Digital Transformation and use of AI in designing Greenfield Airport
(A Comparative study between USA and India Greenfield Airport)

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Abstract

Airline and travel industry are ever green, always emerging, faces constantly changing technology, huge dependency on infrastructure with no room for errors. Travel industry has very less direct interaction with the customer, engaging the customer after the service is another big challenge. We need loyalty customers, better profits and lower costs yet excel in our operations and services and have a competitive edge over other players of the industry. To excel, we need 100% uptime of all our systems, zero errors, and no mechanical failures or service disappointments. How can we do that with low margins and when we are so vast and gigantic? This paper focuses on digital transformation of the industry with a special focus on Artificial Intelligence as solution in boarding and considers the critical processes like boarding, baggage claims processing and briefly touches the cockpit solutions. All organizations are now in the phase of unlearning their traditional ways of doing the business and relearning the tools and techniques towards business enablement. One of the business enablers is "Digital Transformation.

Keywords: AI; Boarding experience; Claims processing; Digital Transformation; Greenfield Airport

Introduction

Travelling for work, pleasure and other needs became an essential part of everyday life for every common man regardless of mode of transport. With the revolutionary changes in transportation field in global business scenario, the need for understanding, analyzing and constantly improving the existing facilities and thinking head of millennium demands became the necessity. Keeping the airports and railways in mind, the study focuses on analyzing and proposing innovative path applications for next generation boarding experiences in context of USA and India. The developed

country like USA and developing country like India both need to focus on how we envision and learn to constantly improve things for citizen. The challenges for two countries may be different in terms of life style, population/ usability, technology choices or frequency or potential customers. Comparing two different countries here provides the opportunities to learn from each other. For example, for India, technology and infrastructure may be a challenge may not be so much for USA. When we study USA, the lessons from this country are useful as we develop new infrastructure or make right technical challenges in India. In India, we have a lot of population, crowd management, customer care, customer satisfaction and price point, usage of technology and usability of the same for a very diverse community/ state will provide an excellent insights to USA on how to cater a wide variety of customers with a huge difference in backgrounds and how to handle huge crowds or handle a multiple different language preferences to make the unified model which can fit into every situation or for every culture/ The transportation needs and customer expectations and preferences vary widely. The current research focuses on withal given constraints, how we can accomplish the goal of developing innovative paths for future Greenfield design approach and digital transformation by incorporating AI as a tool. Digital transformation in Greenfield- Developing Innovative Paths for Next Gen Experience discusses the following areas:

- Improvising the customer experience
- Achieving 100% safety
- Incorporating the intelligence
- This research limited to
- To design the airport for NextGen Millennium Customers
- To provide the comparative study between USA and India

The Below mentioned airline data is considered for current research study.

Figure 1 Airline data is Considered for current

Objectives of Research

1. To study Digital Transformation and use of AI in designing Greenfield Airport

Related Literatures

Greenfield is a design thought process where we can think of possibilities without considering previous designs or existing system constraints or any known restrictions. Under this school of thought, we consider few areas of research in airlines like cockpit solutions, boarding process or baggage and claims processing. This paper focuses on specific study on boarding process and explores the possibilities of how digital transformation can revolutionize system thinking and impact on choice of tools and techniques. This paper also provides other aspects in digital transformation and discusses future of AI in aviation sector. Various disciplines like social media, consumer behavior, customer analytics, architecture, computer designing and digital transformation solutions, marketing, big data are considered. These aspects help the researcher to identify the drivers and help to identify the right design and development tools to solve the complex business problems.

Figure 2 Touch points along the Boarding journey

The following are some of the points that drive the need for the study:

• Every airline customer must go through the boarding process and no airline can claim that they have the best boarding process

• Due to constantly increase of the customer base and less boarding time between two flights taking- off from the terminal, the boarding process has become a challenge

- Innovative study and re-imagining the airport design can help the airport authorities and airline agencies to serve the customers better. This thus increases the repeated customers

- The more intelligent systems are provided, the better designs can be taken in terms of safety and security. Data alone is not enough to deliver the solution.

Significance

Every airline industry can be benefitted by this research as the aviation industry challenges are the same. To name few challenges 100% uptime, 100% safety, increasing the customer satisfaction, customer retention and lower profit margins. Other issues like aircraft maintenance, overheads, constantly growing needs, changing technology, complex infrastructure and numerous stakeholders make the solutions less creative. Current research is highly significant as we focus on just the solutions in greenfield designs. If we consider a boarding experience of baggage claims, it is a multi- variable complex problem. Unless we think creative, we can't solve the problem and meet the objectives of the millennium generation.

Research Methodology

The source of data or the proposed study would be both primary and secondary sources. Primary data will be collected from the sample respondents, observations, interviews and the secondary data will be collected from related research works, published books, journals and internet. The primary data will be collected through a structured questionnaire from the sample respondents at various airports and airline customers. We can also consider online surveys. The data is collected from surveys, social media, interviews personal & Groups exclusive for this study. Convenience sampling, random sample is used to collect the data from the respondents. It's a non-probability sampling technique in which elements have been selected from the target population based on their accessibility to convenience to the researcher. The study is conducted to study the onboarding experience off the travelers in India and USA with major airlines. Social media data is going to give the global perspective of the travelers based on the certain criteria. The sample size for questionnaire for India and USA each is targeted to 1200 customers. The customer responses are collected using structured questionnaire developed on the factors considered for the study and the data is analyzed using appropriate statistical methods. To identify the major factors that influence boarding experience. The data can be classified into domestic and international travel: cross tabulated and processed its findings in a systematic manner. Chi Square test, and ANOVA, algorithmic models for multi-variable analysis and Queuing

theory will be used for the collected data. Multi point liker scale is used to measure the boarding experience. The data is collected is in the form of text, pictures, video and also in voice format. The analysis of this data needs big data analytics to transform the unstructured data into a structured format for storage and analysis. Data is converted into structured format of tables and cubes. Then the algorithms are built and outcome of the same is shown in the graphical view for this paper reference. Please refer to the below mentioned analytical results for insights Emotional Vs non emotional Factors identified in survey Interview results on emotional vs non-emotional antecedents

Research Results

1. Focus Area 1- Boarding Experience

This picture explains various touch points during the boarding journey. The touch points mentioned here are not always under the control of airline authorities. As the customer travels to various boarding points, the challenges will differ. Boarding is an extremely complicated process and varies hugely based on technology, distance, airport internal architecture, weather (cancellation), distance between security and terminal, mode to reach the terminal, travelers' preferences, airlines and technology, customer age to name few. With numerous touch points through-out the boarding process, there is a huge opportunity on how using AI. Please refer to other sections of this paper for in-depth analysis and how we can improvise the boarding experience

2. Focus Area 2 - Baggage and Claims Processing

Figure 3 bag conveyor machine

Any global travel organization can't operate to every corner of the world. To extend connectivity to different parts of the world, travel companies will often end-up be doing joint ventures. There are some instances where the connecting airline is delayed or if the charter flight to the destination couldn't the customer luggage along with them or if any of the legs in multi airline flight is missed, often the customer encounters problems in collecting the luggage. Reasons can be any, if the customer doesn't get the baggage at the destination, it is not only frustrating, but also messes up the trip of the customers. Airlines usually compensate the baggage rentals or reimburse some purchases which a costly affair is. At times the customer needs to make several calls to customer service center to track the baggage and be at home when the luggage is delivered. If multi-airlines are considered this process is even more cumbersome. In case of JV's already the profits are shared, on top of this, maintenance of customer call center, claims processing, reimbursement etc is an additional expenditure. This is a perfect example where we can use AI to resolve the issues. In case of JV's we can run an algorithm with set of rules based on set threshold values to identify the claims, and bot can automatically process the claims. With historical data, the algorithms can be well trained, and we can configure and adjust the claims model based on the changing needs. Once the primary airline applies the claim, JV airlines claims can also be automatically processed/ request can be sent in the meantime by using bot. This not only saves the time, but also removes the human errors and delays.

3. Problem Statement for Focus Area 1

60% of the boarding problems are reported in the form of less satisfaction which also reflected on many social media. Re-imagine the boarding experience and make it seamless for best customer experience to every customer by combining many cross functional domains by studying in-depth analysis
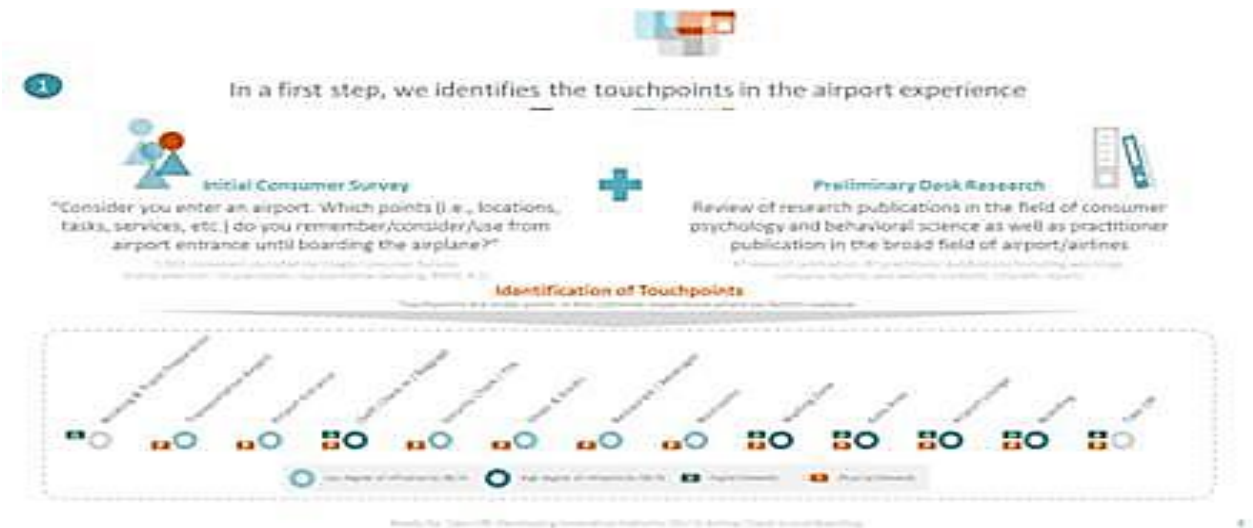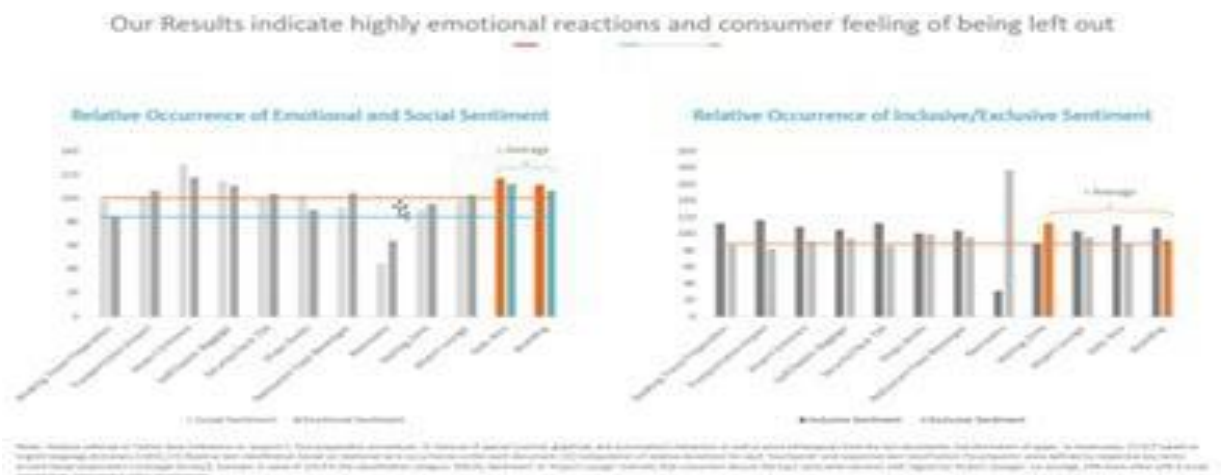
Figure 4 in a first step touch points in the airport

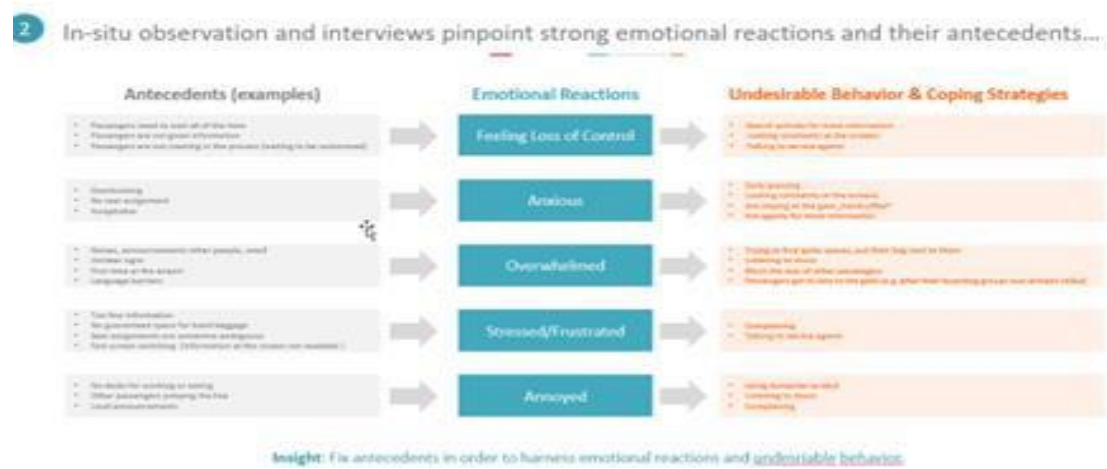**Figure 5** results on emotional vs non- emotional antecedent

Figure 6 results on emotional vs non- emotional antecedents

Figure 7 Bigdata Collected From Different Airport Samples

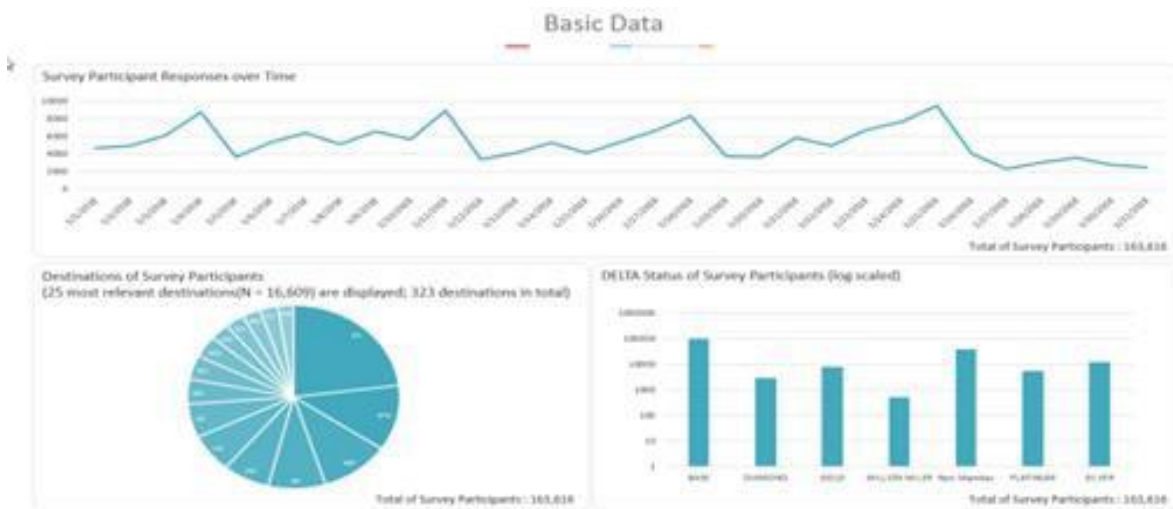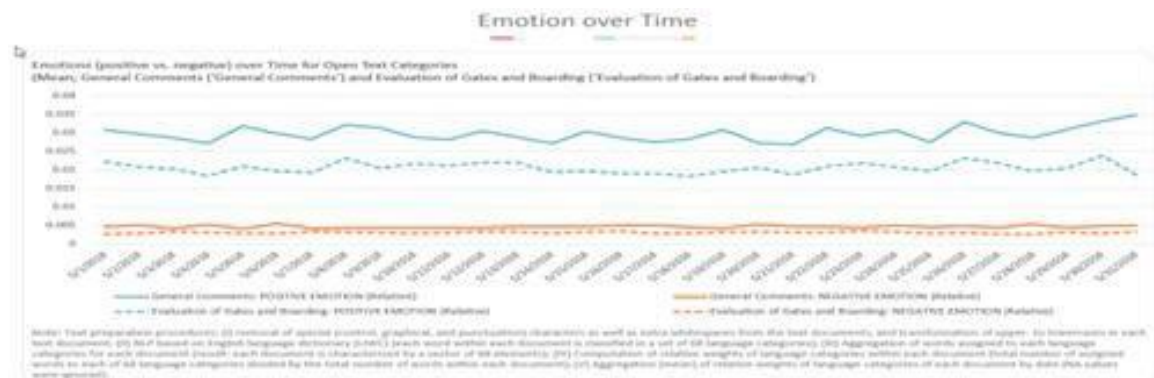**Figure 8** Data collected and survey responses

Figure 9 Details of survey results

Figure 10 Survey responses over time

Figure 11 Emotions over time

Figure 12 Emotions per tier member
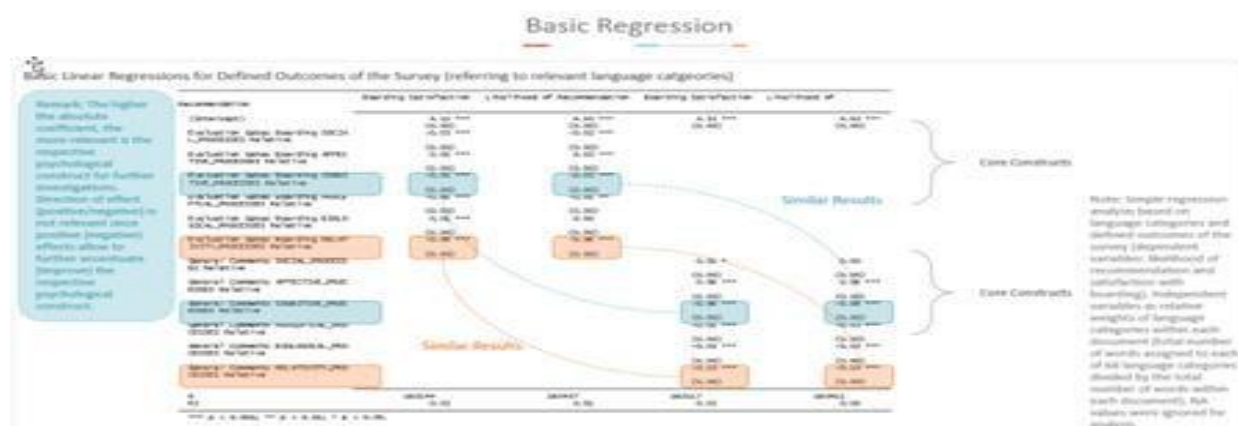

Figure 13 N-Gram for varying length

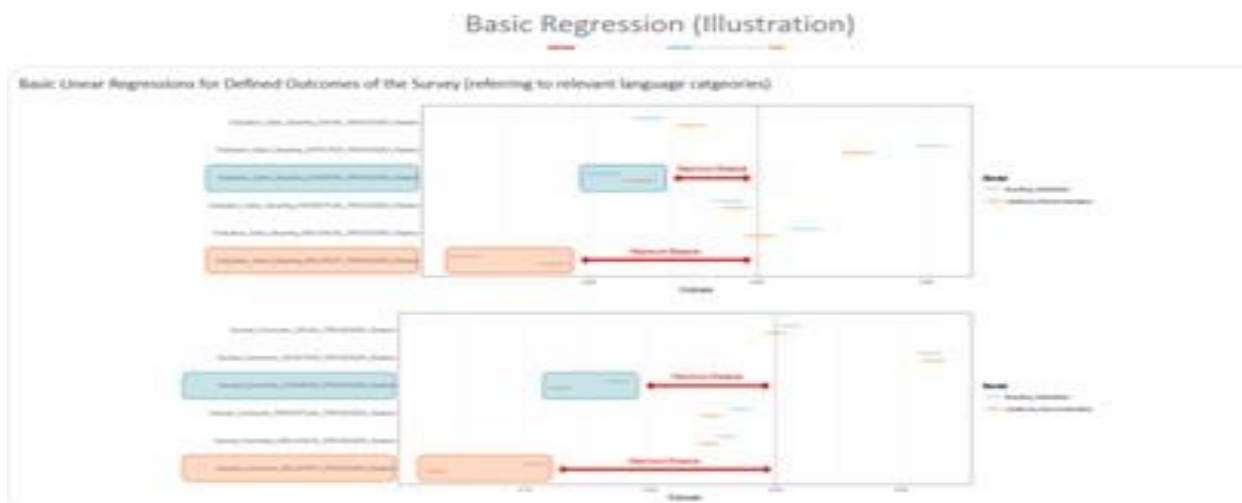**Figure 14** Basic Regression Analysis
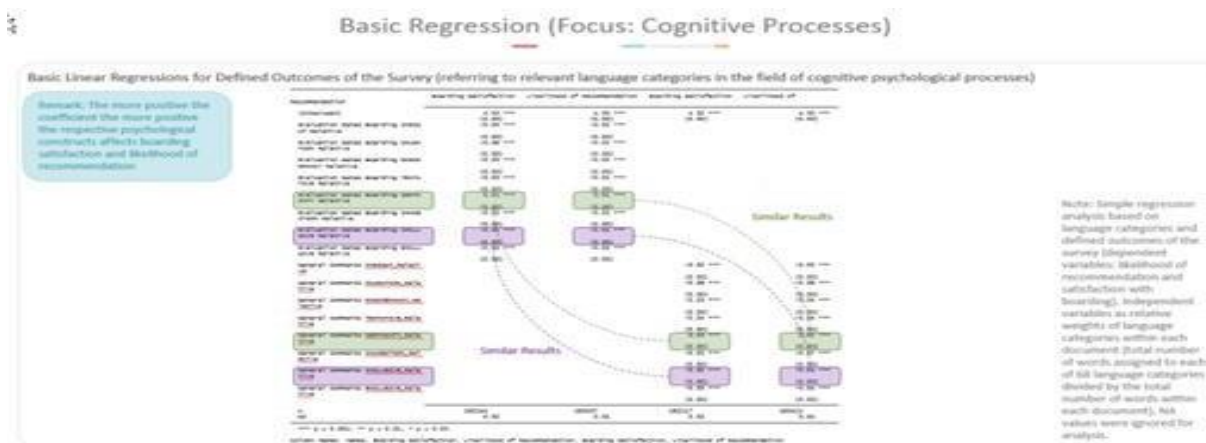
Figure 15 Illustrated Basic regression

Figure 16 Cognitive Processed- continue regression

Note: All these graphs are generated as a result of algorithms we used in boarding process. The logic for these algorithms will be presented along with data in a detailed manner as part of my final thesis.

4. Key Findings Based On Data Analysis Resulted For Focus Area 1 & 2:

Baggage (handling, check-in, storage on airplane) is relevant (storage on board and access) Passengers are aware and think about the 'appropriate' boarding procedure (order of boarding; from back to front, window to aisle, etc.) feel informed in terms of expertise (claim to know it better) 'Certainty' and 'Inclusiveness' represent two major psychological mechanisms that affect the 'customer experience' (satisfaction, likelihood of recommendation) Certainty is linked to comments/feedback that focusses on the baggage/carry-on issues Inclusiveness is linked to expectations/recommendations for boarding procedures

5. Tools and Techniques to Address The Key Findings

Based on the objectives of the research the data collection, analysis is conducted and identified key findings. For focused areas 1 & 2, the problem is very complex as it touches the business process which needs re-engineering, customer analytics and consumer behavior needs shift of thought process, systems thinking needs new tools and techniques. The possible solution to address the multivariable dependent on infrastructure, people, process and systems is through

digital transformation.

Figure 17 change – Renewal Associates

What is Digital Transformation:

Figure 17 Digital transformation

Digital transformation is the transformation of society by using digial technology to accomplish simplicity, speed, agility, adoptability and provide secured solutions. With digital disruption in technology, recent shift to cloud storage, smart mobile application, Social media tools and analytics, IoT and AI, the organization have now 360 shift on traditional approaches on how they are currently doing their business. With many new tools and applications are available, every organization literally considering digital transformation. Some achieve 100% digial transformation by 2020 like Saudi Arabia education division. Based on the organization maturity levels, adoptability of team members, the digial transfomation goals can be established. Some domains are more complex in implementation than the rest. Digital transformation is a momentum it starts with going digital and ends with doing digital

The digital transformation is not one step process, it is multiyear culture shift process. Some of the core elements of digital transformations can be to improve customer understanding, customer touch points, modifying the business, increase the growth, process optimization, digitization and thus achieving the performance excellence. This paper focuses on customer touch points for travel industry and case studies are presented focus on how to establish the single focus of customers, strategies on providing the better customer satisfaction.

Figure 18 Digital Transformation Process

Digital transformation as stated above is a multiyear process focuses on new thought process of culture change, shift in thought process, from thinking agile to performing and being agile, business and IT alignment etc. In order to evolve to the state of completely transformed, consider the stages below:
Business as usual

Digital literacy to educate the team
Formalizing the plan for digital transformation

Taking strategic initiatives

Converge in action plan

Innovate solutions

Transform

Depending on the organization maturity levels, some may be little more advanced than the rest. Instead of jumping or skipping a stage, if we are following the above 7 step process, we can accomplish better goals, sustainable growth and manageable conflict. The main pillars for the success as always been people, process.

6. Game Changers in Digital Transformation

Technology makes a big role in Digital transformation. There are many areas that we can consider for digital transformation. Based on the goals of the organization we can show agility, performance, speed and high ROI. Some of the areas that are considered in this space focus on automation of processes, testing, faster and quicker deployments and incorporating the dev ops tools, Digital tracking of the infrastructure and assets, sharing the contracts, artifacts etc via block chain, connecting all the tools vi IoT applications to name few. Organization digital maturity, domain and the specific goals can drive the results. This paper now focuses on specific cases of

AI and the difference it can make in the digital community.

Figure 19 the tools vi IoT applications

Connecting all devices like scanners, phones, digital assets, physical assets, cameras, vehicles, appliances etc via IoT is not only a revolutionary thought, but also adds lot of value and reduces

monitoring lot easier.

Figure 20 Reduces monitoring lot easier

While the organizations implement RFID and many other tracking systems and connect them through custom mobile apps. Through IoT we can control better the devices, predict the down time and schedule monitoring and can do completely programmed solution through mobile apps. Airport is a complex system and needs coordinating and connectivity of various systems, hardware devices, machines in order to perform well.

Dev Ops is the utilization of lean and agile techniques to combine development and operations into single IT value stream. When Dev Ops is combined Infrastructure, business is taken into next level by IT. This helps to have programmability and can give the visibility between current to desired solution. These things are easily scalable when added big data, machine learning data as we add programmability, the agility is achieved. Dev ops expedite the quicker deployments by automating the deployments, configuration, monitoring many environments. Good way to save costs, gain agility and eventually target to digital transformation of the organization.

AI is one of the hottest topics in the IT world. Many of us might have already started using it in the form of Microsoft office products, google home, Alexa or Apple home or a self-driving car. We are most exposed to consumer electronics side of AI. Transportation and health care is early adopters of AI as these machines are trained with tons of images in several thousand hours of training. The collected images vs stored images are compared and with the programmed algorithms, we accomplish many tasks. We will discuss in detail about a case study in airline

industry which can save tons of time and reduces conflicts and provides the better customer services. AI usage is a game changer in airline industry and more specifically in JV.

Block chain is another hottest area in digital transformation. The distributed, decentralized network, peer to peer transformation, transparency of pseudonymity, irreversible records and computation logic make this technology much more adoptable and trustable everywhere the source to all transaction tracking is the key. Many applications are proposed by using this technology are in POC status. In airline, when we make the tracking documents available between JVs and between different logistics teams, we can save enormous amount of time. The block chain applications can go beyond financial assets. Information about provenance of goods, identity, credentials and digital rights can be securely stored with DL. Though it is challenge, but it can be tracked physical assets, resources, credentials and other relevant events by using this technology. Good technology to experiment in going digital transformation.

7. How Digital Transformation And AI Helps To Resolve The Greenfield Airport Design?

This paper touched briefly 5 focus areas and now let us discuss how each area can be addressed through digital transformation as a tool. As we already know Digital transformation is not a single tool or a technique, but a thought process which combines a variety of tools. Each focused area is different and solutions for each of the problems will also vary though we see few commonalities in each. 8.Focus Area 1

Table 1 Boarding Experience- Solution

Problem	How to make boarding experience a seamless experience?
Sub-focus areas to consider	Gate redesigning Systems redesigning ,Display board redesigning Notification push & Mobile app System integration for JV's In-airport GPS design and implement
Reasons for complexity	Multiple steps and multiple locations to track Infrastructure dependency Language barrier Limited space constraints Global data collection constraints for biometrics Joint venture dependencies No single process works for different gates or different airlines or different locations
Digital transformation role	Perfect example where we can education, transform and perform the digital transformation.

| Specific tools to be applied	Dev Ops for multiple deployments AI in predicting the pain areas and quickly addressing the problems based on historical data Implementation of Biometrics for seamless experience IoT for tracking the scanners Enhanced mobile apps for pushing notifications Implement built-in GPS for each station and automatic navigation to the gate API development and deployment for data exchange Redesigning the business process to get aligned with systems thinking Physical layout at gate to reflect the effective usage of space Notification display and effective utilization of the display board via uniform way of displaying boarding notifications
How AI can help in short term	By predicting the Customer tolerance Customer boarding satisfaction levels Delays in boarding and providers drivers for systems thinking Delivers the metrics based on the initial checking at security to onboarding
Future of AI in Boarding	Will continue to play major significant roles in predictive analytics, automating bot check-ins, increased use of biometric and intelligent solutions coupled with AI solutions with GPS solutions, providing the joint partnership solutions and single view of customer boarding status can be easily solved by using AI.

Focus Area 2

Table 2 Baggage and Claims Processing

Problem	How to effectively track bags and reduce the claims or reduce the time taken for claims processing
Sub-focus areas to consider	Bag tag tracking, Bag tracking and claims processing in JV's
Reasons for complexity	Multi-leg travel, Multiple airlines coordination for Joint ventures, No uniformity in bag tag reading, missing notifications, no data visibility between multi- airlines, cumbersome and stringent rules and different cycle time for claims processing
Digital transformation role	Business process redefining and unconstrained design thinking with more effective tool implementation, being thinking agile to performing agile can be accomplished by applying digital

	transformation principles to this business problem
Specific tools to be applied	IoT and permanent Bag Tag and Dev Ops Dev Ops for deployment AI in early detecting the baggage loss, predicting the delays early on
How AI can help in short term	AI in predicting the bag claim and missing baggage Incorporating AI in baggage processing to expedite when the claim is recorded Robots to search the bags and answer the queries on claims Automatic claims processing based on the rules set for joint ventures and providing clear visibility to the customers

Table 3 Future of AI Baggage and Claims

Future of AI Baggage and Claims	
	 IoT @ Baggage and benefits of Collaborating platform:
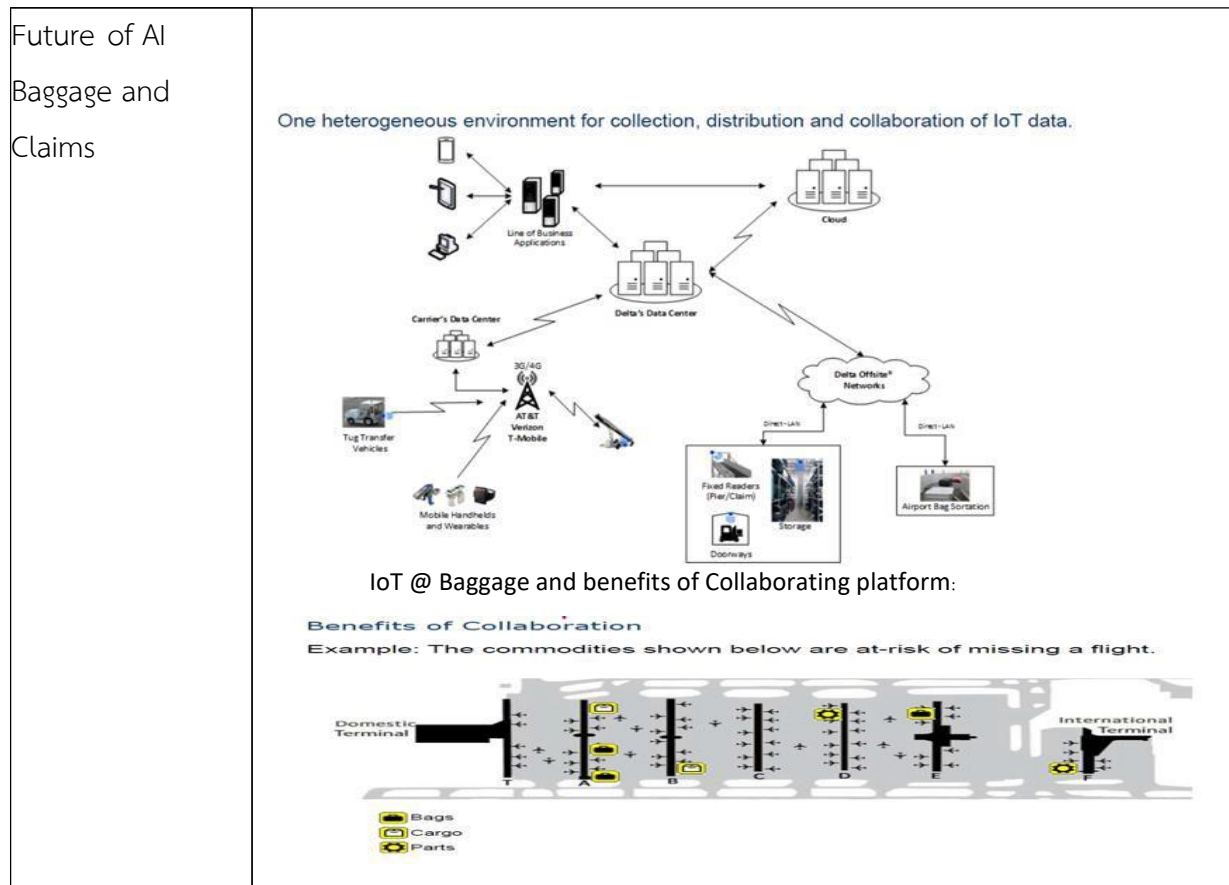
Conclusion

All organizations are now in the phase of unlearning their traditional ways of doing the business and relearning the tools and techniques towards business enablement. One of the business enablers is "Digital Transformation. From doing agile to being agile, from tracking devices to connecting devices, from managing the environments to automating the environments, incorporating intelligence in everything we do is the new mantra of success. Digital transformation is a multi-step and multi-year process. The travel industry can hugely benefit from being agile to performing agile which also include complete transformation of the business and aligning with IT. Tools, techniques, processes, people all need to undergo change to be transformed. We can use IOT, Block chain, Data science, Dev Ops, Automation and AI to achieve digital transformation. The data is collected, algorithms are built, and systems are to be well trained to implement the above solutions. We can always do in iterative method.

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