Traditional cost cutting programmes have reached their limits. Post-flight cost analytics will be replaced by real-time cost-driver-based costing to support operations decision makers. Gesine Varfis investigates how activity based costing (ABC) will benefit airlines for real-time cost management.

Getting a grip on real-time costing

Anticipating the next big move in the aviation industry is important, but responding to this by changing long-standing processes, implementing new solutions, making them acceptable and keeping them sustainable is complex and expensive.

By now, the low-hanging fruit in airline operating cost savings have been harvested. Cost-driver-based analytics is the next opportunity in the context of airline operations costing and economic decision-making, as previously elaborated *(see Boosting operations management with accurate real-time costing systems, Aircraft Commerce, October/November 2018, page 13)*.

This article describes why cost-driver-based analytics will be one of the next challenges airlines need to face and overcome in generating further bankable savings in operations. Cost-driver-based analytics have not yet been established as an industry standard, so there are no off-the-shelf operations management solutions available to support real-time operations costing. Partial elements of this exist, and start-ups are beginning to develop solutions, but airlines need to get more engaged in digitalisation and big data analytics.

Cost-driver-based cost management is linked to big data analytics, real-time costing for operations, and decision-making support for predictive and prescriptive cost-driver analytics. Many airlines are unaware of cost drivers, or at best only specific finance teams are dealing with them. Airlines, therefore, need to manage cost drivers on the shop floor (maintenance), maintenance control centre (MCC) and in hub and operations control centres (HCC and OCC). These are the departments where high-cost decisions are routinely controlled and implemented.

Traditional cost-cutting

Generally, it is no longer possible to achieve 20-25% cost-saving margins based on pure process or organisation re-engineering or outsourcing, such as: outsourcing the weight and balance function; assigning ramp agent duties to a qualified loader; or transferring walkout assistance from a qualified engineer to a trained ground services employee.

Certain carriers have led these projects, while others have followed after the projects have become 'common industry practice'. This also applies to innovative IT developments, big data or analytics, such as easyJet signing Skywise for predictive maintenance management in 2018, or Lufthansa signing a 10-year strategic partnership with Inmarsat in 2015.

Waiting for cost-efficient solutions to be available in the market place is no longer an option. Previously it was prudent to gauge applicability of a solution by its performance with a launch customer, or making several site visits to see a system in operation before starting an IT replacement or upgrade project. These projects were driven by vendor product/industry standard developments applicable to any airline with some predictable and accountable customisation as part of a package. For example, crew management solutions were customised to national laws and regulations.

Simply adopting best practice will not generate all possible savings when airlines actively engage in cost-driver-based analytics. The pace of digitalisation and speed at which artificial intelligence (AI) and machine learning are being applied are widening the gap between airlines that are engaged in digital transformation and those that have yet to put it on the agenda.

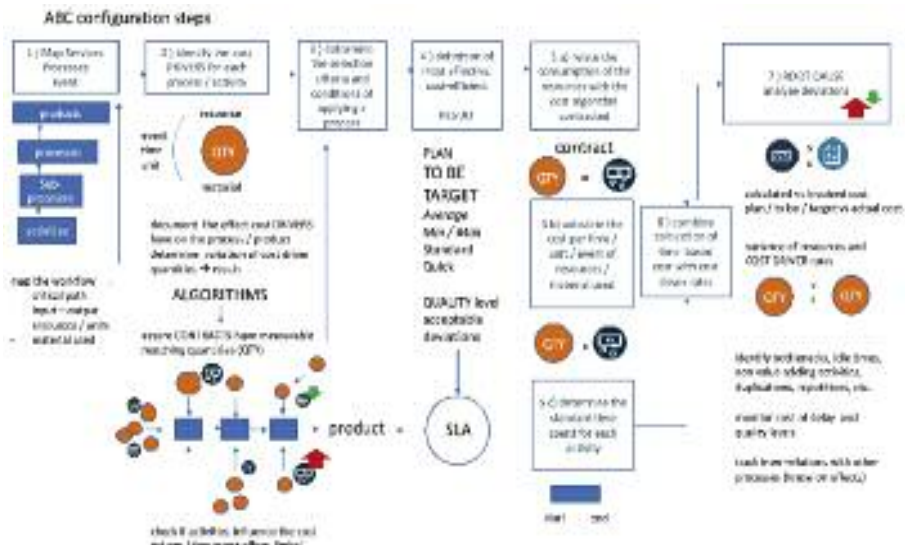
Eventually, the gap between a fully digitalised airline and an airline considering integrating the techlog into the electronic flight bag (EFB), will be too big to be closed economically. There is also the problem of employees being too deeply rooted in traditional ways.

The era of traditional cost-cutting programmes was characterised by simple replication of existing programmes. Big data and digitalisation refer to high-quality and available individual data sources. Fixing common data management obstacles, such as data duplication, questionable data sources and fragmented data to meet the requirements of digitalisation and big data analytics cannot be copied. Airlines need tailor-made solutions so that their own data is available for analysis.

This article focuses on the methodology of cost-driver-based costing, and the areas in which it can be applied. It also elaborates how managers need to support transformation to generate sustainable savings.

Cost-driver-based analytics are related to transformations taking place in the world of big data and digitalisation. Dealing with digitalisation and big data requires a different skill set in an organisation's management, as well as high-quality and accessible data.

Data needs will grow, and the airline industry is on the verge of affordable data analytics. Algorithms are being developed to predict a component's failure as part of



The approach in how Activity Based Costing (ABC) is configured to determine the cost of a process or event is the same for a one-time analysis or for a real-time costing solution. After the processes have been mapped and the cost drivers have been identified, the quantity and cost relation determine the cost of an activity, process and product. The analytics based on cost deviations as well as benchmarking allow the determination of savings.

predictive maintenance. Due to the nature of predictive failure, an intact component is removed from an aircraft and sent to the shop. The shop checks it and tags it as intact, after which it is reinstalled on an aircraft where it later fails during operations. The data volumes required to predict the failure of a component are already large; the ones to determine what will cause predicted failure to allow the shop to test a component under the failure predicted environment require substantially more data.

Airlines need to get the data now. They do not have the luxury of waiting to adapt to growing data requirements at a later stage. Tomorrow's airline management decisions will be data-driven, and paired with creativity and innovation management. Tomorrow's AI needs data. At the same time, the lifecycle of new application requirements and tools will shorten, and business growth or savings without the adoption of IT solutions and data analytics will become unthinkable.

With the end of traditional cost-cutting programmes, airlines need to embrace change, and re-organise processes, organisation, culture, tools and systems. Change is a corporate activity that needs to be continuously applied and managed.

Numerous airlines have incorporated change as part of daily business. Chief commercial officers need to enrich classic marketing with analytics, making use of the vast quantity of data available. To this end, easyJet appointed a chief data officer in 2018 for driving business growth based on big data, AI and machine learning. easyJet also appointed a director of operations transformation, who is responsible for delivering operations strategy with a specific focus on reducing operational disruptions, improvement in operations performance, and digital, data, connectivity and mobility transformation.

The Lufthansa Group has appointed a chief digital officer for digital strategy, innovation and transformation. In addition, Dr Christian Langer is responsible for the product division digital fleet solutions at Lufthansa Technik, with the recently announced MRO platform 'Aviatar'.

Digitalisation and big data will meet cost-driver-based costing, so airlines need to get ready to encounter it.

Methodology evolution

Cost-driver-based costing has its roots in activity-based costing (ABC) and process modelling. ABC has developed over the past 20 years as a method for improving business processes in relation to the costs they generate. In this context, ABC has been used to support strategic decisions, such as pricing, outsourcing, make or buy decisions and identification and measurement of process improvement initiatives. With this approach, airlines have determined the cost of delay and cost of maintenance, and have identified maintenance and ground operations cost drivers. ABC is a time-limited exercise focused on determining cost of a delay and cancellation based on post-flight data.

For example, analysis of a year's worth of cost and delay data performed by operations, maintenance and finance departments has always proved to be time-consuming, because traditional accounting data and costs provide neither the cost of a process (workflow) nor unrelated resource-consumption metrics, such as labour and materials.

As an example, airlines still use the 2015 report published by Eurocontrol, together with a University of Westminster technical report on European airline delay cost reference values. This analysis is a reference document for European delay costs incurred by airlines, both at strategic planning and tactical stages. Regardless of the time that has elapsed since 2015, the delay cost references appear to be valid.

ABC requires collection and analysis of a significant amount of data. This means only a time-limited approach can be used for benchmarking. The data has to be benchmarked externally, which is difficult. Alternatively, the data analytics must be based on a sound comparable database (months and years of data) to allow sound recommendations. These types of analyses and calculations go beyond traditional costing practices in project control and financial accounting. Therefore, ABC one-time cost-saving projects are combined with best practice benchmarks by experts that have identified cost-saving opportunities at other airlines. The decision to change from post-flight analytics to exact real-time results to support economic decisions (such as delay or cancellation of a flight) cannot validly be based on an outdated average cancellation cost, but needs to be calculated in real-time for each situation, taking into account the number of passengers who will miss connections with rebooking, delay, food and overnight requirements, among other cost-drivers.

Aircraft manufacturers and consultants have been determining 'traditional' cost-cutting programmes for airlines. In 2005, Boeing launched Technical Operations Performance Improvement and Cost Solutions (TOPICS) to help customer airlines better understand maintenance costs and factors that drive high costs, and to benchmark those with other operators. The goal was to provide airlines with solutions and best practices that would help improve maintenance operations, optimise maintenance costs, and increase profitability. As published in Boeing's Aero Magazine in the first quarter of 2010, Tom Buyers, formerly regional director of airline value analysis and marketing for airline economics, noted that airlines had identified cost-saving opportunities, determined saving potentials, and recorded actual savings.

It is now time to move from cost-cutting projects via continuous post-flight analytics towards real-time costing and cost analytics to perform the right decision on the spot.

In terms of application, ABC allocates

costs based on the amount of resources consumed by a product or service. ABC determines those processes and activities required for a product, assigning resources and materials required for each activity with related costs. These are the resource cost per time unit (minutes or hours), event and/or cost of utilised material. ABC allocates direct costs based on product cost drivers related to the resource used.

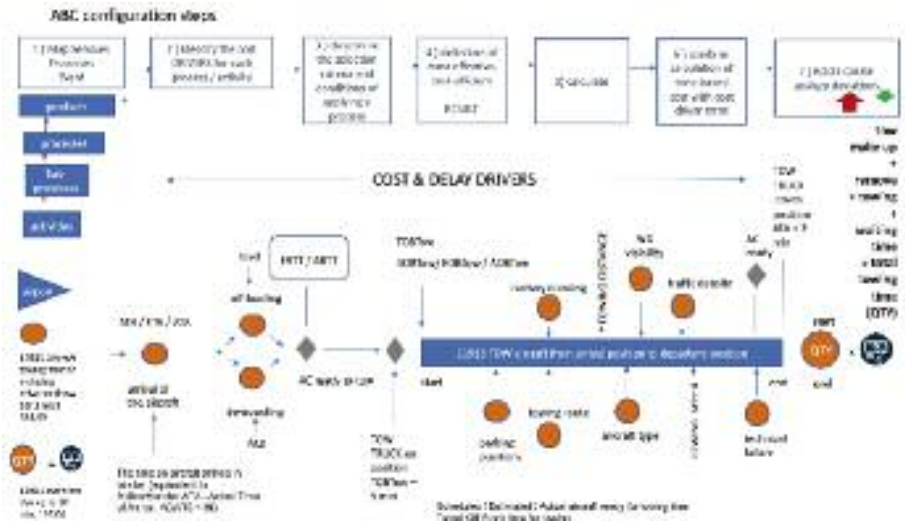
The data obtained can be used to identify wasted resources and unnecessary costs. A load master, for example, is allocated for complete turnaround of an aircraft, but only provides 20 minutes of actual supervision. The rest is idle time, where the load master is not adding any value to the exercise.

In general, ABC has been used to calculate the share of the total cost for each step of a process. This determines a product, service or cost for the customer. Correlation of an activity with a cost and measurable value or cost driver allows someone to analyse reasoning behind the cost, and benchmark the cost and time required to complete the activity. ABC is used to identify delays, inefficiencies, bottlenecks or cost deviations compared to industry benchmarks, standard service or product cost, and invoiced cost.

ABC process determination comes close to process enhancement modelling. Workflows, processes and resource consumption are currently mapped with IT solutions, such as Architecture of Integrated Information Systems (ARIS), a process-mapping solution developed in the 1990s. Process-mapping has attracted start-ups like Celonis, which is a Munich-based IT system provider. ARIS maps processes and throughput times to determine transparent, lean and efficient workflows as well as costing and resource consumption. The costing models used, however, are not as important since the systems are applied for industrial production. Here efficiency gains and cost savings are determined with workflow and process optimisations. This is different for airlines; decision-making in heavily irregular situations cannot be compared with industry workflow optimisation. Especially for airlines, real-time costing will make a difference by supporting the OCC decision-making with the cost for different operations scenarios.

Real-time costing goes beyond scenario comparisons. By determining the cost-driver average, the standard or target cost used for an activity (for example, the time required for a load master to be present for the loading procedure), airlines and service providers can determine when to change from using a ramp agent to using a load master. Therefore, this determines the pricing and service level agreements of the new services. They can also take immediate action to fix a cost driver that has been detected moving out of the normal level. A highly sophisticated use of cost-driver analytics and management is the use of fuel monitoring and management solutions. After International Air Transport Association (IATA) fuel-saving initiatives have been addressed, fuel-saving techniques need to be monitored, including single-engine taxiing, and use of a ground power unit (GPU) instead of an aircraft's auxiliary power unit (APU). More sophisticated analytics, therefore, are required.

As previously mentioned, one reason why ABC has not been established is the large amount of data, and the number of algorithms, correlations and aggregations a system needs to manage. This applies to not just actual data, but also historical data for analytics and prediction. With digitalisation moving towards AI, big data analytics is no longer an obstacle. At the same time the cost of data sourcing, data archiving and analytics reaches a level where a cost-benefit analysis of using analytics makes sense. Airbus (Skywise) and Lufthansa Technik (Aviatar) provide state-of-the-art open data platforms that allow costs and



With ABC not only the cost of a process, product or service get traceable. With the cost of use the cost of a delay can be identified and based on the delay drivers, and different delay cost scenarios can be predicted and compared. The example shows some of the cost drivers affecting the cost for towing from the arrival position to maintenance base

benefits to be shared. SAP Hana also offers a powerful real-time data analytics platform. Airbus is working on a new aircraft connectivity solution (FOMAX), which will enhance data volume downloads from 400 parameters to 24,000 parameters for the A330 (aircraft data comprises 1,400-40,000 parameters), at a cheaper and more efficient rate that allows airlines to use predictive maintenance analytics.

ABC cost-driver analytics

Configuring an ABC project or tool takes significant time and effort, driven mainly by determination of required data. Airline operations cost control, billing and invoice control solutions (for example, KEOPS CC by XLM Aero, Airpas by Sabre or FinesseCost by Accelya) support a limited scope of cost analytics (post-flight actual data versus post-flight invoiced data). It is difficult, however, for airlines to get data sources and cost drivers integrated and defined. Gathering and agreeing on data, and assuring and testing data quality can take as long as a year before going live. Airlines intending any form of ABC cost driver analytics for a time-limited project or tool with or without consulting efforts, should get data sources and cost drivers defined and cleaned. If an airline is unable to do this, where else is it possible to find and fix common data management obstacles, such as data duplication or fragmentation, and questionable data sources?

Data and cost-drivers collected need to be integrated into a high-level ABC configuration by turning them into measurable, traceable units, related to algorithms determining the results. Cost-drivers need to be changed into measurable units, documented and agreed in supplier contracts or internally.

Applicability cost-driver

There are still airlines that operate without knowing aircraft maintenance costs, specific costs of a delay or cancellation, or cost drivers. These operators are unable to control maintenance invoices because they do not know what an event should cost. ABC can make a difference for airline operations and maintenance, since direct allocation of actual costs to a product makes it possible to identify true costs and cost drivers.

Knowing which aircraft needs to be operated on longer routes to meet lease return conditions without an extra maintenance check, monitoring service level agreements (SLAs), knowing supplier support agreements, and being familiar with warranty details make it possible to generate significant cost savings via ABC methodology. ABC should be applied for all airline operating costs, such as shown.

ABC for aircraft turnaround

One of the services that has been well defined in terms of process and activity mapping, and assignment of resources and times (plan, target, and actual time spent for activities) is aircraft turnaround.

Airlines have defined standard reference models, and developed quick turnaround models or variable models (based on load scenarios) applicable to managing different delay, irregularity and turnaround scenarios. Current turnaround management solutions allow managers to control the turnaround process, based on deviation of real-time data recorded for start and end times versus standard times required. In the case of a delayed start to a turnaround process (with no buffers), the minimum time required for the process determines the expected delay. Based on this information, target off-block time (TOBT) can be predicted. More sophisticated solutions perform load and special load-based predictions.

The mapped processes (with start and end times) used for turnaround management apply to ABC. ABC assigns the cost of resources (time or material) to each activity, aggregated to the total cost of a service. As previously mentioned, this type of analysis has been performed for consulting purposes. There are solutions in the market to control the cost of ground-handling invoices post-flight.

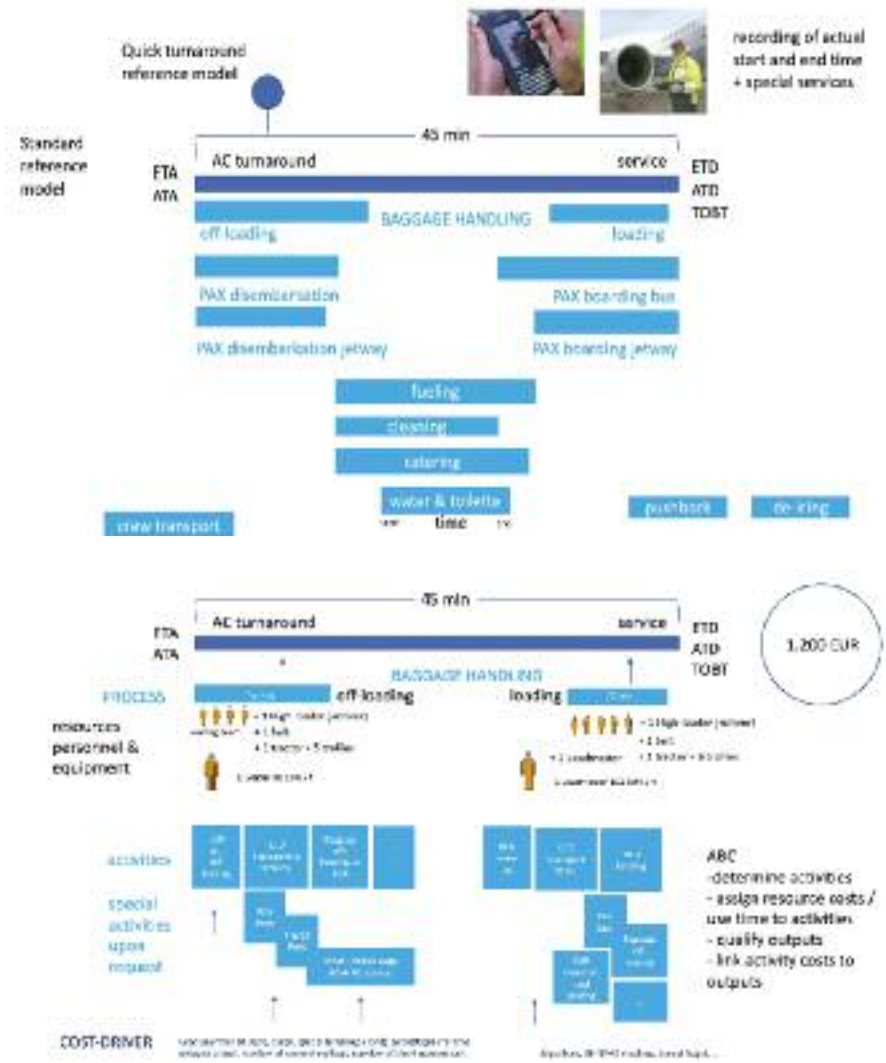
A solution has not been developed, however, that performs costing for each turnaround in real-time. Currently, detailed cost algorithms applied for ground-handling are shared or negotiated with the airline's procurement department. Cost can, therefore, be assigned to measured activities and processes aggregated to the ground-handling cost per flight. Ground-handling providers, such as Fraport, not only publish rates for ground-handling, landing fees, terminal use and parking, but also describe the calculation model in detail. The list of service charges, valid as of January 1st 2019, are published on Fraport's website.

Fraport, like other service providers, defines the charging (parameter-measuring) period for services. For pushback services, the time charged is described as follows: 'The charging period for push-out services starts two minutes prior to timely set TOBT or rather with contractual agreed lead time prior to timely set TOBT or latest with the arrival of the aircraft towing tractor at the position. Push-out time ends when the tractor has completed towing-/push-out procedure and leaves the position'.

The benefit is not only to have the exact cost of a turnaround for invoice control. With real-time costing, service levels and turnaround services can be varied according to the most efficient, fast, economic and customer-satisfying turnaround performance. The cost of a delay can be predicted, managed and varied.

Swissport offers a ground-handling package to airlines with improved cost transparency, complemented by conversion of handling costs from fixed to variable. Variable costing changes the scenario as it can be used to manage irregularities, as well as the cost of operations on the day. It only makes sense when an airline has an overview of the handling status, standard fixed cost and the option to manage variable cost

ABC costing for aircraft turnaround management gets more important. Today airlines manage their turnaround process on time-based (start and end time management) methodology. They determine how to save time in case they need to recover from a delay. With variable turnaround costing, the resources used can be related to the real work required. This will be the end of standard turnaround package cost.



and quality of services. An airline needs to know the time and cost not only of a standard turnaround cleaning service, but also of a quick turnaround cleaning, reduced cleaning, or no cleaning at all. At the same time the controller needs to be aware of the cleanliness of the aircraft to avoid jeopardising the customer experience. Trying to win back 50 complaining passengers out of 156 on board (with each complaint-handling estimated to cost €120 per passenger) might in the long run be more expensive than the economic decision taken on the spot.

Take first-mover advantage

The future of airlines will be digital. Real-time variable cost management, providing overall situational awareness and decision support, will play a role in this new area of operations management. Aviation may have been slow to feel the impact of technology as the industry has been protected by regulations and investment constraints, and had protected markets with no pressure to change. However, the pressure on the industry to change is now increasing. The chief digital officer role has been established in leading airlines and others will follow.

Real-time costing, combined with variable costing, complemented by customer satisfaction management, can give birth to entirely new business models, and will leave companies that fail to adapt struggling to survive. Currently, big data sets are becoming larger, and will eventually change the nature of business decisions. Enhancements based on data samples, statistical methods and expert know-how will be replaced by real-time analytics on performance, cost and service quality calculations on all the data. There will be no errors because of sampling that produces precise predictive and prescriptive analytics.

With big data analytics, any move to start structuring corporate data efficiently will prepare for the evolution towards AI. Open data platforms are the easiest way to join in data analytics, allowing for shared hardware and development cost, and provide the necessary benchmarking and experience for small to medium-sized airlines.

Making change stick

Success is driven by empowerment, communication and continuous change management. When real-time costing is put onto the agenda, it is important to follow some key guidelines.

Significant transformation and innovation requires a dedicated person, with the scope and magnitude of a chief transformation, digitalisation or data analytics officer with a direct line to the chief executive officer. Costing involves all areas of the airline: finance and operations need to determine the operating cost together with procurement. This ensures that costs are contracted, controllable and measurable in all stations.

The next maker or breaker of success is the empowerment and engagement of employees, who need to drive change or be part of change with strategic management guidance, KPIs and targets.

Transformation requires the change of roles and responsibilities and alignment with new targets. Crucial to the process is continuous communication throughout all levels of a corporation. Employees that know and contribute to corporate needs can challenge and test costing solutions, and determine the algorithms and cost-drivers better than external consultants. At the same time, employees can bridge gaps, remove barriers and tackle the bottlenecks between traditional ways of conduct and big data analytics. Open cost-driver discussions and cost awareness of all employees is key to the next stage of real-time economic decision-making in the OCC, MCC or HCC; it is a recipe for success. Employees should be engaged where cost-driver based real-time analytics are applied.

Engagement of integrators (or integration workshops, based on an open innovation principle) are another key to success. Data analytics needs the insight of data and process owners. It requires a culture of open innovation, collaboration and calculated risk-taking. Simple things, like open work environments, flexible work hours or home-office working can make a difference.

Targets and achievements need to be communicated regularly so that employees understand what the company is trying to achieve. AC