchen = 0.005896 - 0.000121 BC Initial Load Factor

Average Waste per Meal in Vegetable Room = 0.053641 - 0.001638 BC Initial Load Factor

Average Waste per Meal in Butchery = 0.004264 - 0.000252 BC Initial Load Factor

Average Waste per Meal in Total Kitchen Except Pre-Production = 0.030347 - 0.000770 BC Initial Load Factor

Average Waste per Meal in Total Kitchen With Pre-Production = 0.088251 - 0.002659 BC Initial Load Factor

The Initial BC Load factor has significantly Negative Correlation with the Waste per Meal in all the Sub Areas in the Production Department. This represents the Pre Preparation of the Meals in advance for the Business Class Passenger Loads because if the Loads Increased the Average Waste per Meal get Reduced, Vice Versa. The Minimum Waste per Meal is achieved when the Initial BC Load is 100% which means the Flight is completely full at the Initial Stage. Because the Risk of the Producer for potential increase is zero, because of that the Producer can produce the Exact Quantity and the Risk taken by the Pre-Production by Producing the Full Configuration in advance is match with the Initial Load Received.

Linear Regression – BC Initial Load Factor Variance

Average Waste per Meal in Hot Kitchen = 0.016656 + 0.000279 BC Load Factor Variance

Average Waste per Meal in Confectionery = 0.002001 - 0.000058 BC Load Factor Variance

Average Waste per Meal in Bakery = 0.005470 + 0.000469 BC Load Factor Variance

Average Waste per Meal in Cold Kitchen = 0.005830 + 0.000263 BC Load Factor Variance

Average Waste per Meal in Vegetable Room = 0.052854 + 0.000963 BC Load Factor Variance

Average Waste per Meal in Butchery = 0.004137 + 0.000287 BC Load Factor Variance

Average Waste per Meal in Total Kitchen Except Pre-Production = 0.029956 + 0.000952 BC Load Factor Variance

Average Waste per Meal in Total Kitchen With Pre-production = 0.086948 + 0.002203 BC Load Factor Variance

Except the Average Waste per Meal in Confectionery all the Other Sub Kitchen's Waste per Meal is increasing with the Increasing of the Passenger Load Factor within the Last 24 Hours to the Estimated Time of Departure (ETD). The Provision for the Confectionery staff for the potential passenger Load growth is higher than the Other Sub Kitchens. The risk has minimized by the Confectionery staff by Producing more at the Initial Stage but the Risk of Waste due to not receiving the expected Passenger Loads will have to bear by the Company.

Linear Regression – EY Initial Load Factor

Average Waste per Meal in Hot Kitchen = 0.017250 - 0.000818 EY Initial Load Factor

Average Waste per Meal in Confectionery = 0.002089 - 0.000127 EY Initial Load Factor

Average Waste per Meal in Bakery = 0.005685 - 0.000275 EY Initial Load Factor

Average Waste per Meal in Cold Kitchen = 0.005958 - 0.000165 EY Initial Load Factor

Average Waste per Meal in Vegetable Room = 0.054797 - 0.002672 EY Initial Load Factor

Average Waste per Meal in Butchery = 0.004394 - 0.000344 EY Initial Load Factor

Average Waste per Meal in Total Kitchen Except Pre-Production = 0.030982 - 0.001386 EY Initial Load Factor

Average Waste per Meal in Total Kitchen With Pre-production = 0.090173 - 0.004401 EY Initial Load Factor

Referring to the above Linear Regression Equations of the Average Waste per meal in each Sub kitchen with EY-Initial Load Factor, there is a negative relationship exists for all. This indicates that the increase of the initial EY Load factors are decreasing the average Waste per meal, vice versa. This represents that the Initial Preparation of the meals for the EY Passenger Loads by Eliminating the Potential Increases of the Passenger Loads as Much as Possible.

Linear Regression – EY Load Factor Variance

Average Waste per Meal in Hot Kitchen = 0.016662 + 0.000829 EY Load Factor Variance

Average Waste per Meal in Confectionery = 0.001999 - 0.000050 EY Load Factor Variance

Average Waste per Meal in Bakery = 0.005486 + 0.000575 EY Load Factor Variance

Average Waste per Meal in Cold Kitchen = 0.005841 + 0.000052 EY Load Factor Variance

Average Waste per Meal in Vegetable Room = 0.052875 + 0.00323 EY Load Factor Variance

Average Waste per Meal in Butchery = 0.004146 + 0.000571 EY Load Factor Variance

Average Waste per Meal in Total Kitchen Except Pre-Production = 0.029987 + 0.001406 EY Load Factor Variance

Average Waste per Meal in Total Kitchen With Pre-production = 0.087008 + 0.00521 EY Load Factor Variance

The Linear Regressions of EY-Load Factor Variance indicates a Positive variance with the Average Waste per Meal in all the Sub- kitchens except Confectionery. When the EY-Load Factor Variance increase the average Waste peer Meal Decreases, Vice versa, Except the Confectionery. The Increases in the Passenger Load Factors in the Last 24 hours to the Estimated Time, the Average Waste per Meal Increase due to the discrepancies to the Continuous production floor.

CHAPTER 05

CONCLUSION AND RECOMMENDATIONS

5.1. Summary of the Findings

The Selected sample Flights pax Counts represent approximately 80% of the Population of the Research. Approximately 80% of the total production is represented by the selected Sample for the Period of July to October 2017. Within the Sample approximately 74% is represented by AB Airline and 6% by XY Airlines.

The highest average daily meal count has catered on the week day number 07 (Saturday). There was a peak in both Week day Number 01 (Sunday) and 05 (Thursday).

There are Total 8223 Data Points (Sectors) has analyzed in the research Sample. Out of the 8223 data points (Sectors) 95% represent AB Airline and XY Airline represent 5%.

The Average total Variance between First Class initial and the Final pax Load was +4%, the Business Class pax Load Variance was also +4% and the Economy Class Pax Load Variance was +1%.

AB Airlines has generated more Variance in Business Class Pax Load Variance +4% compared to XY Airline Variance +2%. The Average Pax Loads for all the Classes of the both Airlines has Increased (Positive variance only) represent that the Risk of the increasing of the Loads within Last 24 hours has transferred to the Caterer by the Airline.

AB Airline has only generated positive Load Factor fluctuations in all for months. The highest First Class Average Load factor fluctuation (+12) has occurred on August, and the Highest Business Class and Economy Class Average Load factor fluctuation was on October. The Lowest Economy Class Average Load factor fluctuation was in both July and August (0%).

The highest (9%) First Class Average Load Factor has fluctuated on Friday whereas Lowest reported on Monday (0%).

Minimum +1% Variance has generated for all AB Airline Business Class Average Initial Load factor. The Business Class Average Load Factor has only generated Positive Load Factor variance. AB Airline Economy Class Load Factor Variance has generated both Positive and the negative Load Factor Variance, varying from -2% to +1%. The highest fluctuations are occurred in the AB Airline Short Sector Flights (AB Airlines 1, AB Airlines2 and AB Airlines3).

XY Airline first Class Load Factor has significantly Varied in both Positive and negative from -3% to +18%. Compared to First class Load factor Variance, the business Class Average Load Factor Variance was quite controllable which was varying from -3% to +8%.

The Variability of the Average Load Factor of XY Airline was significantly high compared to AB Airline for all Classes.

The Business Class Load factor Variance was Minimum in August which also represent the highest Load Factor of the Period of the Research with 43%. Economy Class Load Factor Variability also Lowest (0%) in August following the highest Load factor with 73%.

AB Airlines 2 Sector also has reported minimum Load factor variance in August following the Highest Load Factor of the Period with approximately 89%. There was a negative Load Factor Variance for Economy Class in August which was significant since all other Variances are Positive for the Sector.

The minimum Variance in August with highest Average Load factor has continued for AB Airlines 3 sector also. The AB Airlines 4 Sector has incurred significant amount of negative Variances in both Classes. The Economy Class has only generated negative variances varying from -1% to -3%. The Minimum Variability followed by highest Load Factor has only continued for Business Class only. The Average Load factor Variability has reported in October with -1%.

The Business Class average Load Factor Variance has minimum Compared to the above Short Sectors. AB Airlines 7 Sector (Medium Haul) also represents a marginal Average Load Factor fluctuation compared to the AB Airline Short Sectors. Following the AB Airlines 5 Sector (Long Haul), AB Airlines 8 sector also has incurred marginal Average Passenger Load factor Variance Compared to Short Haul Flights in both Classes. The Variability of the business Class and the Economy Class Average Passenger Load Factor Variance was not significant. The AB Airlines 1 and AB Airlines 2 Short Haul sectors has generated a significant Variability in Average Economy Class Passenger Load Factor Variance with respect to week day. The Average Passenger Load Factors of both Business Class and Economy Class have only reported Positive Variance in all Weekdays for both AB Airlines 1 and AB Airlines 2 Sectors (Short Haul). The number of data points is significantly high in AB Airlines 1, AB Airlines 2 and AB Airlines 3 compared to the Other Sectors. The accuracy of the findings and the Conclusion will more accurate because of that in those sectors compared to Other Sectors, because the impact of a single flight, single day will not significantly affect the final output. The Long Haul (AB Airlines 5 and AB Airlines 8) have incurred both positive and negative Passenger Load factor Variance but that is significantly less compared to Short haul sectors. The variability of

Business Class and the Economy class Percentage Variance is not significant in AB Airlines 5 and AB Airlines 8.

Per meal highest waste is represented by Pre Production area, Vegetable Room which is 0.053 kg per meal. Minimum waste per Meal is represented by the Confectionery which is 0.002 kg per meal. The highest Standard deviation also recorded in pre-production area, Vegetable room which is 0.009 kg per meal. Minimum standard deviation is represented by both Confectionery and the Butchery which is 0.001 kg per meal. The difference between minimum and the maximum Waste per meal is significant in all the Kitchens. Maximum Total Waste per meal has reported 200% compared to the minimum waste per meal 0.063 kg per meal.

The highest portion of the average Waste per meal is generated by the Vegetable room then the Hot Kitchen. Minimum Proportion has incurred by the Confectionery.

Each sub kitchens has reported the Lowest Average Waste per meal on August which is the Peak period with highest Meal Count of the Research period. The Highest waste has reported in the month of October.

According to the ANOVA Test p-Values the of the Hypothesis test, The Mean Waste per Meal values of Different Sectors are Equal.

According to the ANOVA Test, The Mean Waste per Meal values of Different Months are Not Equal, The Mean Waste per Meal values of Week Days are Not Equal.

All the coefficients are negative (Except the Daily Meal Count) with reference to Hot Kitchen Waste per meal. The highest Coefficient (absolute value) represent the EY- Final Load Factor as -0.0032 means each single increase in EY- Final Load Factor will reduce Average Hot Kitchen waste per meal by 0.0032 kg, vice versa.

In Confectionery, The highest Coefficient (Absolute Value) is incurred by EY- Load Factor Variance of 0.00014, which means the each single increase of EY- Load Factor Variance will increase 0.00014 kg of Waste per Meal in Confectionery.

BC- Initial Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for Average Waste per Meal in Bakery. EY- Final Load Factor has the highest coefficient (Absolute Value) over the Average Waste in Bakery.

FC- Final Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for the Cold kitchen Average Waste per meal. With Negative (-0.00130) coefficient of EY- Initial Load Factor has the highest coefficient (Absolute Value) on Cold kitchen Average Waste per Meal.

The Highest Absolute Coefficient has generated by EY- Final Load Factor with Negative (-0.01033) coefficient means the Increase of this Independent Variable will reduce the Average waste Per Meal in Vegetable Room. Coefficient of the FC- Final Load Factor, FC- Load Factor Variance, BC- Initial Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are Scientifically significant for the Average Waste Per Meal in the vegetable Room.

Only Daily Meal Count has positive Coefficient with Average Waste per Meal in butchery where all the other factors has negative coefficients. EY- Final Load Factor has the highest absolute Coefficient Value from the variables.

Since all the Independent Variables related to the Passenger Loads are having negative coefficient with the Average Waste per Meal in Butchery indicates that the Pre Preparation in the Butchery has produced by keeping provision for the potential increases within last 24 hours to the ETD of the Flights without any scientific rationale. The risk of waste generated due to not increasing the Passenger Loads within last 24 hours to the Estimated Time of Departure will have to bear by the Caterer according to the Current Situation.

Coefficients of the Independent Variables of the Research against the Average Waste per Meal generated in the Total Kitchen except Pre Production (Vegetable Room and Butchery), the positive Coefficients are generated by the EY- Load Factor Variance and Daily Meal Count, and all the other Independent Variables have generated a negative Coefficients. The coefficients of the FC- Final Load Factor, BC- Initial Load Factor, BC- Final Load Factor, BC- Load Factor Variance, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for the Average Waste per meal (Vegetable Room and Butchery). The Highest Absolute Value Coefficient is represented by the Independent Variable EY- Final Load Factor with negative (-0.00553) Coefficient.

Except EY- Load Factor Variance and Daily Meal Count, all the Other Independent Variables have Negative Coefficient, means the Increase in those factors will reduce the average Waste per meal in Total Kitchen with Pre Production.

The Highest Absolute Value Coefficient (-0.01677) is incurred by the EY- Final Load Factor , which the company need to focus and forecast better in order to reduce the Average Waste per Meal in Total Kitchen With Pre Production.

Based on the linear regression analysis the impact is very minimum for the Average Waste per Meal in Confectionery by the Daily Meal Count.

According to the Linear Regression of Average Waste per Meal in Cold Kitchen with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline.

Relationship of the Average Waste per Meal in Pre- Production (Vegetable Room and Butchery) with Daily Meal Count, the spreading (Deviation/ Variation) is high in Pre-Production (Vegetable Room and Butchery). There is a Weak Negative relationship with the Daily meal Count according to the below two linear regression Equations.

Total Kitchen except Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. Average Total Kitchen with Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000004 kg.

The Minimum Waste per Meal is achieving in Saturday (Week Day No 07) and the Maximum Waste per Meal is reporting on Sunday (Week Day No 1).

Except the Average Waste per meal in Confectionery other Dependent Variables have negative relationship with the each Independent Variable.

The Initial BC Load factor has significantly Negative Correlation with the Waste per Meal in all the Sub Areas in the Production Department.

Except the Average Waste per Meal in Confectionery all the Other Sub Kitchen’s Waste per Meal is increasing with the Increasing of the Passenger Load Factor within the Last 24 Hours to the Estimated Time of Departure (ETD).

Referring to the Linear Regression Equations of the Average Waste per meal in each Sub kitchen with EY-Initial Load Factor, there is a negative relationship exists for all.

The Linear Regressions of EY-Load Factor Variance indicates a Positive variance with the Average Waste per Meal in all the Sub- kitchens except Confectionery.

5.2. Discussion and the Conclusion of the Research

The current available literature in foodservices has little published on pre consumer food waste. There is also a gap in the current literature providing qualitative insight to the issue of food waste in organizations. Furthermore, the airline catering industry is an area with minimal publicly available waste research. The present study aims to assess how much food is wasted in Sub production kitchens of an airline catering company, explore the relationship with the Flight Load Fluctuations.

There is a variation of the average Daily Waste in Flight Catering Company, Sri Lanka. Production of the Flight Kitchen are vary in terms of total Pax count, types of meals, Airline Classes, etc. The average daily kitchen Waste fluctuate throughout the year.

The Average Pax Loads for all the Classes of the Airlines has Increased (Positive variance only) represent that the Risk of the increasing of the Loads within Last 24 hours has transferred to the Caterer by the Airline. Airline has not given a significant provision for potential Load Increases when they place the initial Order (Initial Load) to the Caterer. This creates Production Uncertainty whereas the caterer has to take the risk of Last minutes top-ups in advance and produce more than the Initial Order Placed by the Airline creating the Supply Chain Bullwhip effect. If the top-ups not received the caterer has to bear the Cost of Over-Production.

This Research allowed the Flight Catering Companies to identify the importance of having accurate Forecasting System to minimize the Production Waste.

Each month the pattern of the meal count fluctuation with the Week Day Number can be observed. Irrespective of the month the Pattern of the Average daily meal count of the Week Day has continued over the period of the research.

The Average Pax Loads for all the Classes of the both Airlines has Increased (Positive variance only) represent that the Risk of the increasing of the Loads within Last 24 hours has transferred to the Caterer by the Airline. Airline has not given a significant provision for potential Load Increases when they place the initial Order (Initial Load) to the Caterer. This creates Production Uncertainty whereas the caterer has to take the risk of Last minutes top-ups in advance and produce more than the Initial Order Placed by the Airline creating the Supply Chain Bullwhip effect. If the top-ups not received the caterer has to bear the Cost of Overproduction.

There is a variation of the Variability of the Passenger Load Factor Variance from Customer Airline to Airline. Because of that the Impact to the Waste is Varying, this need to consider in costing and Pricing.

The Variability of the Passenger Load Factor is less in the Peak Months for all the Classes. The Meal Bank Inventory Levels Should adjust according to the Month of the Year.

The Passenger Load Factor Variability is high in Short Haul Flights compared to the Medium Haul and the Long Haul Flights. This need to consider when calculating the Inventory Levels of the Meal bank.

To identify whether the Negotiation for meal Prices conduct with a common platform for all the Airlines or customized based on the Individual Customer Airline performances.

The Comparison of the Pre-Production (Vegetable Room and Butchery) and the Production (Hot Kitchen, Cold Kitchen, Confectionery and the Bakery) contribution for the Total Average Waste per meal has followed the popular Pareto Theory which is 80% of the Average Waste per meal has generated from the Pre-Production (Vegetable Room and Butchery) and the balance 20% has generated for the Other Kitchens (Hot Kitchen, Cold Kitchen, Confectionery and the Bakery). Sub kitchens Represents Lowest Average Waste per meal on August which is the Peak period with highest Meal Count.

The provision for the potential increases might cause the Average waste per meal due to the uncertainty in the production line without accurate forecast for the Final pax Counts. The impact of the upstream in the supply chain can be seen that the waste has increased significantly in the Upstream (Pre- production) due to the Supply Chain bullwhip Effect.

All the sectors approximately follow the same pattern of Variability in same Period of the Year. The Month of the Year and the Week Day Number is significantly affect the Average Waste per Meal.

Which means the Hot Kitchen Waste per meal is increasing when the Load Factor values are increasing and when the Load factor Values are reducing the Hot Kitchen Waste per Meal is increasing. The Hot kitchen Waste is highly depend on the EY Final Load Factor. The Confectionery waste is significantly depend on the EY Load Factor Variance.

The Bakery waste per meal is significantly depend on the EY Final Load factor better forecasting of this factor will significantly control the Average Waste per Meal in Bakery.

FC- Final Load Factor, BC- Final Load Factor, EY- Initial Load Factor, EY- Final Load Factor and Daily Meal Count are scientifically significant for the Cold kitchen Average Waste per meal. The Initial EY Load factor has Highest Impact on the Cold Kitchen Waste per Meal. The company will be able to reduce the Cold Kitchen Average Waste per meal significantly with better forecasting and focusing on EY- Initial Load Factor.

This represent the since the preparation of the Vegetables is done in advance has minimized the risk of increasing the Loads at the Last 24 hours by producing for Configuration (Full Load) or Close to Configuration by provisioning the potential increases.

Butchery waste Per Meal is significantly depend on the EY Final Load Factor. Indicating that the company need to focus and Forecast more on this factor in order to reduce the Average Waste per meal in the Butchery. All the Independent Variables related to the Passenger Loads are having negative coefficient with the Average Waste per Meal in Butchery indicates that the Pre Preparation in the Butchery has produced by keeping provision for the potential increases within last 24 hours to the ETD of the Flights without any scientific rationale.

Average Waste per Meal generated in the Total Kitchen except Pre Production (Vegetable Room and Butchery) is highly depend on the EY final Load Factor.

The EY- Final Load Factor , which the company need to focus and forecast better in order to reduce the Average Waste per Meal in Total Kitchen With Pre Production due to high dependency.

According to the Linear Regression of Average Waste per Meal in Hot Kitchen with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline.

The Production Output in the Confectionery is not sensitive as the Outputs of the Hot Kitchen or Cold Kitchen. The components of a Product producing the Confectionery is Less compared to the Products in Hot Kitchen and Confectionery. Provides the opportunity to reduce the waste. The Specific requirements such as Blast Chilling in Hot Kitchen which required approximately four Hours are not in Confectionery which minimize the average production time providing more flexibility for the last 24 Hour passenger Loads Increases, finally reduce the Waste by not keeping more provision for the potential Increases.

The Production Output in the Bakery is not sensitive as the Outputs of the Hot Kitchen or Cold Kitchen. The components of a Product producing the Bakery is Less compared to the Products in Hot Kitchen and Confectionery. Provides the opportunity to reduce the waste.

Relationship of the Average Waste per Meal in Pre- Production (Vegetable Room and Butchery) with Daily Meal Count, the spreading (Deviation/ Variation) is high in Pre-Production (Vegetable Room and Butchery). This is because there are multiple characters affect the Pre- Production Waste such as Seasonality, Quality of the Raw Material Received, etc. The impact of the passenger Loads is less in some seasons due to the Quality of the Products received (E.g.: Melon, Pineapple, Grapes, Potato, Carrot, Chicken waste percentage significantly increase due to the Seasonality or Supplier Effect). Total Kitchen except Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000001kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline. Average Total Kitchen with Pre-Production Waste per Meal with Daily Meal Count below each Single Increasing of the meal Count will reduce the Average waste in hot kitchen by 0.000004 kg. This represent the Over preparation of Food to accommodate the Passenger Loads Uncertainty of the Customer Airline. The Production Waste per Meal is reducing with the Increase of the Number of meals per day. The Demand Uncertainty has significantly affect the increase of Waste in the Production Area. Some components of the First Class meal which cooked as a bulk can Use for the First class Load which has Leads to reduce the Average Waste per Meal in Hot Kitchen.

The number of components (Separable Components in the Final Product) in a Confectionery Final Product is less compared to the Cold Meal or Hot Meals which the Confectionery has to specifically produce the Products for the First Class Meal which will lead to an increase of the waste with the Increase of Initial Load in First Class. All most all the kitchens have to specifically produce the Components in the First Class Meal since the there is a Significant variance in the Components in the First Class. Also the Production Team Commence the Production Once they receive the Initial Load since the No of Meals are less and to Avoid Waste and the significant Unpredictability in Forecasting the Loads in First Class.

All the other Sub kitchens have Negative Linear relationship with the FC Load Factor Variance, indicating that the Increase of FC Load Factor Variance will marginally reduce the Average Waste per Meal. This is due to keep a the Provision for the potential increases by the production staff when they receive the Initial Loads for the First Class, and the Possibility of Share Some Product Components with the Increased passenger Loads which have currently Prepared a bulk in Pre-Production. The Initial BC Load factor has significantly Negative Correlation with the Waste per Meal in all the Sub Areas in the Production Department. This represents the Pre Preparation of the Meals in advance for the Business Class Passenger Loads because if the Loads Increased the Average Waste per Meal get Reduced, Vice Versa. The Minimum Waste per Meal is achieved when the Initial BC Load is 100% which means the Flight is completely full at the Initial Stage. Because the Risk of the Producer for potential increase is zero, because of that the Producer can produce the Exact Quantity and the Risk taken by the Pre-Production by Producing the Full Configuration in advance is match with the Initial Load Received.

Except the Average Waste per Meal in Confectionery all the Other Sub Kitchen's Waste per Meal is increasing with the Increasing of the Passenger Load Factor within the Last 24 Hours to the Estimated Time of Departure (ETD). The Provision for the Confectionery staff for the potential passenger Load growth is higher than the Other Sub Kitchens. The risk has minimized by the Confectionery staff by Producing more at the Initial Stage but the Risk of Waste due to not receiving the expected Passenger Loads will have to bear by the Company.

Referring to the Linear Regression Equations of the Average Waste per meal in each Sub kitchen with EY-Initial Load Factor, there is a negative relationship exists for all. This indicates that the increase of the initial EY Load factors are decreasing the average Waste per meal, vice versa. This represents that the Initial Preparation of the meals for the EY Passenger Loads by Eliminating the Potential Increases of the Passenger Loads as Much as Possible.

When the EY-Load Factor Variance increase the average Waste peer Meal Decreases, Vice versa, Except the Confectionery. The Increases in the Passenger Load Factors in the Last 24 hours to the Estimated Time, the Average Waste per Meal Increase due to the discrepancies to the Continuous production floor.

5.3. Recommendations of the Research

This Study proved that there is a deviation of the Passenger Load Factor Fluctuation in Different Customer Airlines based on that the Impact to the Waste is Different from Customer Airline to Airline, hence Customized pricing strategy should implement instead of a standard pricing Strategy, based on the Operational Efficiency due to the provided information from the Customer Airline.

Less Customized item Producing Sub Kitchens Such as Bakery and Confectionery has generated Less Waste Compared to the Sub kitchens Prepared more Customized Products. This Conclude that the Company Should Consider the Standardization in Menu Planning.

Outputs generated by the Sub kitchens which have less Options for Controlling the Quality and the Expiry has generated more waste such as Vegetable Room, Cold Kitchen and Hot Kitchen compared to the Sub kitchens such as bakery and Confectionery which have more Output Expiry Control Options such as Freezing, have generated Less Waste. The Hot kitchen should consider the Freezing of the Meals option in order to Control the Waste with better cost benefit analysis, because the cost of Freezing should evaluated with the Waste.

Based on the Research findings the Economy Class Passenger Load factors has significant impact on the Production Waste, Propose to commence the Meal Bank with Economy Class meals initially. The company should decide the Percentage of Meals for the Meal Bank based on the total Daily Economy Class meal count to cater the Load factor Increases within 24 Hours. But this should agree with the Customers to provide standard meal for the Increases within 24 Hours to the Departure. The company should check the possibility of reducing the Cycle time of the Process by Identifying the Current Bottlenecks such as Blast Chillers which consume approximately 4 to 6 Hours of the total Cycle time of the Meals. It is recommended to restructure the Production Process to Operate with 24 Hours Production Cycle time to eliminate the Uncertainty in the Floor due to the Non availability of the Passenger Loads to Plan the Production Accordingly. The Company should adjust the Strategies are required to manage over-ordered and over-produced food. One way to achieve this would be to create more standardization between customer menus, especially for economy meals which make up the majority of meals produced. More standardization between menus would give more opportunities for over-produced or over-ordered food to be utilized, decreasing the amount of food wasted.

This could be done through an economy meal Specifications, a concept that is used by other airline catering companies and was identified during Literature Review. The economy Class would need to be well marketed to customers and a non-negotiable but competitive price offered to help gain customer buy-in. Creating more overlap between customer menus would make production more efficient. It would be easier to streamline production processes for example, by producing similar mea l components that belong to different menus at the same time. Reducing food waste will help decrease food costs, and create greater efficiencies in production and assembly.

It is anticipated the food cost savings made by employing strategies to decrease food waste will balance some of the difference in offering lower cost meals. Further aspects of the menu could be used to help offset the difference further, including:

Have a menu featuring seasonal vegetables that are lower cost;

- Limit the specifications available, for example, for shape and size. Offering only two to three cuts of carrot would decrease variety in ordering and increase opportunities for use if over-ordered or overproduced
- More lenient specifications for shape and size of protein portions such as fish, would help utilize fish fillets completely
- Feature meals which utilize the protein offcuts of other meals or business class meals
- The use of standardized weights for protein components (such as curries) to create efficiency in meal assembly and decrease tools required. The above strategies could be used independent of an economy meal catalogue to reduce waste, reduce food cost and create efficiencies
- Implementing ‘Lean’ strategies, with a mass production and manufacturing operation
- Meal Bank – Standard Meal Store to Cater the Late Additions (Appendix 1.3)

5.4. Future Study Potentials

Based on the available Literature, there are very limited research studies have carried out in the Flight Catering Industry which is an Billion Dollar Business with High risk and Responsibility due to the Nature of the Industry. The researcher propose to further study the below areas in order to provide more information for decision making and improve the Industry as a whole.

- Evaluate the Financial and Operational Impact of the Load factor Variance
- Evaluate the feasibility of Different Passenger Loads Forecast Systems and the Financial and Operational Impact of implementing the Systems
- Analyze the Waste by Categorization of the Waste which will provide more information for decision making on Waste Reduction
- Evaluate the Financial such as increase the Cost per Meal and operational Impact of the Waste such as disposing and recycling the Waste
- Evaluate the Financial and Operational Feasibility of Static and Mobile Meal Bank
- Analyze the Customer Agreements and their impact on the Waste Generation and the Load factor Uncertainty, and identify the agreements/ terms which has created a win-win situation for both Customer Airline and the Flight Caterer by improving the Flight catering industry as a Whole.
- Evaluate the impact of Menu Planning and Standardization on Controlling the Waste in the Flight Kitchen
- Impact of Menu/ Meal Standardization on Customer Airline and the Passenger Satisfaction
- Evaluate the better Preparation techniques available in the World which minimize the Cycle time and the Waste in the Flight Kitchen
- Impact of Frozen Meals on Reducing the Waste in Flight Kitchen and the Operational and Financial Benefit of Using the Frozen Meals
- Impact of Frozen Meals on Customer Airline and the Passenger Satisfaction
- Evaluate the Possibility of Using the Ready Made (Pre – Produce) Meals/ food items for Economy Class meals and the Impact of Ready Made (Pre – Produce) Meals/ food items on Customer Airline and the Passenger Satisfaction

REFERENCES

- Fox T, Fimeche C. Global food: waste not, want not. London (UK). Institute of Mechanical Engineers; 2013.
- Food and Agriculture Organisation of the United Nations. Food Waste footprint: impacts on natural resources- Summary report. Department NRMaE; 2013.
- Parfitt J., Barthel M., Macnaughton S. Food waste within food supply chains: quantification and potential for change to 2050. Philosophical Transactions: Biological Sciences. 2010;365(1554):3065-81.
- Engström R. & Carlsson-Kanyama A. Food losses in food service institutions Examples from Sweden. Food Policy. 2004;29(3):203-13.
- Goonan SL. Getting a taste for food waste; an ethnographic exploration into the generation of hospital food waste prior to patient consumption.[Master's Thesis]. Dunedin, New Zealand: University of Otago; 2012.
- Sonnino R., McWilliam S. Food waste, catering practices and public procurement: A case study of hospital food systems in Wales. Food Policy. 2011;36(6):823-9.
- Kwon S., Bednar., C., Kwon J., Butler, K. . An Investigation of College and University Foodservice Administrators' Level of Agreement on Potential Influencing Factor on Sustainable Food Waste Management Journal of Foodservice Management and Education. 2012;6(2):21-6.
- Yi-Chi Chang Y., Jones P. Flight Catering: An Investigation of the Adoption of Mass Customisation Journal of Hospitality and Tourism Management 2007;14(1):47-56.
- Jones, P. (2004) Flight Catering, Butterworth Heinemann: Oxford
- Goto, Jason H. (1999). A Markov Decision Process Model for Airline Meal Provisioning.
- Morency, V. (1999). A proposal for improving the meal provisioning process at Canadian Airlines
- Pinedo, M (2009) Planning and Scheduling in Manufacturing and Services 2nd Edition Published by Springer
- Daniel. F. (2014), Demand Forecasting for Perishable Commodities: A Case Study of Inflight Food Demand for Low Cost Airline
- Ross, J. (2014), Food waste in an airline caterer’s production kitchen

- Yi-Chi Chang Y., Jones P. Flight Catering: An Investigation of the Adoption of Mass Customization Journal of Hospitality and Tourism Management 2007;14(1):47-56
- Lynes JK. & Andrachuk M. Motivations for corporate social and environmental responsibility: A case study of Scandinavian Airlines. Journal of International Management. 2008; 14(4):377-90.
- Li XD., Poon CS., Lee SC., Chung SS., Luk F. Waste reduction and recycling strategies for the in-flight services in the airline industry. Resources, Conservation and Recycling. 2003; 37(2):87-99.

- Johan N. & Jones P. Forecasting the demand for airline meals.
- Jones P. & Thomas M. Innovation in Flight Catering: Who? What? And how? 2003.
- Gustavsson J., Cederberg C., Sonesson U., Otterdijk R., Meybeck A. (2011) “Global Food Losses and Food Waste: Extent, Causes and Prevention”, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, Retrieved from: http://www.fao.org/docrep/014/mb060e/mb060e00.pdf; Last revealed: 27.05.2013
- Exodus (2007) “We don’t waste food. A household survey. Final Report.”, UK:WRAP., Retrieved from: http://www.wrap.org.uk/sites/files/wrap/We_don_t_waste_food__A_household_survey_mar_07.db6802f9.6397.pdf; Last revealed: 20.03.2013
- Hall K., Guo J., Dore M. & Chow C. (2000) “The progressive increase of food waste in America and its environmental impact”, PLoS ONE 4, e7940
- Kantor L., Lipton K., Manchester A. and Oliveria V. (1997) “Estimating and addressing America’s food losses”, Food Review, Vol. 20 (1), pp. 2–1
- Jones T. (2004) “The value of food loss in the American Household”, Bureau of Applied Research in Anthropology, A Report to Tilia Corporation, San Francisco, CA, USA
- Jones T. (2006) “Addressing food Waste in the US”, Interview: The Science Show, 8 April, Retrieved from: http://www.abc.net.au/rn/scienceshow/stories/2006/1608131.htm; Last retrieved: 20.03.2013
- Jones, P. (2004) Flight Catering, Butterworth Heinemann: Oxford

- Jones, P. (2007) Flight-Catering, in Becker, H. And Grothues, U. (2006) CateringManagement Portrait einer Wachstumsbranche in Theorie und Praxis, Behr'sVerlag: Hamburg Chpt 1.4.1, p. 39-55
- Booz, Allen and Hamilton Consultants, (1982) New product management for the 1980s, Booz, Allen and Hamilton Consultants:New York
- Christensen, C.M. and Overdorf, M. (2000) Meeting the Challenge of Disruptive Change, Harvard Business Review, March-April 2000, 67-76
- Cowell, D. (1988) New Service Development, Journal of Marketing Management, 3 (3) 296-312
- Easingwood, C.J. (1986) New Product Development for Service Companies, Journal of Product Innovation Management, 4 264-275
- Jones, P., Hudson, S. and Costis, P. (1998) New Product Development in the U.K. Tour Operating Industry Progress in Hospitality and Tourism Research 3 (4) 283-294
- Jones, P. (1995) Developing new products and service in in-flight catering, International Journal of Contemporary Hospitality Management, 7 (2/3) 24-28
- Jones, P. (1996) Managing Hospitality Innovation Cornell HRA Quarterly, 37 (5) 86-95
- Kelly, D. and Storey, C. (2000) New service development: initiation strategies, International Journal of Service Industry Management, 11 (1) 45-62
- McCool, A. (1995) Inflight Catering Management, Wiley:New York
- Robinson, A.G. and Stern, S. (1997) Corporate Creativity, Berret Koehler:New York
- Sheridan, M. (1998) Air Worthy, Restaurants and Institutions, 108 (30) 45-54
- Scheuing E.E. and Johnson E.M. (1989) A Proposed Model for New Service Development, The Journal of Services Marketing, 3 (2) 25-34
- https://www.hcareers.com/article/career-advice/airline-caterer-job-description
- Valery, N. (1999) Innovation in industry, The Economist, 2 February, 5-28
- Wan L. and Jones, P. (1993) "Innovation in the UK Foodservice Industry" International Journal of Contemporary Hospitality Management, 5 (2) 32-38

APPENDIXES

Appendix 1.1. Airline Load Factor Analysis

Airline	Month	Day	Data Points	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
XY Airlines	July	1	19	26%	16%	-10%	62%	62%	0%	75%	74%	-1%
XY Airlines	July	2	20	24%	21%	-3%	48%	46%	-2%	67%	71%	4%
XY Airlines	July	3	10	5%	6%	1%	45%	42%	-3%	63%	60%	-3%
XY Airlines	July	4	12	30%	28%	-2%	63%	56%	-7%	71%	71%	1%
XY Airlines	July	5	15	24%	17%	-8%	49%	53%	4%	73%	72%	-1%
XY Airlines	July	6	15	16%	26%	10%	47%	56%	10%	69%	72%	4%
XY Airlines	July	7	20	31%	29%	-3%	75%	73%	-2%	80%	79%	0%
XY Airlines	**July Total**		**111**	**24%**	**21%**	**-2%**	**57%**	**57%**	**0%**	**72%**	**72%**	**1%**
XY Airlines	August	1	20	23%	40%	18%	68%	76%	8%	92%	94%	2%
XY Airlines	August	2	20	28%	41%	13%	68%	70%	3%	90%	91%	1%
XY Airlines	August	3	24	20%	28%	8%	61%	63%	2%	90%	89%	-1%
XY Airlines	August	4	20	34%	45%	11%	62%	65%	3%	87%	87%	-1%
XY Airlines	August	5	25	32%	35%	3%	71%	71%	1%	89%	90%	1%
XY Airlines	August	6	20	20%	33%	13%	75%	80%	5%	90%	94%	5%
XY Airlines	August	7	20	31%	51%	20%	75%	82%	7%	95%	97%	2%
XY Airlines	**August Total**		**149**	**27%**	**39%**	**12%**	**68%**	**72%**	**4%**	**91%**	**92%**	**1%**
XY Airlines	September	1	20	28%	30%	3%	69%	68%	-1%	88%	88%	1%
XY Airlines	September	2	20	28%	21%	-8%	67%	62%	-5%	81%	78%	-2%
XY Airlines	September	3	20	23%	21%	-1%	53%	52%	-2%	72%	73%	2%
XY Airlines	September	4	16	25%	33%	8%	53%	64%	10%	70%	74%	4%
XY Airlines	September	5	20	24%	35%	11%	53%	58%	5%	71%	72%	2%
XY Airlines	September	6	25	19%	26%	7%	64%	67%	3%	77%	80%	3%
XY Airlines	September	7	25	39%	39%	0%	72%	75%	3%	87%	86%	-1%
XY Airlines	**September Total**		**146**	**27%**	**29%**	**3%**	**62%**	**64%**	**2%**	**78%**	**79%**	**1%**

XY Airlines	October	1	10	24%	23%	-1%	51%	46%	-5%	70%	68%	-2%
XY Airlines	October	2	9	28%	21%	-7%	66%	51%	-15%	58%	57%	-1%
XY Airlines	October	3	5	15%	10%	-5%	34%	32%	-2%	39%	42%	3%
XY Airlines	October	4	4	16%	13%	-3%	36%	39%	2%	50%	65%	14%
XY Airlines	October	5	5	38%	38%	0%	62%	60%	-1%	61%	61%	1%
XY Airlines	October	6	5	33%	33%	0%	45%	49%	4%	56%	59%	3%
XY Airlines	October	7	5	15%	20%	5%	47%	63%	16%	45%	65%	20%
XY Airlines	**October Total**		**43**	**24%**	**22%**	**-2%**	**51%**	**49%**	**-2%**	**56%**	**60%**	**4%**
XY AIRLINE Total			**449**	**26%**	**30%**	**4%**	**62%**	**63%**	**2%**	**79%**	**80%**	**1%**
AB Airlines	July	1	328				52%	53%	2%	73%	73%	0%
AB Airlines	July	2	329				46%	50%	4%	73%	72%	-1%
AB Airlines	July	3	153				45%	50%	4%	72%	71%	-1%
AB Airlines	July	4	238				47%	48%	1%	69%	69%	0%
AB Airlines	July	5	255				38%	44%	6%	67%	68%	1%
AB Airlines	July	6	238				48%	51%	3%	72%	72%	0%
AB Airlines	July	7	343				49%	53%	3%	69%	70%	1%
AB Airlines	**July Total**		**1884**				**47%**	**50%**	**3%**	**71%**	**71%**	**0%**
AB Airlines	August	1	315				53%	55%	1%	79%	79%	0%
AB Airlines	August	2	331				51%	52%	1%	77%	77%	-1%
AB Airlines	August	3	383				49%	52%	2%	76%	76%	-1%
AB Airlines	August	4	424				52%	53%	0%	76%	76%	0%
AB Airlines	August	5	438				53%	55%	2%	77%	77%	0%
AB Airlines	August	6	325				54%	57%	3%	78%	79%	0%
AB Airlines	August	7	339				53%	55%	2%	77%	76%	-1%
AB Airlines	**August Total**		**2555**				**52%**	**54%**	**2%**	**77%**	**77%**	**0%**
AB Airlines	September	1	336				45%	46%	2%	70%	70%	0%
AB Airlines	September	2	343				41%	44%	4%	64%	65%	1%
AB Airlines	September	3	325				36%	43%	7%	63%	66%	3%
AB Airlines	September	4	341				39%	45%	7%	65%	68%	3%
AB Airlines	September	5	355				39%	48%	9%	67%	69%	2%

AB Airlines	September	6	420				43%	51%	8%	71%	72%	1%
AB Airlines	September	7	448				44%	48%	4%	69%	70%	0%
AB Airlines	**September Total**		**2568**				**41%**	**47%**	**6%**	**67%**	**69%**	**1%**
AB Airlines	October	1	168				36%	45%	9%	66%	68%	3%
AB Airlines	October	2	168				32%	41%	8%	63%	65%	2%
AB Airlines	October	3	84				30%	41%	11%	65%	67%	3%
AB Airlines	October	4	85				32%	47%	15%	64%	67%	2%
AB Airlines	October	5	89				35%	47%	12%	67%	70%	3%
AB Airlines	October	6	85				34%	44%	9%	63%	65%	3%
AB Airlines	October	7	88				42%	48%	6%	67%	66%	0%
AB Airlines	**October Total**		**767**				**34%**	**44%**	**10%**	**65%**	**67%**	**2%**
AB Airlines Total			**7774**				**46%**	**50%**	**4%**	**71%**	**72%**	**1%**
Grand Total			**8223**	**26%**	**30%**	**4%**	**46%**	**50%**	**4%**	**72%**	**72%**	**1%**

Appendix 1.2. Airline Sector Wise Load Factor Analysis

Sector	Month	Day	Data Points	FC- Initial	FC- Final	FC- Variance	BC- Initial	BC- Final	BC- Variance	EY- Initial	EY- Final	EY- Variance
AB Airlines 1	July	1	182				40%	41%	1%	66%	65%	0%
AB Airlines 1	July	2	169				37%	41%	3%	69%	68%	-1%
AB Airlines 1	July	3	85				35%	39%	3%	67%	66%	-1%
AB Airlines 1	July	4	120				39%	39%	-1%	63%	64%	1%
AB Airlines 1	July	5	136				28%	33%	5%	62%	64%	3%
AB Airlines 1	July	6	126				35%	40%	5%	68%	68%	1%
AB Airlines 1	July	7	176				40%	42%	2%	64%	65%	1%
AB Airlines 1	July Total		994				37%	39%	3%	65%	66%	1%
AB Airlines 1	August	1	171				48%	43%	-5%	74%	74%	0%
UL1	August	2	164				41%	41%	0%	75%	75%	0%
AB Airlines 1	August	3	213				39%	40%	1%	71%	70%	0%
UL1	August	4	210				40%	43%	3%	73%	74%	1%
AB Airlines 1	August	5	235				44%	45%	2%	74%	74%	0%
AB Airlines 1	August	6	173				45%	47%	1%	74%	76%	1%
AB Airlines 1	August	7	171				40%	43%	3%	72%	71%	-2%
AB Airlines 1	August Total		1337				42%	43%	1%	73%	73%	0%
AB Airlines 1	September	1	187				37%	39%	1%	68%	68%	0%
AB Airlines 1	September	2	174				35%	39%	3%	65%	66%	1%
AB Airlines 1	September	3	183				31%	38%	7%	60%	63%	2%
AB Airlines 1	September	4	171				31%	38%	7%	63%	66%	3%
AB Airlines 1	September	5	186				35%	42%	8%	67%	70%	3%
AB Airlines 1	September	6	222				37%	46%	9%	69%	70%	1%
AB Airlines 1	September	7	233				37%	40%	3%	66%	67%	1%
AB Airlines 1	September Total		1356				35%	40%	5%	66%	67%	2%
AB Airlines 1	October	1	96				30%	38%	7%	61%	63%	2%
AB Airlines 1	October	2	86				28%	34%	6%	62%	63%	1%
AB Airlines 1	October	3	48				32%	39%	8%	62%	64%	2%

AB Airlines 1	October	4	43				29%	42%	13%	63%	64%	1%
AB Airlines 1	October	5	47				26%	38%	12%	67%	69%	2%
AB Airlines 1	October	6	46				28%	37%	9%	59%	62%	3%
AB Airlines 1	October	7	46				32%	35%	3%	62%	61%	-1%
AB Airlines 1	October Total		412				29%	37%	8%	62%	64%	1%
AB Airlines 1 Total			4099				37%	41%	3%	68%	69%	1%
AB Airlines 2	July	1	72				69%	73%	4%	84%	85%	1%
AB Airlines 2	July	2	63				57%	67%	10%	84%	84%	-1%
AB Airlines 2	July	3	36				52%	63%	11%	81%	81%	0%
AB Airlines 2	July	4	47				54%	62%	8%	80%	81%	1%
AB Airlines 2	July	5	53				59%	65%	7%	84%	83%	-1%
AB Airlines 2	July	6	47				67%	68%	0%	84%	83%	-1%
AB Airlines 2	July	7	72				61%	66%	5%	84%	83%	-1%
AB Airlines 2	July Total		390				61%	67%	6%	83%	83%	0%
AB Airlines 2	August	1	71				57%	70%	14%	90%	91%	0%
AB Airlines 2	August	2	63				71%	70%	-1%	91%	90%	-1%
AB Airlines 2	August	3	87				69%	75%	5%	92%	90%	-2%
AB Airlines 2	August	4	80				77%	73%	-4%	90%	89%	-1%
AB Airlines 2	August	5	90				72%	73%	1%	92%	90%	-2%
AB Airlines 2	August	6	61				61%	71%	10%	88%	87%	-1%
AB Airlines 2	August	7	67				66%	68%	2%	87%	88%	0%
AB Airlines 2	August Total		519				68%	72%	3%	90%	89%	-1%
AB Airlines 2	September	1	72				53%	56%	3%	75%	76%	1%
AB Airlines 2	September	2	64				48%	53%	5%	68%	72%	4%
AB Airlines 2	September	3	72				46%	53%	6%	70%	77%	7%
AB Airlines 2	September	4	63				48%	57%	9%	76%	79%	3%
AB Airlines 2	September	5	72				46%	64%	18%	78%	81%	4%
AB Airlines 2	September	6	80				47%	57%	10%	77%	79%	2%
AB Airlines 2	September	7	90				49%	54%	5%	75%	76%	1%
AB Airlines 2	September Total		513				48%	56%	8%	74%	77%	3%

AB Airlines 2	October	1	34				27%	41%	14%	67%	75%	8%
AB Airlines 2	October	2	32				22%	38%	16%	62%	69%	7%
AB Airlines 2	October	3	18				19%	44%	25%	70%	76%	6%
AB Airlines 2	October	4	16				24%	53%	29%	67%	76%	8%
AB Airlines 2	October	5	18				30%	45%	15%	70%	78%	8%
AB Airlines 2	October	6	16				26%	47%	22%	68%	71%	3%
AB Airlines 2	October	7	18				32%	52%	20%	72%	75%	3%
AB Airlines 2	October Total		152				26%	44%	19%	67%	74%	6%
AB Airlines 2 Total			1574				56%	63%	7%	81%	82%	1%
AB Airlines 3	July	1	44				62%	64%	2%	76%	75%	-1%
AB Airlines 3	July	2	44				59%	64%	5%	77%	77%	0%
AB Airlines 3	July	3	22				61%	62%	1%	70%	73%	2%
AB Airlines 3	July	4	31				53%	59%	6%	68%	70%	2%
AB Airlines 3	July	5	33				45%	53%	8%	69%	68%	-1%
AB Airlines 3	July	6	33				56%	57%	1%	70%	71%	1%
AB Airlines 3	July	7	43				59%	64%	4%	68%	71%	3%
AB Airlines 3	July Total		250				57%	61%	4%	72%	72%	1%
AB Airlines 3	August	1	39				61%	68%	7%	77%	78%	1%
AB Airlines 3	August	2	44				52%	60%	8%	74%	75%	1%
AB Airlines 3	August	3	53				58%	60%	2%	74%	73%	-1%
AB Airlines 3	August	4	52				56%	61%	4%	71%	72%	1%
AB Airlines 3	August	5	55				56%	59%	2%	74%	75%	1%
AB Airlines 3	August	6	43				62%	67%	5%	76%	76%	0%
AB Airlines 3	August	7	41				64%	67%	3%	78%	77%	-1%
AB Airlines 3	August Total		327				58%	63%	4%	75%	75%	0%
AB Airlines 3	September	1	43				54%	56%	3%	69%	69%	0%
AB Airlines 3	September	2	44				42%	50%	8%	62%	61%	0%
AB Airlines 3	September	3	44				39%	44%	5%	61%	64%	3%
AB Airlines 3	September	4	43				41%	49%	8%	56%	60%	4%
AB Airlines 3	September	5	44				40%	47%	7%	61%	62%	1%

AB Airlines 3	September	6	55				46%	54%	8%	65%	68%	2%
AB Airlines 3	September	7	55				50%	56%	6%	67%	68%	0%
AB Airlines 3	September Total		328				45%	51%	6%	63%	65%	1%
AB Airlines 3	October	1	22				58%	68%	10%	74%	76%	2%
AB Airlines 3	October	2	22				42%	52%	10%	64%	67%	3%
AB Airlines 3	October	3	11				44%	51%	7%	70%	73%	3%
AB Airlines 3	October	4	11				41%	52%	11%	61%	65%	4%
AB Airlines 3	October	5	11				60%	70%	10%	65%	69%	4%
AB Airlines 3	October	6	11				43%	50%	7%	65%	67%	2%
AB Airlines 3	October	7	11				53%	55%	2%	65%	65%	1%
AB Airlines 3	October Total		99				49%	58%	8%	67%	69%	3%
AB Airlines 3 Total			1004				53%	58%	5%	69%	70%	1%
AB Airlines 4	July	1	18				67%	66%	-1%	81%	79%	-2%
AB Airlines 4	July	2	10				36%	31%	-5%	64%	64%	-1%
AB Airlines 4	July	3	4				44%	44%	0%	67%	62%	-4%
AB Airlines 4	July	4	13				59%	48%	-12%	80%	73%	-8%
AB Airlines 4	July	5	7				34%	40%	7%	67%	63%	-3%
AB Airlines 4	July	6	13				65%	67%	2%	81%	78%	-4%
AB Airlines 4	July	7	18				65%	67%	2%	79%	81%	2%
AB Airlines 4	July Total		83				57%	56%	-1%	76%	74%	-2%
AB Airlines 4	August	1	20				51%	53%	2%	76%	74%	-2%
AB Airlines 4	August	2	12				42%	45%	3%	65%	60%	-5%
AB Airlines 4	August	3	15				31%	36%	5%	59%	58%	-1%
AB Airlines 4	August	4	25				66%	61%	-5%	76%	72%	-4%
AB Airlines 4	August	5	15				52%	51%	-1%	65%	62%	-3%
AB Airlines 4	August	6	20				69%	69%	0%	76%	74%	-2%
AB Airlines 4	August	7	20				68%	71%	2%	82%	78%	-4%
AB Airlines 4	August Total		127				57%	57%	0%	72%	70%	-3%
AB Airlines 4	September	1	20				48%	46%	-2%	75%	70%	-5%
AB Airlines 4	September	2	12				28%	27%	0%	58%	58%	0%

AB Airlines 4	September	3	12				29%	40%	11%	58%	58%	-1%
AB Airlines 4	September	4	20				55%	57%	3%	74%	72%	-1%
AB Airlines 4	September	5	12				45%	51%	6%	59%	58%	0%
AB Airlines 4	September	6	25				57%	62%	5%	74%	73%	-1%
AB Airlines 4	September	7	25				48%	53%	5%	75%	72%	-3%
AB Airlines 4	September Total		126				47%	51%	4%	70%	68%	-2%
AB Airlines 4	October	1	10				56%	58%	2%	71%	69%	-2%
AB Airlines 4	October	2	6				31%	41%	10%	50%	52%	2%
AB Airlines 4	October	3	3				19%	25%	6%	54%	54%	0%
AB Airlines 4	October	4	5				44%	54%	10%	74%	75%	0%
AB Airlines 4	October	5	3				51%	65%	14%	60%	60%	0%
AB Airlines 4	October	6	5				46%	31%	-14%	60%	62%	2%
AB Airlines 4	October	7	5				61%	71%	10%	70%	64%	-5%
AB Airlines 4	October Total		37				46%	51%	5%	64%	64%	-1%
AB Airlines 4 Total			373				52%	54%	2%	72%	69%	-2%
AB Airlines 5	July	1	8				90%	93%	3%	100%	97%	-3%
AB Airlines 5	July	2	8				92%	90%	-2%	99%	97%	-2%
AB Airlines 5	July	3	4				97%	86%	-12%	97%	93%	-4%
AB Airlines 5	July	4	6				88%	75%	-13%	94%	90%	-4%
AB Airlines 5	July	5	6				65%	76%	11%	92%	96%	4%
AB Airlines 5	July	6	6				79%	85%	6%	91%	87%	-3%
AB Airlines 5	July	7	8				89%	89%	0%	97%	97%	0%
AB Airlines 5	July Total		46				86%	86%	0%	96%	94%	-2%
AB Airlines 5	August	1	8				96%	91%	-5%	100%	99%	-1%
AB Airlines 5	August	2	8				81%	78%	-4%	100%	97%	-3%
AB Airlines 5	August	3	10				78%	85%	7%	98%	96%	-1%
AB Airlines 5	August	4	10				75%	77%	2%	100%	100%	0%
AB Airlines 5	August	5	10				84%	89%	5%	96%	98%	2%
AB Airlines 5	August	6	8				89%	88%	-1%	100%	99%	-1%
AB Airlines 5	August	7	8				98%	92%	-6%	100%	99%	0%

AB Airlines 5	August Total		62				85%	86%	0%	99%	98%	-1%
AB Airlines 5	September	1	8				95%	96%	0%	100%	98%	-2%
AB Airlines 5	September	2	8				93%	87%	-6%	98%	97%	-1%
AB Airlines 5	September	3	8				70%	82%	13%	96%	94%	-2%
AB Airlines 5	September	4	8				82%	81%	-1%	96%	97%	1%
AB Airlines 5	September	5	8				79%	88%	9%	98%	97%	-1%
AB Airlines 5	September	6	10				91%	93%	2%	99%	98%	-1%
AB Airlines 5	September	7	10				88%	93%	5%	100%	99%	-1%
AB Airlines 5	September Total		60				86%	89%	3%	98%	97%	-1%
AB Airlines 5	October	1	4				73%	96%	23%	96%	95%	-1%
AB Airlines 5	October	2	4				55%	61%	5%	68%	65%	-3%
AB Airlines 5	October	3	2				68%	68%	0%	78%	81%	4%
AB Airlines 5	October	4	2				57%	71%	14%	54%	53%	-1%
AB Airlines 5	October	5	2				96%	96%	0%	67%	65%	-2%
AB Airlines 5	October	6	2				64%	64%	0%	49%	48%	-1%
AB Airlines 5	October	7	2				82%	86%	4%	94%	95%	1%
AB Airlines 5	October Total		18				69%	78%	8%	74%	74%	-1%
AB Airlines 5 Total			186				84%	86%	2%	96%	95%	-1%
AB Airlines 7	July	1										
AB Airlines 7	July	2	12				39%	40%	1%	54%	56%	2%
AB Airlines 7	July	3										
AB Airlines 7	July	4	8				20%	16%	-3%	36%	34%	-2%
AB Airlines 7	July	5	8				31%	36%	5%	33%	34%	1%
AB Airlines 7	July	6										
AB Airlines 7	July	7	12				28%	36%	8%	33%	34%	1%
AB Airlines 7	July Total		40				30%	33%	3%	40%	41%	1%
AB Airlines 7	August	1										
AB Airlines 7	August	2	16				45%	45%	0%	43%	45%	2%
AB Airlines 7	August	3										
AB Airlines 7	August	4	20				38%	39%	1%	36%	36%	1%

AB Airlines 7	August	5	12				45%	53%	7%	46%	47%	1%
AB Airlines 7	August	6										
AB Airlines 7	August	7	16				51%	50%	-1%	65%	64%	0%
AB Airlines 7	August Total		64				44%	46%	1%	47%	48%	1%
AB Airlines 7	September	1										
AB Airlines 7	September	2	14				34%	34%	0%	40%	40%	0%
AB Airlines 7	September	3										
AB Airlines 7	September	4	16				37%	35%	-2%	36%	37%	0%
AB Airlines 7	September	5	16				27%	28%	1%	40%	41%	1%
AB Airlines 7	September	6	2				25%	25%	0%	42%	42%	0%
AB Airlines 7	September	7	15				58%	58%	0%	63%	63%	0%
AB Airlines 7	September Total		63				38%	38%	0%	45%	45%	0%
AB Airlines 7	October	1										
AB Airlines 7	October	2	6				49%	50%	1%	56%	45%	-10%
AB Airlines 7	October	3										
AB Airlines 7	October	4	3				33%	44%	10%	38%	33%	-5%
AB Airlines 7	October	5	4				31%	44%	13%	50%	52%	2%
AB Airlines 7	October	6										
AB Airlines 7	October	7	2				100%	75%	-25%	62%	58%	-5%
AB Airlines 7	October Total		15				48%	50%	3%	52%	46%	-5%
AB Airlines 7 Total			182				39%	41%	1%	45%	45%	0%
AB Airlines 8	July	1	4				46%	44%	-2%	73%	73%	0%
AB Airlines 8	July	2	23				52%	49%	-3%	70%	67%	-3%
AB Airlines 8	July	3	2				71%	80%	9%	96%	88%	-8%
AB Airlines 8	July	4	13				61%	56%	-5%	77%	70%	-7%
AB Airlines 8	July	5	12				41%	45%	4%	64%	63%	-1%
AB Airlines 8	July	6	13				51%	54%	3%	65%	64%	-1%
AB Airlines 8	July	7	14				55%	59%	4%	57%	57%	0%
AB Airlines 8	July Total		81				52%	52%	0%	68%	65%	-3%
AB Airlines 8	August	1	6				59%	55%	-4%	85%	83%	-1%

UL8	August	2	24				59%	59%	0%	83%	81%	-2%
AB Airlines 8	August	3	5				43%	37%	-6%	85%	84%	-1%
UL8	August	4	27				57%	50%	-7%	82%	80%	-3%
AB Airlines 8	August	5	21				51%	55%	5%	73%	73%	0%
UL8	August	6	20				63%	63%	0%	82%	81%	-1%
AB Airlines 8	August	7	16				62%	64%	2%	81%	80%	-1%
AB Airlines 8	August Total		119				58%	57%	-1%	81%	79%	-1%
AB Airlines 8	September	1	6				39%	34%	-5%	42%	41%	-1%
AB Airlines 8	September	2	27				52%	54%	2%	64%	62%	-2%
AB Airlines 8	September	3	6				28%	26%	-2%	39%	37%	-1%
AB Airlines 8	September	4	20				44%	51%	6%	67%	68%	1%
AB Airlines 8	September	5	17				45%	43%	-2%	51%	50%	-1%
AB Airlines 8	September	6	26				37%	42%	5%	66%	65%	-1%
AB Airlines 8	September	7	20				39%	44%	5%	67%	66%	-1%
AB Airlines 8	September Total		122				43%	45%	3%	61%	60%	-1%
AB Airlines 8	October	1	2				50%	57%	7%	66%	69%	3%
AB Airlines 8	October	2	12				53%	60%	7%	74%	74%	0%
AB Airlines 8	October	3	2				14%	13%	-2%	39%	37%	-1%
AB Airlines 8	October	4	5				43%	50%	7%	83%	82%	-1%
AB Airlines 8	October	5	4				56%	73%	17%	77%	78%	1%
AB Airlines 8	October	6	5				78%	84%	6%	83%	84%	1%
AB Airlines 8	October	7	4				91%	92%	2%	86%	84%	-1%
AB Airlines 8	October Total		34				58%	64%	7%	76%	76%	0%
AB Airlines 8 Total			356				51%	53%	1%	71%	69%	-1%
XY Airlines-1	July	1	4	34%	22%	-13%	95%	92%	-2%	82%	81%	-1%
XY Airlines-1	July	2	4	44%	31%	-13%	55%	49%	-6%	67%	72%	5%
XY Airlines-1	July	3	2	13%	25%	13%	36%	38%	2%	59%	58%	-1%
XY Airlines-1	July	4	3	13%	17%	4%	72%	71%	-2%	52%	57%	6%
XY Airlines-1	July	5	3	42%	8%	-33%	60%	59%	-1%	59%	63%	4%
XY Airlines-1	July	6	3	8%	38%	29%	40%	47%	7%	57%	52%	-5%

XY Airlines-1	July	7	4	13%	9%	-3%	77%	73%	-4%	68%	68%	0%
XY Airlines-1	July Total		23	25%	21%	-4%	65%	64%	-1%	65%	66%	1%
XY Airlines-1	August	1	4	16%	28%	13%	74%	73%	-1%	92%	93%	1%
XY Airlines-1	August	2	4	0%	0%	0%	50%	52%	2%	73%	70%	-3%
XY Airlines-1	August	3	5	23%	18%	-5%	45%	42%	-3%	61%	65%	4%
XY Airlines-1	August	4	5	50%	38%	-13%	49%	45%	-4%	70%	65%	-5%
XY Airlines-1	August	5	5	38%	35%	-3%	57%	45%	-12%	67%	71%	4%
XY Airlines-1	August	6	4	22%	19%	-3%	67%	72%	5%	71%	89%	18%
XY Airlines-1	August	7	4	34%	59%	25%	75%	73%	-2%	90%	90%	0%
XY Airlines-1	August Total		31	27%	28%	1%	59%	56%	-2%	74%	76%	2%
XY Airlines-1	September	1	4	44%	31%	-13%	83%	85%	1%	88%	88%	1%
XY Airlines-1	September	2	4	9%	16%	6%	63%	63%	1%	61%	61%	1%
XY Airlines-1	September	3	4	28%	22%	-6%	53%	51%	-2%	48%	54%	6%
XY Airlines-1	September	4	4	16%	13%	-3%	57%	71%	14%	49%	54%	6%
XY Airlines-1	September	5	4	34%	22%	-13%	62%	49%	-13%	53%	55%	2%
XY Airlines-1	September	6	5	10%	8%	-3%	66%	66%	0%	64%	68%	4%
XY Airlines-1	September	7	5	23%	13%	-10%	88%	70%	-18%	81%	78%	-3%
XY Airlines-1	September Total		30	23%	17%	-6%	68%	65%	-3%	64%	66%	2%
XY Airlines-1	October	1	2	38%	44%	6%	100%	86%	-14%	94%	96%	2%
XY Airlines-1	October	2	2	19%	25%	6%	89%	93%	4%	45%	51%	5%
XY Airlines-1	October	3	1	25%	25%	0%	62%	71%	10%	44%	54%	9%
XY Airlines-1	October	4	1	25%	0%	-25%	62%	64%	2%	44%	91%	47%
XY Airlines-1	October	5	1	63%	50%	-13%	93%	88%	-5%	77%	86%	9%
XY Airlines-1	October	6	1	25%	25%	0%	29%	31%	2%	45%	53%	8%
XY Airlines-1	October	7	1	25%	25%	0%	90%	93%	2%	49%	62%	12%
XY Airlines-1	October Total		9	31%	29%	-1%	79%	78%	-1%	60%	71%	11%
XY Airlines-1 Total			93	26%	23%	-3%	65%	63%	-2%	67%	70%	3%
XY Airlines-2	July	1	4	38%	34%	-3%	52%	55%	3%	87%	87%	1%
XY Airlines-2	July	2	4	34%	34%	0%	74%	77%	4%	87%	88%	1%
XY Airlines-2	July	3	2	0%	0%	0%	43%	38%	-5%	79%	76%	-3%

XY Airlines-2	July	4	3	63%	50%	-13%	71%	63%	-8%	90%	90%	0%
XY Airlines-2	July	5	3	17%	17%	0%	73%	71%	-2%	97%	94%	-3%
XY Airlines-2	July	6	3	46%	46%	0%	49%	48%	-1%	81%	83%	2%
XY Airlines-2	July	7	4	28%	41%	13%	76%	80%	4%	91%	91%	-1%
XY Airlines-2	July Total		23	34%	34%	0%	64%	64%	0%	88%	88%	0%
XY Airlines-2	August	1	4	38%	50%	13%	81%	86%	5%	98%	98%	0%
XY Airlines-2	August	2	4	72%	75%	3%	79%	82%	4%	98%	98%	0%
XY Airlines-2	August	3	4	59%	31%	-28%	58%	73%	15%	99%	99%	0%
XY Airlines-2	August	4	5	43%	68%	25%	72%	80%	8%	98%	97%	0%
XY Airlines-2	August	5	5	48%	43%	-5%	87%	93%	6%	98%	99%	0%
XY Airlines-2	August	6	4	25%	28%	3%	92%	98%	6%	98%	98%	0%
XY Airlines-2	August	7	4	50%	84%	34%	89%	100%	11%	99%	100%	0%
XY Airlines-2	August Total		30	48%	54%	7%	80%	87%	8%	98%	98%	0%
XY Airlines-2	September	1	4	47%	56%	9%	97%	92%	-5%	99%	98%	-1%
XY Airlines-2	September	2	4	38%	31%	-6%	94%	84%	-10%	99%	92%	-6%
XY Airlines-2	September	3	4	53%	44%	-9%	77%	72%	-5%	87%	87%	0%
XY Airlines-2	September	4	4	34%	41%	6%	57%	73%	17%	83%	85%	1%
XY Airlines-2	September	5	4	44%	66%	22%	63%	95%	32%	86%	87%	1%
XY Airlines-2	September	6	5	38%	60%	23%	83%	87%	3%	90%	92%	3%
XY Airlines-2	September	7	5	63%	63%	0%	93%	96%	3%	92%	94%	1%
XY Airlines-2	September Total		30	45%	52%	7%	81%	86%	5%	91%	91%	0%
XY Airlines-2	October	1	2	25%	38%	13%	54%	52%	-1%	87%	87%	0%
XY Airlines-2	October	2	2	50%	25%	-25%	49%	46%	-2%	73%	70%	-3%
XY Airlines-2	October	3	1	38%	13%	-25%	57%	33%	-24%	41%	37%	-4%
XY Airlines-2	October	4	1	38%	38%	0%	43%	43%	0%	55%	55%	0%
XY Airlines-2	October	5	1	38%	75%	38%	74%	90%	17%	74%	75%	1%
XY Airlines-2	October	6	1	13%	13%	0%	55%	60%	5%	67%	67%	0%
XY Airlines-2	October	7	1	25%	25%	0%	62%	62%	0%	86%	86%	0%
XY Airlines-2	October Total		9	33%	32%	-1%	55%	54%	-1%	71%	70%	-1%
XY Airlines-2 Total			92	42%	46%	4%	74%	78%	4%	91%	90%	0%

XY Airlines-3	July	1	4	3%	9%	6%	51%	54%	4%	76%	76%	0%
XY Airlines-3	July	2	4	0%	0%	0%	44%	36%	-8%	75%	75%	0%
XY Airlines-3	July	3	2	0%	0%	0%	48%	40%	-7%	65%	65%	0%
XY Airlines-3	July	4										
XY Airlines-3	July	5	3	0%	4%	4%	31%	48%	17%	82%	81%	-2%
XY Airlines-3	July	6	3	8%	25%	17%	82%	82%	0%	91%	91%	-1%
XY Airlines-3	July	7	4	0%	0%	0%	92%	80%	-13%	92%	91%	-2%
XY Airlines-3	July Total		20	2%	6%	4%	59%	58%	-2%	81%	81%	-1%
XY Airlines-3	August	1	4	25%	25%	0%	87%	92%	5%	100%	100%	0%
XY Airlines-3	August	2	4	50%	50%	0%	93%	95%	2%	100%	100%	0%
XY Airlines-3	August	3	5	5%	20%	15%	75%	87%	11%	100%	100%	0%
XY Airlines-3	August	4										
XY Airlines-3	August	5	5	15%	20%	5%	91%	97%	6%	100%	100%	0%
XY Airlines-3	August	6	4	22%	9%	-13%	100%	98%	-2%	100%	100%	0%
XY Airlines-3	August	7	4	47%	50%	3%	95%	95%	0%	97%	100%	3%
XY Airlines-3	August Total		26	26%	28%	2%	90%	94%	4%	100%	100%	0%
XY Airlines-3	September	1	4	3%	9%	6%	78%	79%	1%	97%	97%	0%
XY Airlines-3	September	2	4	13%	6%	-6%	65%	61%	-5%	90%	87%	-3%
XY Airlines-3	September	3	4	9%	19%	9%	52%	55%	4%	80%	81%	1%
XY Airlines-3	September	4										
XY Airlines-3	September	5	4	19%	38%	19%	56%	59%	3%	86%	86%	0%
XY Airlines-3	September	6	5	15%	15%	0%	78%	81%	4%	91%	92%	0%
XY Airlines-3	September	7	5	35%	30%	-5%	70%	80%	10%	99%	88%	-10%
XY Airlines-3	September Total		26	16%	20%	3%	67%	70%	3%	91%	89%	-2%
XY Airlines-3	October	1	2	31%	19%	-13%	19%	23%	4%	59%	54%	-5%
XY Airlines-3	October	2	1	38%	13%	-25%	48%	38%	-10%	50%	47%	-4%
XY Airlines-3	October	3	1	0%	0%	0%	14%	14%	0%	37%	35%	-2%
XY Airlines-3	October	4										
XY Airlines-3	October	5	1	25%	13%	-13%	38%	29%	-10%	54%	52%	-2%
XY Airlines-3	October	6	1	38%	38%	0%	62%	74%	12%	62%	62%	0%

XY Airlines-3	October	7	1	13%	25%	13%	48%	52%	5%	62%	62%	0%
XY Airlines-3	October Total		7	25%	18%	-7%	35%	36%	1%	55%	52%	-2%
XY Airlines-3 Total			79	17%	19%	2%	70%	72%	2%	88%	87%	-1%
XY Airlines-4	July	1	4	41%	3%	-38%	30%	27%	-3%	51%	50%	-2%
XY Airlines-4	July	2	4	22%	13%	-9%	17%	12%	-5%	44%	43%	-1%
XY Airlines-4	July	3	2	13%	6%	-6%	14%	7%	-7%	32%	28%	-4%
XY Airlines-4	July	4	3	17%	4%	-13%	32%	22%	-10%	50%	47%	-4%
XY Airlines-4	July	5	3	25%	8%	-17%	25%	21%	-3%	39%	38%	-1%
XY Airlines-4	July	6	3	4%	4%	0%	23%	15%	-8%	54%	48%	-6%
XY Airlines-4	July	7	4	34%	19%	-16%	42%	41%	-1%	57%	58%	2%
XY Airlines-4	July Total		23	24%	9%	-15%	27%	22%	-5%	48%	46%	-2%
XY Airlines-4	August	1	4	3%	3%	0%	14%	32%	18%	77%	80%	3%
XY Airlines-4	August	2	4	0%	25%	25%	39%	37%	-2%	86%	87%	1%
XY Airlines-4	August	3	5	8%	20%	13%	44%	29%	-16%	95%	86%	-9%
XY Airlines-4	August	4	5	13%	13%	0%	39%	42%	4%	83%	85%	2%
XY Airlines-4	August	5	5	10%	5%	-5%	30%	26%	-4%	85%	82%	-3%
XY Airlines-4	August	6	4	3%	28%	25%	28%	34%	6%	81%	86%	5%
XY Airlines-4	August	7	4	9%	3%	-6%	54%	50%	-4%	92%	96%	5%
XY Airlines-4	August Total		31	7%	14%	7%	36%	35%	0%	86%	86%	0%
XY Airlines-4	September	1	4	3%	6%	3%	18%	17%	-1%	67%	67%	0%
XY Airlines-4	September	2	4	16%	3%	-13%	37%	35%	-2%	65%	63%	-3%
XY Airlines-4	September	3	4	6%	6%	0%	26%	11%	-15%	60%	60%	0%
XY Airlines-4	September	4	4	19%	19%	0%	24%	23%	-2%	56%	61%	5%
XY Airlines-4	September	5	4	6%	13%	6%	15%	13%	-2%	41%	45%	4%
XY Airlines-4	September	6	5	8%	8%	0%	27%	29%	2%	60%	62%	2%
XY Airlines-4	September	7	5	38%	25%	-13%	29%	31%	2%	71%	74%	3%
XY Airlines-4	September Total		30	14%	12%	-3%	25%	23%	-2%	60%	62%	2%
XY Airlines-4	October	1	2	0%	0%	0%	17%	13%	-4%	30%	28%	-2%
XY Airlines-4	October	2	2	0%	0%	0%	57%	10%	-48%	37%	35%	-1%
XY Airlines-4	October	3	1	0%	0%	0%	0%	0%	0%	18%	23%	5%

XY Airlines-4	October	4	1	0%	0%	0%	10%	10%	0%	28%	34%	6%
XY Airlines-4	October	5	1	0%	0%	0%	17%	7%	-10%	20%	16%	-4%
XY Airlines-4	October	6	1	0%	0%	0%	19%	10%	-10%	29%	28%	-1%
XY Airlines-4	October	7	1	13%	13%	0%	33%	45%	12%	26%	30%	4%
XY Airlines-4	October Total		9	1%	1%	0%	25%	13%	-12%	28%	29%	0%
XY Airlines-4 Total			93	13%	11%	-2%	29%	26%	-3%	63%	63%	0%
XY Airlines-5	July	1	3	13%	13%	0%	91%	90%	-1%	80%	79%	-1%
XY Airlines-5	July	2	4	19%	25%	6%	51%	55%	4%	63%	77%	14%
XY Airlines-5	July	3	2	0%	0%	0%	83%	85%	1%	81%	72%	-8%
XY Airlines-5	July	4	3	29%	42%	13%	75%	68%	-7%	90%	90%	0%
XY Airlines-5	July	5	3	38%	46%	8%	56%	64%	9%	88%	83%	-5%
XY Airlines-5	July	6	3	13%	17%	4%	39%	88%	49%	60%	89%	29%
XY Airlines-5	July	7	4	81%	75%	-6%	90%	93%	3%	89%	88%	-1%
XY Airlines-5	July Total		22	31%	34%	3%	69%	77%	8%	78%	83%	5%
XY Airlines-5	August	1	4	31%	94%	63%	85%	97%	13%	95%	100%	5%
XY Airlines-5	August	2	4	19%	56%	38%	79%	86%	7%	94%	99%	5%
XY Airlines-5	August	3	5	13%	50%	38%	80%	85%	5%	100%	100%	0%
XY Airlines-5	August	4	5	30%	63%	33%	88%	93%	5%	99%	100%	1%
XY Airlines-5	August	5	5	50%	73%	23%	88%	96%	8%	96%	99%	3%
XY Airlines-5	August	6	4	28%	78%	50%	88%	96%	9%	98%	100%	1%
XY Airlines-5	August	7	4	16%	59%	44%	63%	92%	29%	96%	100%	4%
XY Airlines-5	August Total		31	27%	67%	40%	82%	92%	10%	97%	100%	3%
XY Airlines-5	September	1	4	41%	47%	6%	71%	69%	-2%	89%	92%	3%
XY Airlines-5	September	2	4	66%	47%	-19%	77%	67%	-10%	89%	88%	-1%
XY Airlines-5	September	3	4	16%	16%	0%	58%	68%	10%	82%	84%	2%
XY Airlines-5	September	4	4	31%	59%	28%	75%	88%	13%	93%	98%	4%
XY Airlines-5	September	5	4	19%	38%	19%	67%	72%	5%	88%	89%	1%
XY Airlines-5	September	6	5	23%	38%	15%	68%	73%	6%	80%	87%	7%
XY Airlines-5	September	7	5	35%	63%	28%	82%	98%	15%	95%	97%	2%
XY Airlines-5	September Total		30	33%	44%	12%	71%	77%	6%	88%	91%	3%

XY Airlines-5	October	1	2	25%	13%	-13%	68%	58%	-10%	82%	77%	-4%
XY Airlines-5	October	2	2	38%	38%	0%	80%	63%	-17%	80%	78%	-2%
XY Airlines-5	October	3	1	13%	13%	0%	36%	40%	5%	56%	60%	4%
XY Airlines-5	October	4	1	0%	13%	13%	31%	38%	7%	74%	79%	5%
XY Airlines-5	October	5	1	63%	50%	-13%	88%	88%	0%	79%	78%	-1%
XY Airlines-5	October	6	1	88%	88%	0%	60%	71%	12%	78%	84%	6%
XY Airlines-5	October	7	1	0%	13%	13%	2%	62%	60%	1%	83%	82%
XY Airlines-5	October Total		9	32%	31%	-1%	57%	60%	3%	68%	77%	9%
XY Airlines-5 Total			92	30%	48%	18%	73%	80%	8%	87%	91%	4%
Grand Total			8223	26%	30%	4%	46%	50%	4%	72%	72%	1%

Appendix 1.3. Meal Bank Procedure – SriLankan Catering Limited

Meal Bank Procedure – SriLankan Catering Limited
(Production – Dispatch- Operations)

Production Department should Hand Over the Meals According to the Below Time Schedule and the Meal Counts according to the Pax counts given below to the Operations Department prior to the 6 Hours to the ETD of the 1st Flight of the Particular Meal Type of the Day

Meal Bank Standard Meal Counts (Pax Counts)															
SECTOR	**MEAL TYPE**	**BC- 1**	**EY-1**	**BC-2**	**EY-2**	**BC-3**	**EY-3**	**BC-4**	**EY-4**	**BC-5**	**EY-5**	**BC-6**	**EY-6**	**BC-7**	**EY-7**
1	HBF	7	42	7	42	7	42	7	42	7	42	7	42	7	42
1 R	HBF	3	26	3	26	3	26	3	26	3	26	3	26	3	26
1	HLM	10	25	10	25	10	25	10	25	10	25	10	25	10	25
1 R	HLM	8	40	8	40	8	40	8	40	8	40	8	40	8	40
1	HRF	5	9	5	9	5	9	5	9	5	9	5	9	5	9
1 R	HRF	3	8	3	8	3	8	3	8	3	8	3	8	3	8
1	REF	11	26	11	26	11	26	11	26	11	26	11	26	11	26
1 R	REF	6	20	6	20	6	20	6	20	6	20	6	20	6	20
2	HLM	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2 R	HLM	18	25	18	25	18	25	18	25	18	25	18	25	18	25
2	SW	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	HBF	4	3	4	3	4	3	4	3	4	3	4	3	4	3
3	HLM	5	3	5	3	5	3	5	3	5	3	5	3	5	3
3	HRF	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	HRF	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	HBF	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	HLM	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	LDN	0	0	0	0	3	3	0	0	3	3	3	3	3	3
4	CBF	0	0	0	0	3	3	0	0	3	3	3	3	3	3

5	LDN	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	HLM	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	SW	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	HRF	3	3	0	0	3	3	0	0	0	0	3	3	0	0
7	HBF	3	5	0	0	3	5	3	3	0	0	3	5	0	0
7	HLM	3	3	0	0	3	3	3	3	0	0	3	3	0	0
8	HLM	3	3	0	0	3	3	3	3	3	3	3	3	0	0
8	HBF	3	3	0	0	0	0	3	3	0	0	3	3	0	0
8	LDN	6	6	3	3	6	6	6	6	6	6	3	3	3	3
8	SW	3	3	0	0	3	3	3	3	3	3	0	0	0	0

1	**Monday**	**2**	**Tuesday**	**3**	**Wednesday**	**4**	**Thursday**	**5**	**Friday**	**6**	**Saturday**	**7**	**Sunday**

Meal Bank Handover Schedule – Dispatch To Operation			
SECTOR	**MEAL TYPE**	**ETD - FIRST FLIGHT**	**MEAL BANK HANDOVER TIME**
1	HBF	07:00	01:00
4	HBF	07:15	01:00
3	HLM	07:20	01:00
1	HLM	07:45	01:00
8	HBF	09:05	01:00
5	LDN	13:05	07:00
5	HLM	13:05	07:00
5	SWS	13:05	07:00
8	LDN	13:20	07:00
2	HLM	14:10	07:00
2	SW	14:10	07:00
8	SWS	14:10	07:00
4	HLM	15:00	07:00
2 R	HLM	18:15	12:00
8	HLM	18:35	12:00
4	LDN	19:15	12:00

4	CBF	19:15	12:00
1	HRF	00:35	18:00
1	REF	00:55	18:00
3	HRF	01:00	18:00
4	HRF	01:15	18:00
3	HBF	01:55	18:00
7	HRF	02:05	18:00
7	HBF	02:05	18:00
7	HLM	02:05	18:00

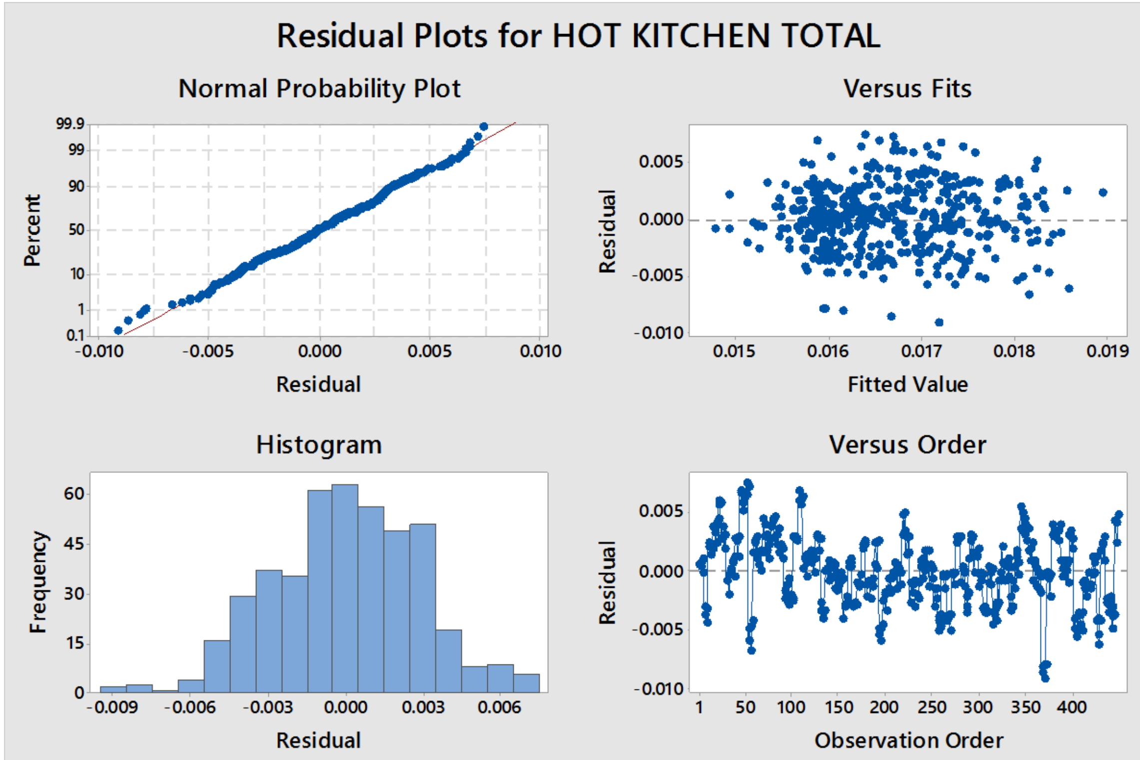
- The Top Ups (Within 4 H to the ETD) for the Day should be managed by the Meals in the Meal bank in Operations department until the cumulative top-ups exceed the Meal Bank Standard Meal Counts
- For AB Airline Meal Bank Meals Should not issue with the individual Flights, it should be issue as a Bulk
- The Cumulative Value of the Booked Load and the Meal Bank Count Should not exceed the Flight Configuration for the Particular Class (When the gap between the Booked Load and the Configuration is Less than the Meal Bank Count the Adjusted Meal Bank Count Should be the deviation Between the Configuration and the Booked Load)
- All the top-ups should Record in the COR System as before but the printout should send to the production only if the top Up cannot catered from the Meal bank (Only if the Cumulative Top Ups Exceed the Meal bank Standards)
- All the meals will be Handover to the operation through dispatch
- Gray color crates should use to handover the Meals – Hot Kitchen, Cold-EY, Confectionary, Bakery
- The individual meal and the Crete should need to mark with the,
    - Sector e.g.- AB Airline Flights Nos
    - Meal Type – HLM
    - Date Label Colour Code

- BC - Cold and Confectionary Meals with date marks will be Handover in Meal Carts
- Operation Department need to provide the Meal Carts with Labels (Sector e.g.- AB Airline 1 No, Meal Type – HLM)
- The Stock In the Meal bank Should Maintain by the Operations department and any short need to inform to the production through both CCU – COR System
- The Expired Meals should disposed at the end of the day (24: 00 H) by Operations Department
- Daily Balance need to be record and inform to the Sous Chef via email and the Production department should replenish the balance according to the meal bank stock levels (6 Hours to the ETD of the 1st Flight of the particular Meal Type of the Day)
- The Meal Bank should Strictly follow the FIFO (First In First Out) System
- For the Foreign Flights the Meal Bank Counts are FC- 1, BC- 2, PEY-2, EY-5

Note:

1. The Meal Bank will be Established in the Operations Department (Level 02) and the Exact Location will be Decided by the Operations Manager
2. All the Meals for the Meal Bank Should Handover to the Operations Department through the Dispatch Department Only
3. Duty Manger need to take the responsibility of remaining expired meals, need to dispose immediately without keeping inside the Meal Bank Chillers.
4. Hygiene should carry out an daily audits, if they found any unacceptable products , Duty Manger who was in charged is totally responsible for that procedure violation
5. The meal Bank Standard Numbers will be Updated according to the Reconciliation Done by Production Planning Executive
6. For TC and CCR Any Meal Bank Meals should not be Handed Over

Appendix 1.4: Multiple Regression Analysis – Residual Plot Hot Kitchen Example



Appendix 1.5: Production Waste - Primary Data Collection Sheet -Example

HOUSEKEEPING DEPARTMENT **PRODUCTION FOOD WASTE QUANTITY INFORMATION SHEET**

MONTH - October **2016** WEEK- 3rd week (From 11th to 17th)

Butchery

Area	Morning(Kg)	Night(Kg)
15th Oct	18	20
16th Oct	22	29
17th Oct	27	39
18th Oct	26	25
19th Oct	26	23
20th Oct	20	27
21st Oct	26	34
Total	**165**	**197**

Hot Kitchen Pot Wash

Area	Morning(Kg)	Night(Kg)
15th Oct	111	40
16th Oct	110	63
17th Oct	88	72
18th Oct	105	28
19th Oct	113	53
20th Oct	65	67
21st Oct	170	67
Total	**762**	**390**

Confectionery

Area	Morning(Kg)	Night(Kg)
15th Oct	59	4
16th Oct	40	23
17th Oct	53	20
18th Oct	52	13
19th Oct	68	10
20th Oct	15	13
21st Oct	51	9
Total	**338**	**92**

Hot Kitchen

Area	Morning(Kg)	Night(Kg)
15th Oct	36	20
16th Oct	42	27
17th Oct	32	24
18th Oct	46	24
19th Oct	21	34
20th Oct	25	32
21st Oct	34	25
Total	**236**	**186**

Butchery Pot Wash

Area	Morning(Kg)	Night(Kg)
15th Oct	9	2
16th Oct	11	10
17th Oct	4	10
18th Oct	19	18
19th Oct	18	7
20th Oct	10	9
21st Oct	18	11
Total	**89**	**67**

Hot Meal Portioning

Area	Morning(Kg)	Night(Kg)
15th Oct	58	6
16th Oct	57	24
17th Oct	54	22
18th Oct	60	31
19th Oct	76	31
20th Oct	80	19
21st Oct	78	29
Total	**463**	**162**

Oven Room/Bread Room

Area	Morning(Kg)	Night(Kg)
15th Oct	5	65
16th Oct	3	7
17th Oct	5	4
18th Oct	7	3
19th Oct	24	26
20th Oct	15	6
21st Oct	8	6
Total	**67**	**117**

Bakery

Area	Morning(Kg)	Night(Kg)
15th Oct	18	53
16th Oct	13	52
17th Oct	13	44
18th Oct	32	30
19th Oct	19	28
20th Oct	10	35
21st Oct	18	35
Total	**123**	**277**

Cold Meal Portioning

Area	Morning(Kg)	Night(Kg)
15th Oct	18	10
16th Oct	15	21

Bakery Pot Wash

Area	Morning(Kg)	Night(Kg)
15th Oct	4	8
16th Oct	9	5

Cold Kitchen

Area	Morning(Kg)	Night(Kg)
15th Oct	61	30
16th Oct	68	48

Vegetable Room

Area	Morning(Kg)	Night(Kg)
15th Oct	678	285
16th Oct	89	56

17th Oct	12	16	17th Oct	8	5	17th Oct	74	27	17th Oct	511	266
18th Oct	10	21	18th Oct	4	2	18th Oct	64	32	18th Oct	509	269
19th Oct	14	5	19th Oct	12	10	19th Oct	69	84	19th Oct	572	362
20th Oct	15	11	20th Oct	10	14	20th Oct	40	37	20th Oct	520	584
21st Oct	14	4	21st Oct	7	6	21st Oct	44	38	21st Oct	431	269
Total	**98**	**88**	**Total**	**54**	**50**	**Total**	**420**	**296**	**Total**	3310	**2091**

Canteen

Area	Morning(Kg)	Night(Kg)
15th Oct	28+46	30
16th Oct	32+51	34
17th Oct	21+59	29
18th Oct	16+72	55
19th Oct	34+58	42
20th Oct	75+65	57
21st Oct	28+78	32
Total	**0**	**279**

Canteen (Outsourced Staff)

Area	Morning(Kg)	Night(Kg)
15th Oct	82	47
16th Oct	54	42
17th Oct	74	33
18th Oct	54	32
19th Oct	79	39
20th Oct	50	28
21st Oct	80	34
Total	**473**	**255**

		AVG per day
Entire Production	**10138**	**1448.29**
Without Veg & Butchery	**4375**	**625.00**