AIRBUS CORPORATE CONSULTING: PREDICTIVE ANALYTICS IN GLOBAL MOBILITIES

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AIRBUS CORPORATE CONSULTING: PREDICTIVE ANALYTICS IN GLOBAL MOBILITIES

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ABSTRACT

As technologies keep evolving over time, they allow the development of new businesses and provide great improvements in existing businesses. Emerging technologies help organizations to act better and become one of the keys to success for businesses. Recently, predictive analytics became a trend which has an increasing influence in the business world. With the power to predict with precision, it could optimize the process and provide advantages to the organization who can utilize it. Airbus is aware of the importance of predictive analytics and would like to initiate the research with the Airbus global mobility team. The predictive analytics could help Airbus on the expatriation assignments regarding the finding of the right candidates, success of assignments, and the possible financial return. The objectives of this study are to explore the useful predictive analytics from academic research, theories, and concepts to use with global mobility, benchmark the existing predictive analytics tools in the market along with exploring the implementation use case from other companies, and to provide recommendations of the possibilities to use predictive analytics to enhance Airbus global mobility. This research explored some interesting factors and possibilities within global mobility which Airbus may want to consider upon implementing the predictive analytics. With the internal analysis using SWOT and listing all existing global mobility resources, Airbus could use the strength and the advantage of existing resources to drive the predictive analytics and data collection forward and at the same time, aware of the weakness and threats that may hinder the implementation. From the exploration, many well-known companies started using

predictive analytics to enhance their human resource operation and financial analysis within their firms. There are also numerous tools capable of predictive analytics available in the market, however, only a few companies started to use it in the global mobility field. Airbus could use this research as a reference point to conduct further research on combining predictive analytics with global mobility. Starting now, Airbus could be the leading company to implement predictive analytics with global mobility.

KEY WORDS: Predictive Analytics/ Global Mobility/ Expatriation Assignments/ Predictive Analytics with Global Mobility/ Airbus

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CHAPTER I
INTRODUCTION

1.1 Background

Airbus was originally formed as a consortium among France (Sud Aviation), Germany (Arge Airbus), and United Kingdom (Hawker Siddeley Aviation). The main goal of the collaboration was to develop short-medium range, high-capacity airliners to fill in a market niche. Airbus, as a commercial aircraft manufacturer along with Helicopters as well as Space and Defense Divisions, is the largest European company and a worldwide leader in aeronautics and space with around 130,000 current employees working on different sites throughout the world (Airbus, n.d.). Operating on an international level, Airbus also has numerous collaborations with suppliers and companies globally.

In the modern business world, especially in Europe, companies start to adopt the ideas of using the advanced technologies which are Internet of Things, automation, and digitalization to incorporate with the business activities (Grant, 2018). This concept is called the fourth industrial revolution or Industry 4.0 originated in 2011 from German government as a part of high-tech strategy project. The Industry 4.0 has been used to improve business performance and optimize the business processes in many large companies including Airbus. (Silva, 2019) Airbus, as a pioneer in the aerospace sector, has been proactively working on digital transformation within the company. Airbus has several projects dedicated to studying the opportunities and seeking possible future implementation in different departments.

With the Industry 4.0 trend, data has become a powerful asset for business. The data analytics has been fully integrated with the business management providing beneficial insights for industry to proactively react to the changes. In addition to providing meaningful insights, data could also be used with artificial intelligence to come up with predictions of the possible courses of the future, allowing the company to be proactive and prepare for the possibilities. For instance, in sales and supply chain,

predictive analytics can be especially useful for forecasting performances and optimizing allocation of resources. Predictive analytics can simulate and calculate the costs and resources needed and come up with the return to facilitate the decision-making processes.

Global Mobility, in the area of management theories, refers to the mobility of white-collar or skilled workers and professionals for the purpose of expanding or transferring knowledge at an international level (Selmer & Lauring, 2015). The concept includes the transfer of individuals globally ranging from traditional expatriates and partners to more recently recognized groups, for example, self-initiated expatriates and international business travelers. The concept of global mobility existed for several decades (Bhaskar-Shrinivas, Harrison, Shaffer, & Luk, 2005), thus it has gained attention and prominence in recent years as business grows internationally and more people are free to move and work worldwide. With an increasing exposure to a larger audience of the concept of global mobility and related management research, global mobility has become a widely recognized domain of academic research. In 2013, the Journal of Global Mobility: The home of expatriate management research (Emerald) launched as an academic research journal specializing in the field of Global Mobility and related topics.

For an international company with a large number of employees like Airbus, global mobility has a more prominent role in the expansion of the firm. However, there are challenges that come with the expansion into different countries regarding the fit of candidates, the expected issues on assignments, return of investment from the project, and security and compliance of assignees. Despite the importance, the predictive analytics in the global mobility field is still less developed. According to a report from Global Mobility Executive (2020), only 3% of the respondents have implemented Virtual Reality and Artificial Intelligence technology in their activity despite 92% of them placing automation of processes as their first priority. Airbus also reflects the same concern as their counterparts. Therefore, global mobility department of Airbus willing to conduct research to find predictive analytics tools and solutions to support their operations from selecting candidates, calculate the expected benefit, and predict the possibilities of any issues that might obstruct the project.

This research will focus on the study of possibilities on using predictive analytics for assisting global mobilities to tackle the challenges and pain points in relation to expatriation assignments Airbus is now facing. The aim of the study is to gather information which helps Airbus global mobility team to explore and make decisions on the direction of incorporation of the predictive analytics with the global mobility business activities. The main models and algorithms of predictive analytics based on historical data from expatriation assignments will be presented, as well as the use cases on the use of predictive analytics across different industries including the in-depth research of tools and solutions from global mobility specialized service providers. The result from this research will lead to recommendations and possibilities of future implementation and changes the global mobility team may need to adopt in order to maximize the potential benefits from the possible solutions of predictive analytics.

1.2 Problem Statement

As Airbus expands its operations to different parts of the world, global mobility has become an increasingly crucial component of its growth. However, managing global mobility is complex and expensive with many challenges ranging from selecting the right candidates for international assignments to ensuring the compliance with local laws and regulations and the impact of personal aspects that could affect with the assignments. Airbus needs to make decisions about where to assign employees, how to manage international assignments, and how to mitigate the risks associated with global mobility while also considering personal factors of the candidates. Without access to accurate and reliable data, Airbus struggles to effectively manage the global workforce resulting in negative outcomes for the business.

Predictive analytics has the potential to help Airbus address these challenges by providing insights into predicting employee behavior, preference, and performance. By leveraging historical data and other relevant information, Airbus could gain accurate prediction to support the decision making with high precision and efficiency on many aspects such as identifying the high-potential employees for proper candidates for international assignments, forecasting costs associated with the programs, and mitigating the risks related to compliance and security.

As Airbus had no clear idea on the use of predictive analytics on global mobility, the challenge for Airbus to implement predictive analytics is the limited understanding and information on the application of predictive analytics in the field. Airbus would be one of the early implementors of the technology in this specific field and that requires a lot of study and research to ensure the success of the implementation as there are only a small number of example cases to use as references. A clear requirement and understanding are crucial, Airbus need to set a practical scope to go further on the steps to integrate the technology with the existing system.

1.3 Research Objectives

There are three objectives in this research to identify the suitable recommendations and propose appropriate solutions for Airbus using predictive analytics to incorporate and facilitate the digital transformation of global mobility activities. The objectives are listed as follows.

1. To explore predictive analytics academic research, theories, and concepts to find appropriate models and algorithms that can be useful for global mobility.

2. To benchmark the existing predictive analytics tools in the market and use case of the implementation of predictive analytics in global mobility in different industries.

3. To provide recommendations on the possible predictive analytics tools and solutions Airbus could use to enhance global mobility within the company.

1.4 Research Scope

The consulting internship project is a cooperation project between Toulouse School of Management with Airbus as a part of Master of International Management program. The consulting project was conducted at the location of Airbus Headquarters in Toulouse, France with the team working with the global mobility department located in Blagnac. The project includes the study on academic research on predictive analytics and global mobility featuring four case studies four companies: Continental, Panasonic, eBay, and Unilever as they are using predictive analytics to incorporate with business

activities. The project also includes an in-depth review of five potential service providers: Equus Software, Visier, Oracle, HR Forecast, and Tableau who provide potential tools and solutions on predictive analytics and global mobility.

CHAPTER II
LITERATURE REVIEW

Airbus Global Mobility team is responsible for managing the assignments or transfers of employees across borders from one location to another. The global mobility team covers the business needs, policies, set up of the assignments, and follow up with candidates or expatriates during and after the assignments. With globalization and digitalization, predictive analytics has more influence in the Global Mobility field, and it is believed to be the basis for the future of global mobility tools. Therefore, this chapter is divided into two sections.

2.1 Global Mobility

2.2 Predictive Analytics

2.2.1 Regression model

2.2.2 Classification model

2.1 Global Mobility

Global mobility in the context of firms' development and business management is one of the well-covered topics in academic research. Axes of research are diverse and can range from the cross-cultural impact on expatriates to current trends of global mobility. There is a consensus that expatriation success or outcome can be predicted or influenced by specific variables.

As in an article of a meta-analytical review of empirical studies on the prediction of expatriate performance through several factors (Mol, Born, Willemsen & Van der Molen, 2005). The study has analyzed the factors contributing to success in expatriation. From the study, the factors which are significant for the success of the expatriation include extraversion, emotional stability, agreeableness, conscientiousness, and openness. It also aligns with the study by Paula M.C. (2006) which shows the correlation between the five personalities with the success of the expatriation.

In addition, another study from International HR Adviser magazine Summer 2015 emphasized the importance of accurate data gathering as a starting point to perform meaningful analytics. Some examples of data sources required to perform the analytics are the demographic data, compensation data, performance data, role definition and requirement, employee skills, qualifications and experience, business plan, etc. The data analytics could be used for aligning the mobility and talent of the assignees with the assignments.

EY has also published an article on the future of mobility stating that the use of data gives organizations the opportunity to measure the success of an assignment, or the return on investment (ROI), by taking into account all aspects of the assignment and mobility function: costs analysis, retention, performance, sustainability, D&I, succession planning, etc. With the right data, the business can see the overall impact on the organization and make fact-based decisions. To sum it up, data analytics in the mobility function enhances transparency, facilitates strategic decision-making process and optimizes opportunities (Docherty, H., 2021). However, the challenge resides in finding the right methods to accurately assess those parameters. McNulty & De Cieri (2011) propose in their research paper a framework to calculate expatriate's ROI, combining financial and non-financial costs. This model takes into consideration multiple internal and external factors and enables the valuation of an international long-term assignment on an individual and organizational level.

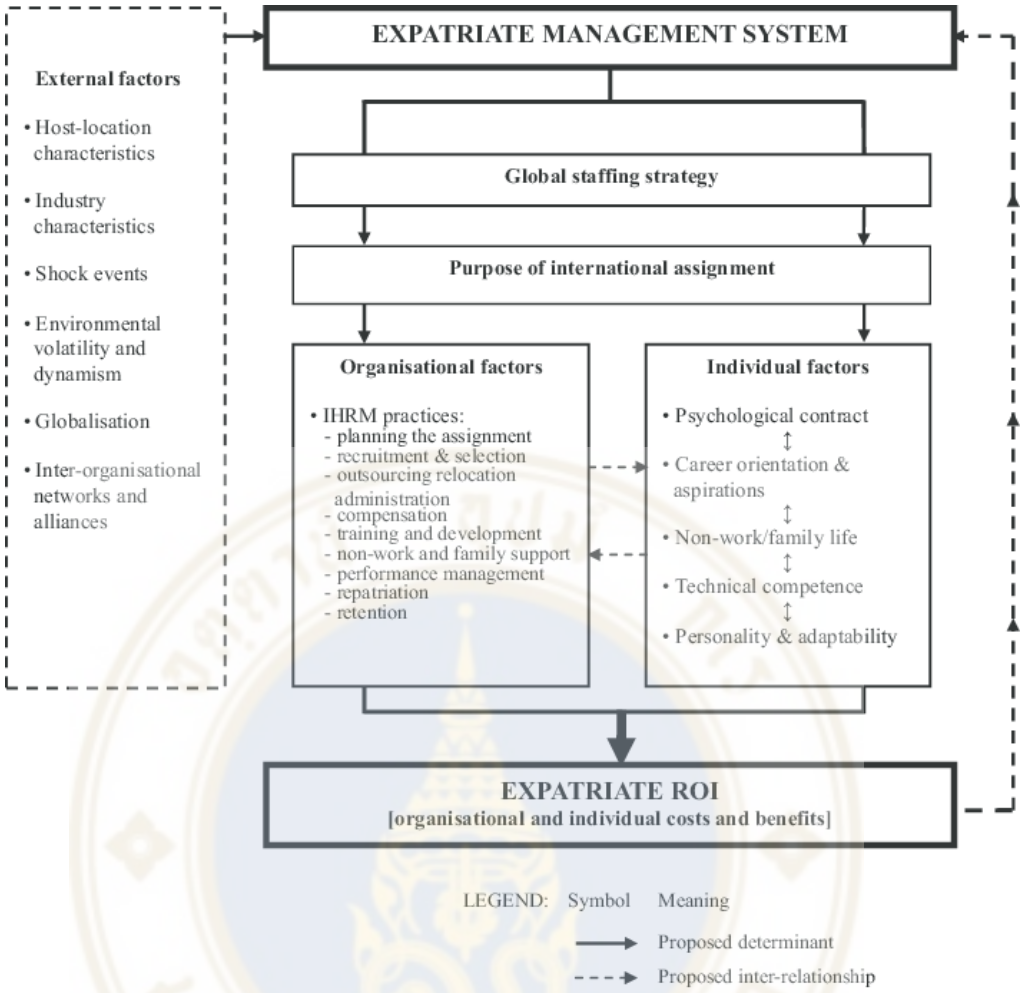

Figure 2.1 Expatriate Management Model

Source: Global Mobility in the 21st Century: Conceptualising Expatriate Return on Investment in Global Firms - Scientific Figure on ResearchGate.

As for non-financial factors, expatriates' personalities, can influence the result of the assignments, these factors may be useful to include in predictive analytics, however, the challenge is in the measurement of these intangible value which is hard to evaluate. There are also other non-financial factors, for example, the effect on the culture of different parts of the world which could also affect the course of actions and decision of the assignees which may deviate from the norm.

2.2 Predictive Analytics

Progress and advancement of the data analytical field are regularly recorded in academic research and journals. Tools and techniques of data analytics are omnipresent in the methodology of research papers. The branch of predictive analytics encompasses many techniques from statistical models to probabilistic models, and machine learning (lepeniotia, K., Bousdekisa, A., Apostoloua, D., Mentzas, G., 2020). The choice of the models will depend on the area of research and the desired result. In people analytics, two types of predictive analytics are more relevant: the classification method and the regression model.

2.2.1 Regression Model

The regression model is a commonly used technique for forecasting. Oftentimes using time series, the models can predict numerical values depending on one or multiple dependent variables from the input. In the case of a linear relationship between variables, linear regression will be used. On the contrary, non-linear relationships make use of polynomial regression.

Those methods are often used in sales to predict sell-out performances; variables can include weight of the account and promotion (Market Research Company New York., n.d.). In education, Liz-Domínguez, M., Caeiro-Rodríguez, M., Llamas-Nistal, M. & Mikic-Fonte, F. A., (2019) make light of the use of regression models to try and predict students' grades. However, the results were sometimes inaccurate. Regression indeed requires extensive research work to determine the relevant factors and their weight on the output. Using qualitative indicators rather than quantitative indicators will naturally hinder the accuracy of the algorithm.

One application of regression model is to predict the frequency of changing location between two places. It is used to find the key factors from the socio-economic variables which correlate with the mobility (Munz, M., Reiner, R., 1988). Another application is the use of regression to predict the internal mobility success within the firm. The regression model is used to calculate and determine the possibility and predict the success of internal mobility based on the historical data of the previous mobilities (Bossi et al., 2022). Other study (Lin et al., 2021) shows the use of regression to determine the factors that influences the relocation of a company in China. The

regression model is used to formulate the empirical structures using to indicate the robustness and fitness indicators influencing the decision to relocate the companies in China.

In the study (Eti, Serkan & İnel, Mehmet., 2016), the regression model is used to explain and predict the profitability with the historical financial data. Multiple linear regression and logistic regression are used in this study. The result of the study shows that the two methods provide different results that are the logistic regression can explain the profitability situation of the company while the multiple linear regression can explain the change in return on assets. From another recent research (Uttrani, Shashank & Nanta[1], Bharti & Sharma, Neha & Dutt, Varun., 2022), the primary objective of the study is to predict the trend under the influence of COVID-19 pandemic and socio-economic factors on global mobility worldwide and develop a regression model to predict future impact. The dataset of global mobility is combined with the COVID-19 cases from April 1, 2020, to May 31, 2021. The result of this study is the regression model which is now used as a basis on the prediction of global mobility in relation with COVID-19 impact use on further studies and also applied to some existing tools as predictive functions.

2.2.2 Classification Model

Classification is a method whose results will not be numeral. Indeed, the algorithm will determine and outcome to an input. This method is used in areas where it is necessary or difficult to have numerical results. Liz-Domínguez, Caeiro-Rodríguez, Llamas-Nistal & A. Mikic-Fonte (2019)'s research paper indicates the prevalence of this method in education. The algorithm studied in the paper enables school organizations to predict the success or failure of a student in a specific program. Data input includes academic and environmental factors. Past students' group performances will be used to gauge a program's difficulty, whereas time spent on a learning website will indicate the commitment of the student. The algorithm will then be able to predict failure or success and enable preventive measures. This model is used in the context of an Early Warning System (EWS); the goal is to monitor students in a continuous way with real-time data and flag signals of failure.

Early Warning System (EWS) has originally been developed to assess natural risks and optimize response to catastrophes. The United Nations has, for example, developed an EWS for famine. Such a system can be adapted to other contexts. Apart from students' failures, Rød, E. G., Gåsste, T., Hegre, H., (2023) have focused their research on geo-political conflict prediction.

In an area closer to Global Mobility, research papers have been conducted using classification models to measure the effectiveness of training. Indeed, according to Raghavendra & Nijaguna (2014) the study uses the characteristics of expatriates to see the relationship between those factors and cross-cultural training. Predictive analytics is utilized as a tool to research the outcome of the study with 4 factors: Readiness to learn, Aesthetic Learning environment, Openness to new experiences, Intellectual Capacity. The result of the study shows that cross-cultural training can encourage readiness to learn and openness to new experiences of the candidates while having a little effect on the aesthetic learning environment and intellectual capacity of candidates.

Predictive analytics sometimes intertwine with automation technology. The use of automation can be beneficial within the domain. The study of Uppin (2017) uses the factor analysis to seek out for the benefit of automation in HR. The result is that HR automation has influences on people, organizations, and societies. The research emphasized the use of automation to help increase the productivity of employees by reducing the repetitive work and making the administration simple. The automation in the information provides autonomy to employees at work. The study also shows that the process automation will make people more virtual and can improve the organization work culture by decreasing the decision-making time and maximizing the benefit from factors including employee motivation, satisfaction, productivity, and time.

In the study of Lama, D., & Mishra, S. (2017), predictive analytics is used in HR decision model over the years. Starting from data collection to identify the suitable case to use, the process takes a large amount of data as a source to conduct predictions. Then, applying the data mining techniques can help with the precision in processing the data. The data mining in the HR can be used for;

1. Employee recruitment (Personnel Selection)
2. Talent management

3. Employee Turnover Analysis

After the process, the generated insights needed to be recorded to prepare for predictions. The result of the prediction is then used as a foundation for the decision making in the HR processes. In this study there are 5 predictive analytics mentioned;

1. Employee Fight Risk Prediction by HP
2. A report from SAS institute
3. Oracle Fusion Workforce Predictions
4. Attrition Risk Prediction from PricewaterhouseCoopers Human Resource System (PWC-HRS)
5. A white Paper from Tata Consultancy Services

CHAPTER III
RESEARCH METHODOLOGY

The research methodology and data collection used in this study are explained through this chapter consisting of Problem Definition, Framework Development, Data Collection, Developing Tools, and Analysis.

3.1 Research Design

The multinational research team was specifically formed by Toulouse School of Management (TSM) to conduct research involving four members. The members consist of Abiola Olaibi who was originally came from Nigeria and had a working experience in the US, Kim-Ngan Ke, a Vietnamese born in France, Marie Amaglo from Belgium, and Krisanapong Eiumtrakul from Thailand. The group members are shown in figure 3.1, from left to right: Krisanapong, Kim, Marie, and Abiola. The research was also conducted with advisory support from TSM tutor, Jana Herbig, a Ph.D. student from Germany. The Toulouse School of Management team had a discussion with Airbus to discuss the concept used in the research regarding the definition and scope of global mobility, predictive analysis, automation, and integration of technologies to use with global mobility. The consulting internship with Airbus had been ongoing for two months from January 3, 2023, to March 3, 2023. in Toulouse, France. The TSM team had a weekly meeting with Airbus whether on-site at the Airbus Blangnac campus or online via google meeting. Also, the internal meeting was held on a regular basis throughout the project. The details and all the stages of the research of this study are as follows.

Figure 3.1 The TSM consulting project team

3.1.1 Problem Definition

The TSM team had received the problem topic of "What are the possibilities in using predictive analytics for global mobility?", proposed by the collaboration between the Toulouse School of Management and Airbus global mobility team. Prior to the meeting with Airbus, the TSM tutor had a short briefing on the project requirement. Then, the TSM team had a meeting with the regional head of global mobility and manager of the human resource management department to discuss the overview along with the details on the requirements of the project. The main goal is to assess the readiness of Airbus global mobility team to apply predictive analytics within the process and find possibilities of the tools or ideas available for Airbus to adopt it.

The desired deliverables the Airbus team requested were the benchmarking of the predictive analytics used with global mobility compared with other companies.

The benchmarking was aimed for Airbus to know the position and status to plan their move in the future. Another deliverable is the possibilities of tools or ideas which have potential to be applied within Airbus, the global mobility team wanted to know what is out there in the market and used the project as reference information on their future projects.

3.1.2 Framework Development

In order to understand Airbus' situation and find a relevant case study for benchmarking, TSM team decided to start with internal analysis for current situation and apply them to find the possibilities for predictive analytics and automation. Following numerous reviews and discussions, Airbus decided to scope the findings to elements which are applicable to global mobility which also include the HR and payroll operation with the focus on the tools or applicable concepts of the big five personalities as the predictive analytics on these elements are more challenging and Airbus would like to know more. As there are not many solutions and direct studies on the use of predictive data and automation on the global mobility, Airbus decided to include a potential case from other field, however, Airbus would like to focus on what is beneficial from the case and chose to ignore the topics that may not be related, for example, the predictive analytics and automation used in operation and supplier department may show the possibility of using the tools to predict the operation activities, but only the applicable and relevant to HR process like cost estimation will be extracted to be used in this study. The prediction for irrelevant processes like optimization of supply chain will be ignored.

3.1.3 Data Collection

The information are gathered from various sources, through an academic studies, contact the service providers, and secondary sources such as online articles and public data which are provided online. The academic research used for this study are gathered from online sources, TSM supported library, and some are retrieved from the service provider. TSM team tried to funnel down the papers to cover the topic interested by Airbus Global Mobility team focusing the relevant global mobility topic especially the big five personalities type and interesting topic on predictive analytics and

automation that are applicable with global mobility. For case studies and the tools and solutions details, these information are retrieved through online channel and direct contact to the service providers in the market. The case studies came from the company websites and articles published by the company, while the tools and solutions details are mostly published from service provider. TSM team were aware of the potential bias due to the perspective of the publisher, therefore, the team tried to find the story from every party possible to ensure the precision of the data. Throughout the project, the TSM team had frequent updates and feedback with Airbus Global Mobility team to ensure the information were relevant to the needs of the team.

3.1.4 Developing Tools

From multiple discussions and feedback sessions between TSM and Airbus, TSM team came up with "the predictive analytics and automation uses in companies" table as the first tool for exploring the readiness of using predictive analytics and automations in the field of HR and Global Mobility. The table contains the company researched through the case studies and their information are listed according to the use of the predictive analytics and automation within their HR or global mobility team.

Another table is created to benchmark the tools and solutions provided by the service providers. With the TSM team closely worked with Airbus Global Mobility team, each tools or solutions are scored based on the agreed criteria: (1) large data handling capacity; (2) faster or better proof of concept (viability); (3) high innovative capacity of the vendor; (4) fast query performance; (5) ease of use for report designers and recipients; (6) flexibility of the software; (7) variety deployment option; (8) availability of local support (European servers); (9) predefined data connection; (10) compatibility with G-suite. Each criterion has a level to reflect the compatibility with Airbus requirements.

3.1.5 Analysis

The TSM team conducted the predictive analytics and automation table analysis based on the case studies which could be found online, therefore, there are some limitations on the financial insights from the companies in the case studies. The 4 companies used are Continental group, Panasonic, eBay, and Unilever. The public

information published online such as number of employees and reputation were used to infer the financial performance. For the tools and solutions table, the information provided online were used in combination with the data gathered directly from the service provider companies who are the developers of the predictive analytics tools used in this research. The service providers the team used for information gathering for this study are (1) Equus, (2) Visier, (3) Oracle, (4) HR Forecast, and (5) Tableau. However, with the time limitation, some technological insights from some company may not be disclosed from the service providers. Therefore, TSM team worked with Airbus Global Mobility team to analyze and rank the gathered information in accordance with the criteria to see the potential use with Airbus.

CHAPTER IV
FINDINGS AND ANALYSIS

This chapter, the results from the data collection, analysis and brainstorming of this research are presented as followed.

1. Explore the predictive analytics for Airbus global mobility
2. Predictive analytics and automation on Global Mobility Area in different industries: Case study
3. Introduction of the tools and solutions for Airbus
4. Data Summary and recommendations to Airbus
5. Future possibilities on predictive analytics

4.1 Explore the predictive analytics for Airbus global mobility

To start analyzing the readiness for Airbus, the TSM team decided to start with the internal analysis of the Airbus global mobility team. The analysis was aimed at identifying the position and the strong and weak point of Airbus global mobility team. In this project, the TSM team had agreed upon using SWOT analysis to determine the strength and weakness and then brainstorming to list all the resources that the global mobility team had to use as a foundation for recommendations that the team had presented to Airbus team.

4.1.1 SWOT Analysis

TSM team had discussed with Airbus on gathering the team process and the data the team had kept record. The final result from SWOT analysis can be seen in table 4.1.

Table 4.1 SWOT Analysis

Strengths	Weaknesses
• High employee assignment satisfaction with the team • A lot of guidance from the team during expatriation mission • Good relationship and feedback from assignees	• Incomplete non-financial data on global mobility • Lack of data on employee personality
Opportunities	**Threats**
• Using predictive data and automation to improve efficiency of expatriation mission	• Personal behavior of expatriates is hard to measure and predict • Instability in particular region of the world

From the SWOT analysis, the strengths of the Airbus global mobility team are mostly lean toward the team and assignee relationship which could be useful on the data collection which in this case could help to mitigate the weakness, however, the global mobility team need to pay more attention and need the tool to help collecting the missing data effectively.

4.1.2 Listing of existing resources

The Airbus global mobility team had been sending and managing the expatriates for a long time. The team had a large pool of data regarding the assignments and had some tools in place to collect data using with the assignment management. TSM team had meetings to extract all the resources that Airbus had to see if it can be useful for choosing or implementing the tools. The resources that TSM team had retrieved are listed below.

1. Large global mobility assignments data pool to use as a basis for predictive analytics.
2. Ability to adjust the policy and handle local restraints.
3. Numerous unique cases based on historical assignments.
4. Large number of partners with good relationships.

With the resources mentioned, Airbus global mobility team can gain advantage from using the existing data to start the predictive analytics without waiting

for data collection as some of them may have already been collected and with good relationships, Airbus has the opportunity to gain more insights and information from the collaboration with partners.

From the SWOT analysis and resources that Airbus holds, Airbus has the potential to use predictive analytics based on the existing global mobility data to calculate the prediction of return on assignments, the success probability of candidates. Airbus has the advantage of the large historical data pool of the assignments over the years with large variety of assignment types worldwide which can be used for wide spectrum of predictions. The ideal model for calculating the financial aspect will be the regression model and for non-numerical model the classification model of predictive analytics will be the best fit. Using both of the models along with a large data, Airbus can predict with a higher accuracy provide the best possible results.

4.2 Predictive Analytics and Automation on Global Mobility Area in different industries: Case study

In this part, TSM team had contacted service providers and researched online to see the use of predictive analytics and automation in companies in HR and Global Mobility in different industries. In this study, 4 case studies were selected for analysis. The 4 cases are: (1) Continental Group; (2) Panasonic; (3) eBay; (4) Unilever.

4.2.1 Continental Group

Continental AG is a technology company offering products and services in the automotive industry. The organization has 243,000 employees spread across 61 countries with the key focus areas on safety, information, environment, and affordable mobility.

Continental's global mobility team assists 1,700 employees worldwide. However, they did not have a formal global mobility management system or centralized organizational structure. As a result, the team struggled to provide support to the growing expatriate population. This caused the global mobility team to lose hours of time manually calculating cost projections and collection balance sheets and assignment agreements every week.

The inability to virtually report their global assignment costs left stakeholders in the dark. Yet, another shortcoming was that global employees did not have access to real-time data, which made the assignment more prone to failure.

The company then made the decision to convert their balance sheet data to the AssignmentPro (by Equus) platform, which was complex at first. Since Continental used to work with an individual spreadsheet per assignee in Excel before. Now, all this data had to be converted to the new program tool. Which was a huge amount of work. Therefore, Equus developed a way to manipulate the data and organize the information in a way that could be easily implemented in the tool. Anna Potter, Head of Americas International Mobility stated, *"Equus understood that our implementation budget was very tight and worked with the Continental team closely to come up with creative solutions to use existing resources."*

By integrating assignee data and business processes to AssignmentPro, Continental's efficiency, data insights, automation and productivity increased significantly. They were able to implement the master data and balance sheets which enabled the switch to a regional support model. The tool provides Continental to access the predictive analytics on financial aspects using for forecasting the return of the assignments.

Anna Porter added, *"When an assignment is initiated, the relevant service orders for global vendors can now be automatically triggered and sent to the appropriate vendor securely, eliminating forms being sent and tracked via email and keyed into the vendor systems. This improves our compliance with data protection requirements, tracking ability and reduces processing time that ultimately allows us to provide the best possible service to our global employees."*

By using automation processes and integrating the global mobility network with Equus Ecosystem, Continental achieved the following; data-driven insights which enable total cost reporting and year-over-year comparison, dramatic increase in global reporting and monitoring capabilities empowering stakeholders with real-time dashboards within AssignmentPro, stronger relationships with key vendors, helping to deliver services better and faster, streamlined service ordering process and access to real-time status information from global vendors, helping to: eliminate data re-keying, standardize the flow of information, track initiation data (date sent, received, services

ordered), securely transmit data, save time chasing status information, share information within HR and Employee portal (Equus Software., n.d.a).

4.2.2 Panasonic

The customer story of Panasonic explores the usage of data analytics to assist in Human Resources Management. For the background, Panasonic is a leading manufacturing company with over 23,000 employees with over 1,500 expatriates all over the world. The headquarters are situated in Newark, New Jersey.

The challenge for Panasonic is eliminating the manual process and predictive analytics integrating HR insights with strategy. The aim for eliminating the manual process is seeking a faster wat to get more accurate insights which could help drive the HR strategy and show the impact on the business overall. Panasonic's HR team combined business and people data to streamline internal processes, gain impactful insights, and transition into a mission-critical role. The data predictive analytics help in decision making about business, predict actions of workforces, and ensure better customer experience. After Panasonic implementing the tools, Panasonic gain a better data architecture with a structured data collection and classification, faster insights from artificial intelligence allowing better predictive analytics, less manual analysis from the automation, and deeper conversations among the team.

For the outcome, the HR team becomes a valuable contributor to the business strategy by providing powerful insights which could help drive the business decisions. The insights also drive the strategy in the overall business by increasing productivity in a hybrid model, reduced two-week projects to 30-minute chats, and empowered HR to inform business strategy.

4.2.3 eBay

eBay has been using data analytics in Human Resources Management to empower the leaders to make data-driven decisions that improve the employee experience. With more than 11,000 employees around the globe, eBay is one of the biggest firms in the world.

eBay is using insights gathered aiming to increase the retention of the existing employees focusing on the employee experiences. The insights enable the HR

team to make data-driven decisions that improve the employee experience and benefit the company as a whole. Predictive analytics helps eBay to analyze a better action to retain its employees. It is a key to understanding what is important for employees and allow HR to help.

The key outcomes from using the tool are the increased access to HR insights, HR can use data to drive business decisions with the predictive analytics result are meaningful to retain employees with the firm, and HR acquire the access to centralized data which can be used for deeper insights and conversation that save a lot of time for the team. By integrating assignee data and business processes to the use of predictive analytics tool, eBay's efficiency, data insights, automation and productivity increased significantly. They were able to implement the master data and balance sheets which enabled the switch to a regional support model.

4.2.4 Unilever

Unilever is one of the largest global consumer goods companies with an overall number of employees of more than 150,000 employees worldwide. They own more than 400 brands under the company, available in more than 190 countries.

Unilever's reconciliation and payroll processes were all conducted manually, relying on emails between payroll, mobility, assignees, and vendors. This made the process not only time-consuming, but also vulnerable to human error. This poses a great risk to a large company like Unilever as one small error could jeopardize the whole operation and can deal considerable damage to the firm.

Unilever managed to streamline part of their tax reconciliation and payroll processes by using predictive analytics and automation tools. For this, they chose Equus' Business Rules feature. The new process is based on Quick Workflows, which covers complex conditions such as assignment length, policy type, tax reconciliation, income levels and payroll dates at different locations. The system can also make predictions with predictive analytics on factors or risks and provide recommendations to work on. The results are a higher level of user-friendliness for the employees, making new calculations becomes faster and easier, more than 200 working hours were saved annually by using the Business Rules tool to predict and ensure the precision of the system.

4.3 Introduction of the tools and solutions for Airbus

In order to provide recommendations, the TSM team had come up with benchmarking criteria. The benchmarking criteria are selected for comparing the existing tools and solutions in predictive analytics.

The criteria used in this study are as follows.

1. Large data handling capacity
2. Faster proof of concept and implementation
3. High innovative capacity of the vendor
4. Fast query performance
5. Ease of use for report designers and recipients
6. Flexibility of the software
7. Variety Deployment option
8. Availability of local support (European servers)
9. Predefined data connection
10. Compatibility with G-Suite

The TSM team discussed with Airbus global mobility and finalized the requirements which can be summarized with the criteria for considering the tools. In each criteria the team had classified the consideration with the details of each level below.

4.3.1 Criteria

4.3.1.1 Large data handling capacity

The tools or solutions will pass this criterion if it can handle more than 1,000 expatriate records. Since the number of expatriates within Airbus as of 2021 is approximately 750, it is expected that the number of expatriates will grow to reach 1,000 in a few more years and Airbus would like the system to be able to support those records.

4.3.1.2 Faster proof of concept and implementation

Airbus is looking for a faster system to implement, therefore, the tools or solutions will pass this criterion if the proof of concept or implementation can be completed within 3 months as a requirement from Airbus.

4.3.1.3 High innovative capacity of the vendor

Airbus needs the vendor to have the capacity to innovate the tools coming up with new ways or useful predictive functions. The system needs to update new innovative functions regularly to pass this criterion.

4.3.1.4 Fast query performance

Airbus needs a tool that can retrieve the queries or requests in a timely manner. The tools or solutions will pass the criterion if the query result performance does not take longer than 1 minute for a simple query and does not take too long for a big query.

4.3.1.5 Ease of use for report designers and recipients

The tools or solutions need reports that are easy to adjust and understand by the team and related personnel. As the reports need to be used by many teams across Airbus, one of the requirements is that the reports need to be adjusted to the needs of each viewer and the adjustment needs to be easy so that the team can edit to some degree.

4.3.1.6 Flexibility of the software

The tools need to be flexible for adjustment. As the requirement of Airbus can be changed over time, the software needs to be able to change with the support of the vendor to meet with requirement of Airbus. If the tool does not have the ability to change, it will not pass this criterion.

4.3.1.7 Variety deployment option

As Airbus has several existing systems in the organization, it needs the tools to be able to deploy in many options, it needs to support the on-premises, cloud-based, or hybrid as the system may be shifted in the future.

4.3.1.8 Availability of local support (European servers)

For the support, Airbus requires the service provider to have a team located in France or at least in Europe who will be able to support in time. Especially for any cloud-based solutions, the server needs to be located in Europe.

4.3.1.9 Predefined data connection

The tools or solutions need to have the ability to connect and be compatible with other systems and databases within Airbus. This is to ensure the interoperability of the selected tools with the existing systems as some of the data needed may be transferred from other systems for analysis.

4.3.1.10 Compatibility with G-Suite

As Airbus has a plan to use G-Suite tool, the requirement for the tools or solutions to be compatible with G-Suite need to be included for consideration. The tools or solutions require to be able to connect directly or service provider needs to find a solution to connect the tools with G-Suite with another workaround to pass the criterion.

4.3.2 Tools and solutions

4.3.2.1 Equus Software

Equus offers global workforce management solutions both for employees who travel regularly and workers that are being relocated. They attach great importance to the user-friendliness and end-to-end functionality of their tools. (Equus Software, 2022A)

WHO IS THE CUSTOMER? Some of the well-known customers of Equus software are Deloitte, IBM, Thompson Reuters, Continental, Cargill, Rolls Royce, Unilever.

The tool Equus provides is called AssignmentPro, a comprehensive global mobility platform for short-term and long-term assignments, permanent transfers, commuters, and project workers. It automates the mobility life cycle, which includes pre-authorization, compensation, taxes, repatriation, etc. Global project authorization

(GPA) enables to define details per project and to automate key projects. It also allows viewing the data insights at any time. (Equus Software, 2022B)

AssignmentPro has several features, but this case will focus on the 5 main features which relate to predictive analytics. Those features are (1) Pulse checks, (2) Airinc and Assignment Pro benchmark tool, (3) Time to post, (4) Disaster recovery, (5) Cost estimate and income calculation.

Pulse checks: Employee satisfaction can be measured in a quick and efficient way with Pulse. It is a tool that quickly measures Overall Happiness, Coordinator Ratings and Employee Feedback. This is done using a simple rating system, which also allows personal written feedback to be added. The information is then reported and put into a dashboard that is easily accessible. This allows the GM team to spot trends and improve the assignee experience. (Equus Software, 2023).

Figure 4.1 Pulse checks feature

Source: Equus software

Airinc and Assignment Pro benchmark tool: This tool allows you to benchmark your global mobility policies by comparing your business policies with market data. On the dashboard, assignees can complete a survey. After conducting this survey, you will be able to see whetheryour policies are below, at or above the market. Which allows you not only to benchmark your GM policies, but also to adjust them according to trends (Equus Software ,2023). As an illustration, the example below benchmarks a particular company's Hardship Policy.

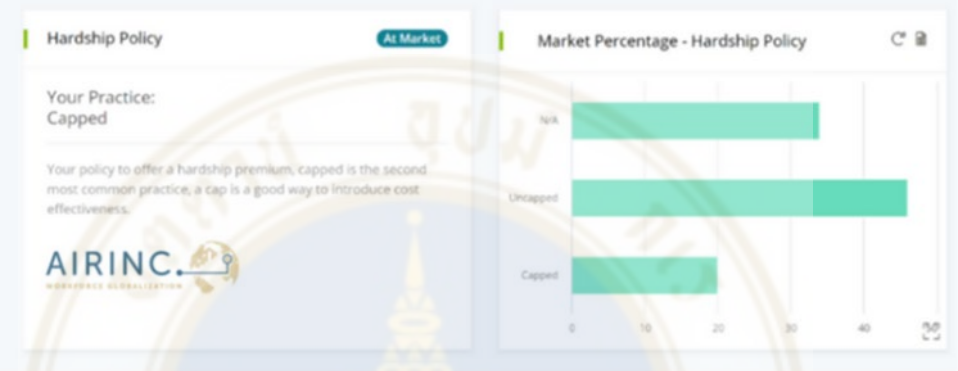

Figure 4.2 Airinc and Assignment Pro benchmark tool

Source: Equus software

Time to Post: The tool gives a prediction of how long it will take to post the assignee to their host location as well as a comparison with SLAs. (Equus Software, 2023)

Figure 4.3 Time to Post

Source: Equus software

Disaster Recovery: The disaster recovery tool allows you to capture the impact of a disaster and its affected workers. It displays what percentage of the population was hit as well as insights into the location of workers and their families. (Equus Software, 2023)

Cost Estimate and Income Calculation: Integrated Tax Engine, this tool is supported by over 150 authorities, in addition to tax and social security agreements and calculations are compatible with any third-party data provider.

The AssignmentPro tool supports two types of calculators: What If Cost Estimates (self-service tool designed for HR users), and Full Cost Estimates (functionality, designed for GM teams).

Upon discussing, the service provider has proposed a possible AssignmentPro usage workflow with Airbus and provide a workflow and a connection diagram to TSM team as can be seen in Figure 4.4 and Figure 4.5 below.

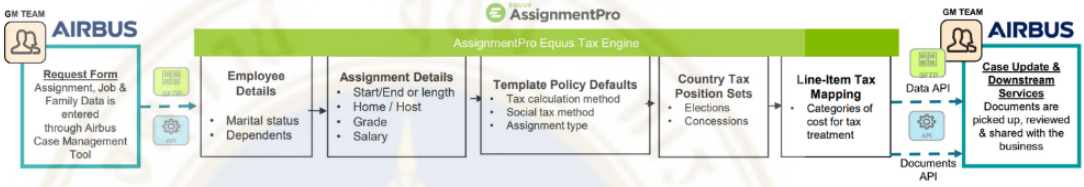

Figure 4.4 AssignmentPro workflow for Airbus

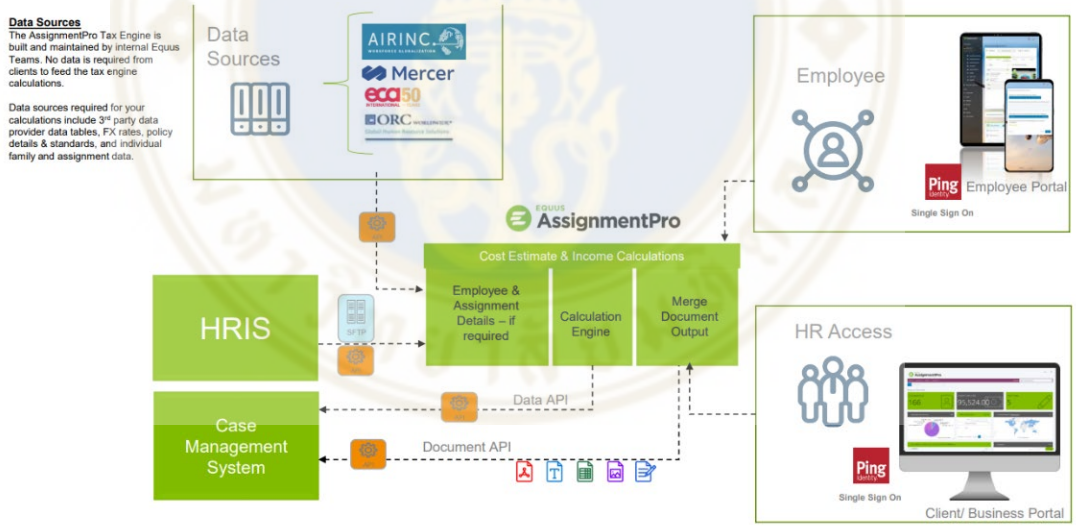

Figure 4.5 AssignmentPro connection diagram

Source: Equus software

4.3.2.2 Visier

Visier is a company providing analytics tools utilizing data to generate insights for assisting decision making in Human Resource Management. The main goal

of the company is to help companies analyze their data with tools that are easy to use and provide accurate insights concurrently. Visier is in a global market with 7 office locations in Vancouver, Toronto, Berlin, Paris, Singapore, London, and Raleigh. The company has more than 600 employees and currently continues to expand globally. The main vision of the company is to reveal the human truth.

WHO IS THE CUSTOMER? Famous customers of Visier are Panasonic, Kohler, Experian, Electronic Arts, eBay, Ford, Loreal.

There are two features which will be focused on this case which are Visier People and Visier People Cloud. The main functions between the two do not differ much, however, the cloud solution is more flexible with the service provided on cloud, but the on-premises version will gain the benefit of a more secure environment.

Visier People is a tool using data to help generate critical information regarding Human Resource Management. As an Artificial Intelligence-powered tool, the tool can generate useful insights and predictions on core questions within Human Resource Management, for example, people risk of exit, career journey insights, etc. Visier People can provide consolidated sources of information gathered across its customers to be used in addition to internal data. The customers also have an opportunity to purchase external data from Visier's partner to be included in the data for generating insights across the industry.

Some of the useful analytics the tools can provide are;

1. People Analytics
2. Talent Retention
3. Talent Acquisition Insights
4. Learning Analytics
5. Workforce Planning
6. Hourly Workforce Insights
7. Collaboration Analytics

Not only providing dedicated tools, Visier has created a people cloud which can act as an extension of the existing Human Resource Management system, enhancing the system to generate insights from them. Most of the functions in the Visier People Cloud are the same with Visier People, but it has the convenience of cloud architecture

which is that it is accessible anywhere and anytime, only the internet connection would be required.

4.3.2.3 Oracle

Oracle is a leading software development company providing cloud infrastructure, database management, application servers and virtualization software. The company prides itself on its Oracle Fusion Analytics products' ability to provide HR teams with insights to improve decision making. The product provides advanced analytics to help companies gain greater control over their hiring process, attrition, talent management, compensation, and mobility.

WHO IS THE CUSTOMER? The customers of Oracle contain lists of prestigious companies. They are Toyota, Xerox, Zeus, BMC, Emerson, World energy.

The Oracle fusion analytics provides different types of analytics. Most of them can customize the input to generate the outcome in accordance with the requirements. The analytics the tool can provide are as follows.

1. Job Mobility
2. Advanced Analytics
3. Talent Recruitment
4. Inclusion and diversity
5. Performance management
6. Talent Profile and Skills
7. Rotation and Retention

The product features are machine learning predictive analytics embedded, Powerful data model, over 100 KPIs, Fast implementation, no coding required, over 50 self-service connectors to various data sources, built in security, native integration with Oracle Cloud HCM, integrated data preparation and reports and continuous data visualization.

4.3.2.4 HR Forecast

HR Forecast is a European leader in predictive skills insights and strategic skill planning. The company provides people analytics solutions and sustainable HR

management tools using intelligent connected data to help companies make netter talent and business decisions.

WHO IS THE CUSTOMER? The customers of HR Forecast include Siemens, SAP, Continental, DB Bahn, T Deutsche Telekom, Stadwerke Dusseldorf.

The tool HR Forecase provides numerous useful functions and analytics which many large companies use for their predictions and analysis. The built-in functions and analytics the tool can provide are as follows.

1. Insight on future workforce demand and supply, future workforce gaps, hidden skills
2. Insights on skill evolution
3. Scenario modeling
4. Building future proof up and reskilling paths for employees
5. Linking business drivers to workforce demands
6. Creation of future job profile
7. Provides transparency on skill structure, labor market availability, competition and costs
8. Provides strategic skill management

While the tool provides a number of useful analytics, the tool also has a feature which suits the needs of well-known companies including the legal compliance and specialized experienced support team. The interesting features the tool can provide are as follows.

1. Automated business intelligence dashboards for Human Resources KPIs
2. Enterprise grade security
3. Data center provided by AWS in Germany
4. Data isolation policies and GDPR Compliance
5. HR Metrics Library
6. Time and people trends tracking and variance analysis
7. Utilization reporting

4.3.2.5 Tableau

Tableau is a company well known for data analytics. With the mission to help people see and understand data, the core business of Tableau revolves around data integration, analysis, and visualization. The company has been delivering data in many companies worldwide enabling customers to access data in an easier and simpler way.

WHO IS THE CUSTOMER? Tableau provides services to renowned companies which are WWF, Siemens, Experian, EDF, Tesco, Swisscom, Lufthansa.

The tool itself is a virtual analytics platform transforming data for people and organizations. It is the market-leading choice for modern business intelligence. The Tableau analytics platform makes it easier for people to explore and manage data, and faster to discover and share insights that can change businesses and the world. The platform helps enable people to see and understand data as it is designed to put the user first – whether they're an analyst, data scientist, student, teacher, executive, or business user. From connection through collaboration, Tableau is the most powerful, secure, and flexible end-to-end analytics platform (Tableau., n.d.).

In terms of predictive analytics, which is an interpretation of an organization's historical data to make predictions about the future, Tableau has the capabilities allowing the organization to use their data to conduct analytics on any aspects they wish. With today's predictive analytics techniques, the company can use Tableau to discover patterns in the data to identify upcoming risks and opportunities for an organization (Tableau., n.d.).

The advanced analytics, Tableau has an advanced analytics function that helps data analysts and scientists simplify their workflows and empower them to ask deeper questions of their data. The company can create their own customized dashboards to see the prediction from the data set they want. Tableau can leverage sophisticated calculations, with R and Python integrations, rapid cohort analysis, and predictive capabilities, data scientists can complete complex analyses in Tableau and easily share the visual results up to their needs (Tableau., n.d.).

4.4 Data Summary and recommendations to Airbus

This section illustrates the comparison of the companies from the case studies including Continental group, Panasonic, eBay, and Unilever. The data comparing each of the companies' use of predictive analytics are shown in Table 4.2.

Table 4.2 Predictive analytics from use case companies

Company	Size	Usage of predictive analytics	Result
Continental group	243,000 employees	Predictive analytics on financial aspects	Forecasting return from assignments, cost insights
Panasonic	23,000 employees	Structured data collection, Predictive analytics on HR insights	Powerful insights driving business decisions, increasing productivity
eBay	11,000 employees	Predictive analytics on HR insights focusing on retention	HR insights, higher employee retention rate
Unilever	150,000 employees	Predictive analytics focus on payroll and financial risk	Faster calculations, saving more than 200 working hours

The next part is the data benchmarking all the tools and solutions gathered for this study including tools from 5 companies: Equus software, Visier, Oracle, HR Forecase, and Tableau. Using the framework, the tools and solutions from each company are measured in accordance with the 10 criteria: Large data handling capacity, Faster proof of concept and implementation, High innovative capacity of the vendor, Fast query performance, Ease of use for report designers and recipients, Flexibility of the software, Variety Deployment option, Availability of local support (European servers), Predefined data connection, Compatibility with G-Suite extracted from Airbus' requirements. The benchmarking result of the five tools with the 10 criteria is shown in table 4.3 as follows.

Table 4.3 Tools and solutions benchmarking

	Equus Software	Visier	Oracle	HR Forecast	Tableau
Large data handling capacity	Pass	Pass	Pass	Pass	Pass
Faster proof of concept and implementation	Pass	Pass	Pass	Pass	Pass
High Innovative capacity of the vendor	Pass	Focus rather on other HR activities	Pass	Limited information	Innovation relies on the recipient
Fast query performance	Pass	Pass	Pass	Pass	Pass
Ease of use for report designers and recipients	Pass	Pass	Pass	Pass	Pass
Flexibility of the software	Pre-defined offer (modifications allowed)	Pre-defined offer (modifications allowed)	Pass	Pre-defined offer (modifications allowed)	Pass
Variety modes of deployment	Pass	Pass	Pass	Pass	Pass
Availability of local support (European servers)	Pass	Pass	Pass	Pass	Pass
Predefined data connection	Pass	Pass	Pass	Pass	Pass
Compatibility with G-Suite	Willing to study if integration is possible	Limited information	Pass	Limited information	Pass

4.4.1 Equus Software

Equus Software satisfies most of the requirements of Airbus. The tool has the ability to handle large amounts of data with fast proof of concept and implementation. The service provider has an innovative mindset with the promise of flexibility allowing the adjustment to match with requirements from Airbus. The tool

also provides a fast performance and easy report layout and adjustment. The service provider has a dedicated team to support within European zones. The variety of options for deployment and provided pre-defined data connection also complies with the requirements. However, the limitation is the compatibility with G-suite which needs further study from the provider.

4.4.2 Visier

Visier is an HR specific tool with the capability to handle large data. It provides fast implementation, however, Visier has a limit focus only in HR activities which may limit the innovative capacity of the tool. For the query speed and ease of use for report, Visier has passed these criteria. Visier allows a variety of modes of deployment with predefined data connection. The support team is also a dedicated team in Europe which satisfies with the requests from Airbus. However, the concern is on the compatibility with G-suite which is very limited.

4.4.3 Oracle

Oracle is one of the well-known technological companies worldwide. In comparison with the requirements from Airbus, Oracle tool has passed all of the criteria starting with the ability to handle large data with fast implementation. Oracle provides highly innovative capacity, fast query performance and adjustable report to handle the needs of Airbus. The tool provides flexibility to adjustment, many modes of deployments and comes with predefined data connection. The support team available in Europe and with the compatibility with G-suite, Oracle is one of the great options for Airbus.

4.4.4 HR Forecast

HR Forecast is a company that provides tools to HR process including global mobility. The HR Forecast tool can handle large amounts of data with fast performance and adjustable reports. The implementation is fast with multiple modes of deployments. HR forecast has a support team located in Europe which can support Airbus. However, HR forecast has a limited innovative capacity and compatibility with G-suite which may be a disadvantage compared with other tools.

4.4.5 Tableau

Tableau is a data management platform which can conduct predictive analytics from the created rule. It can handle a large amount of data with fast query performance. With ease of use for the report with good visualization, Tableau is a good tool for using with predictive analytics. The tool is fast to implement and provides a variety of modes of deployment. The support team also available in European zones. The tool comes with predefined data connection with high flexibility. However, the innovative capacity of Tableau relies on the recipients of the tool as the rules need to be created by the recipients themselves.

From the benchmark of the predictive analytics uses in other company and the tools and solutions introduction, Airbus global mobility team can focus on the predictive analytics on financial and employee retention as there are use cases of the success implementing the technology to help with the processes and then Airbus can move forward with the other aspects when Airbus successfully implement on the financial and employee retention. As for the comparison of the tools, if Airbus needs close guidance and support in the implementation of predictive analytics, Equus is a good choice since it provides the adaptation of the offer and the compatibility with the current tools Airbus has. Oracle would be a great choice in case Airbus seeks a cloud-based solution, however, there is limited information on the service provider as the tool is self-service. Tableau is also another good choice for customized solutions and close integration with the tools Airbus is using.

4.5 Future possibilities on Predictive Analytics

From the analysis in combination with the academic research information, the TSM team had came up with an idea to use the big-five personality factors as a non-financial component to conduct a prediction in combination with financial factors to yield better prediction results to the global mobility team.

The big-five personality factors were originally introduced by Warren T. Norman in 1967 and have become a foundation of psychological factors consisting of Extraversion, Emotional Stability, Agreeableness, Conscientiousness, and Openness.

4.5.1 Extraversion

Extraversion reflects how sociable, outgoing, and energetic a person is. Individuals with a lower score on the extraversion scale are considered to be more introverted. They tend to be more deliberate, quiet, low key, and independent. The extraversion factor can indicate the type of work or positions that an individual may be suitable for (Thomas International., n.d.).

4.5.2 Emotional Stability

Emotional stability refers to an individual's ability to remain emotionally stable and balanced. It reflects how a person handles stress and negative feelings. People with high emotional stability tend to be effective at handling problems (Thomas International., n.d.).

4.5.3 Agreeableness

This factor measures the tendencies of an individual with respect to social harmony. Agreeableness reflects the ability of an individual to get along with others, how cooperative or skeptical they are, and how they might interact within a team (Thomas International., n.d.).

4.5.4 Conscientiousness

Conscientiousness is a factor describing how careful, deliberate, self-disciplined, and organized an individual is. This factor is often used to predict employee productivity, in a lower-level position in particular (Thomas International., n.d.).

4.5.5 Openness

Openness or sometimes called openness to change measures the level of imagination and creativity as opposed to down-to-earth and conventional. It can also refer to the quality of being able to accept and listen to different ideas and opinions from other people (Thomas International., n.d.).

In order to measure the big five personality factors; Extraversion, Agreeableness, Conscientiousness, Emotional Stability, Openness) Srivastava (2023),

has recommend the use of the IPIP (International Personality Item Pool) scales, Saucier's mini-makers, Gosling's Ten-Item Personality Inventory, and DeYoung's Big Five Aspect Scales which are all created for public use in the public domain and may be used without any restrictions. Gaining the result of the big five personality factors, it could be used as a data source for further predictive analytics.

With the data from the research and the functions and features details of the tools and solutions, the TSM team also came up with ideas of possibilities of future actions for Airbus. As Tableau is a self-service solution, Airbus could apply the classifier model to conduct predictive analytics on multiple aspects regarding global mobility. Airbus could also expand the data collection within the team. In addition to assignments data, the big five personalities details of the assignees can be collected to be used with future predictions on the success rate and forecast the return from the expatriation assignments. The big five personalities could be collected through the tools: IPIP scales, Saucier's mini-markers, Gosling's Ten-Item Personality Inventory, DeYoung's Big Five Aspect Scales, etc. With the characteristics of candidates' data collected, it can be used in combination with the statistics and other data to conduct meaningful predictive analytics. With all of the possibilities, the data could be used for generating prediction of the possible outcome of decision making of the candidates or assignees for global mobility team to be proactive and prepare further action for each case of possibilities in the future.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

This chapter presents conclusions and recommendations of the research. The study aims to identify the status and the use of predictive analytics and automation in global mobility field and benchmarking other company in different fields who started to use them and provide recommendations for the tools and solutions existing in the market which could benefit Airbus. The study is conducted under the 3 objectives.

1. To explore predictive analytics academic research, theories, and concepts to find appropriate models and algorithms that can be useful for global mobility.

2. To benchmark the existing predictive analytics tools in the market and use case of the implementation of predictive analytics in global mobility in different industries.

3. To provide recommendations on the possible predictive analytics tools and solutions Airbus could use to enhance global mobility within the company.

5.1 Conclusions and Discussions

To achieve the objectives of the research, the TSM team explored the predictive analytics academic research and concept to find the appropriate models and algorithms to use with global mobility, benchmarking the existing tools and use case from different industries to benchmark for Airbus and provide recommendations to the possibility to enhance Global Mobility.

From the exploration of academic research, theories, and concepts, TSM team found potential topics that can be useful for global mobility in 2 domains. The first one is the big five personalities concept consisting of Extraversion, Emotional Stability, Agreeableness, Conscientiousness and Openness. The five personalities are crucial non-financial factors that affect global mobility assignments, therefore, they can be collected and used for the predictive analytics in global mobility field. The second topic is

predictive analytics models. From the research, there are two models which will be of use in the global mobility aspect which are regression model and classification model. The regression model is mainly used with numerical data such as financial data, and the classification model is needed for non-numerical data. As the TSM team found that the big five personalities will be useful, it is recommended that these data need to be collected and once collected they can be used in the predictive analytics. TSM also proposes to use both regression model and classification model to conduct predictive analytics in global mobility utilizing regression model with numerical data such as financial data, and classification model focusing on the non-numerical data like the big five personality data.

The exploration of research on predictive analytics and global mobility provides a limitless opportunity for Airbus to grab the idea of new innovations to improve the process and management of global mobility in Airbus. Numerous companies have started using predictive analytics and tools to enhance their prediction abilities in many functions such as finance, supply chain, operation, etc. TSM team discovered several use cases and tools for predictive analytics and selected 4 case studies from 4 companies: (1) Continental group; (2) Panasonic; (3) eBay; (4) Unilever, along with 5 tools: (1) Equus; (2) Visier; (3) Oracle; (4) HR Forecast; (5) Tableau, which are focusing more on global mobility. The use of predictive analytics in each of the 4 companies from the case studies can be seen in table 5.1 and the concerning point from the benchmark of the 5 tools are in table 5.2.

Table 5.1 Predictive analytics from use case companies

Company	**Usage of predictive analytics**
Continental group	Predictive analytics on financial aspects
Panasonic	Structured data collection, Predictive analytics on HR insights
eBay	Predictive analytics on HR insights focusing on retention
Unilever	Predictive analytics focus on payroll and financial risk

Table 5.2 Tools and solutions benchmarking concerns

	Equus Software	**Visier**	**Oracle**	**HR Forecast**	**Tableau**
Concerns	Limitation with G-suite compatibility	Limitation with G-suite compatibility	No concern	Limited innovative capacity and limited compatibility with G-suite	Innovative capability relies on tool recipients

The TSM team conducted an internal analysis using SWOT to help identify the strength and weakness of global mobility and then developed a benchmarking table for the use of predictive analytics in global mobility based on the information of each company extracted from the use cases. The table is an important tool for Airbus to assess their readiness to apply predictive analytics in comparison with other big companies which have already implemented the technology. With the table, Airbus can focus to develop a suitable action plan moving towards the goal of improving the global mobility work and process while considering the mitigation on what is lack or could potentially slow down the improvement from the result of internal analysis.

In addition to the internal analysis and benchmarking table, the TSM team also developed a tools and solutions comparison table to compare the existing tools or solutions that can be of use for Airbus global mobility. The tools or solutions are compared with 10 criteria tailored with Airbus requirements: (1) Large data handling capacity; (2) Faster or better proof of concept ; (3) High innovative capacity of the vendor; (4) Fast query performance; (5) Ease of use for report designers and recipients; (6) Flexibility of the software; (7) Variety deployment option; (8) Availability of local support; (9) Predefined data connection; (10) Compatibility with G-Suite. The table can help Airbus as a reference on what to expect from the tools and also give opportunities for further requirements that Airbus could request to the service provider in the future.

In order to cover all objectives, the TSM team also provided recommendations in the managerial perspective to seek the best solution based on the combination of both the existing tools and solutions with the potential use of academic research. This can be possible by providing the requirements to the service providers with the innovative capacity while maintaining the integration of Airbus existing system

at the same time. With the information in this study both research data and recommendations can be used as a starting point or reference in case Airbus would like to move forward with a project involving the incorporation of predictive analytics in the improvement of the process and management project which Airbus plans for in the future.

5.2 Recommendations

The recommendations for Airbus can be categorized into 3 stages, short-term from 1-3 years, mid-term from 3-5 years, and long-term 5 years onwards. For the short-term recommendations, Airbus can use the use cases to compare the current status of Airbus to other companies using predictive analytics to facilitate the process of global mobility. Airbus can learn and see the benefits and also drawbacks of the usage of the technology. Airbus needs to set the direction and goals for the company to move forward. Airbus should also focus on identifying the tools or solutions which match strength and weakness and look into the future needs. Airbus needs to scope down the list of service providers to 1-3 (ideal of one) choices in order to work closely on the requirements and concerns which may come up along the way. This is important as some information which Airbus needs may not be collected at this point and for those data to be meaningful, it takes at least 3-5 years to see the trend, then Airbus needs to start collecting these data early on. Global mobility team may also need to consider the compatibility with existing tools and coordinate with other departments as the tools or solutions may require data from other sources like finance, etc.

Apart from selecting the tools, the global mobility team can start collecting non-financial data on personality along with commence the program to support candidates before the expatriation and after the end of the assignment. The cross-cultural training would be a good pre-expatriation program preparing candidates to be ready for communication with different people from different cultures. Airbus can implement the support system for repatriation after the assignment, it is a good chance to debrief and analyze all knowledge including the soft skills which candidates have acquired during the expatriation. The data collection in multiple dimensions will result in data that can

be a good source for Airbus to use and conduct deeper analysis on non-financial factors relating to the assignments.

In the mid-term, Airbus should start implementing the tools and solutions to incorporate the predictive analytics tools to analyze the data gathered starting from the short-term stage. This will help Airbus to gain meaningful insights and predict the outcome such as the success of the assignments, the return of investment from assignees, etc. With the tools and solutions in place, Airbus will have more data pool for analyzing the factor to use as a basis of further learning and more precision calculated by the system. By including the data gathered from multiple dimensions, Airbus can be the use case for incorporating non-financial data into business predictions whether it will be in global mobility or other fields in the organization.

For the long-term, Airbus can use the data gathered and generated within the system to create a knowledge base. With the knowledge, Airbus can use these data to reinforce the tools or solutions to be more powerful, or on the other hand, it can also be used to support the research within the field. Airbus will have more chances to come up with new techniques and technologies to conduct and research predictive analytics for the use of HR and global mobility in the long run.

5.3 Limitations of This Study

In this research, there are some limitations due to the factors conducting the study which are listed as follows.

1. Although the concept of predictive analytics and global mobility has some degree of maturity in academic research, the adoption of predictive analytics in the global mobility field is new for the industry. Most companies have predictive analytics in place for human resources processes, however, only a few have predictive analytics in place for global mobility management. This causes a limitation on the collection of data which has been one of the biggest challenges.

2. The communication of the requirement between Airbus and TSM team was not specific as the idea of predictive analytics are new to Airbus, hence, Airbus team did not know what to expect as the outcome and are open to all possibilities which give a large scope of work comparing to the limited time frame.

3. The limited time frame of the consulting projects limits the opportunities to exchange data between TSM team and the service provider of the tools.

4. The limited information as some service providers is not willing to share the technologies and tools details without the non-disclosure agreement contract. This limitation led to unequal information as different vendors provide different levels of information.

5. Airbus is a big company and cannot share internal information to outsiders, this limits the TSM team to analyze and provide accurate requirement for the service provider to response with the needed information.

6. The information used in case studies is gathered from the public sources as the companies are not willing to disclose any information about the company and also the tools and solutions that the company uses.

5.4 Future work

Based on the limitations of this study, some further actions could be taken in these particular topics to gain more useful insights and information as follows.

1. Airbus should hire a consultancy company to work and straighten the needs and requirements of predictive analytics in global mobility.

2. Airbus should make a non-disclosure agreement with the potential service provider to gain more insights and information on the tools and solutions and work with the competence provider to adjust the tools or solutions in accordance with Airbus demand.

3. Airbus can form an alliance with other companies to cooperatively research and improve the use of predictive analytics in global mobility.

4. Airbus can initiate the data collection project to ensure the data are collected from different angles to see the holistic view of the possibilities of incorporating predictive analytics with global mobility and may expand to include other departments within Airbus.

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