Legacy airlines are still dealing with the problems of eroded traffic volumes and passenger yields in the face of competition. New techniques in revenue management include the use of improved market segmentation, better forecasting, and more dynamic optimisation.

Developments in revenue management techniques

The past decade has seen many changes in airline revenue management (RM) practices, due to the increased presence of low-cost carriers (LCCs), greater competition generally, and the emergence of the internet as an important sales channel. These three factors have led to a drop in gross fares and yields for legacy airlines, and although they have made many changes, they still need to improve their RM practices in order to combat eroded revenues.

In the meantime, the majority of LCCs have had to adopt hybrid airline strategies in order to generate higher yields and revenues, and are having to distribute and sell through more sales channels, thereby incurring a higher cost of sales.

Changes in RM

The RM philosophy followed by most legacy carriers, prior to the LCCs' arrival on the scene, was based on airlines having as many as 20-30 fare classes and price points in an attempt to segment buyers into groups, categorised by their willingness or ability to pay a particular price. One objective of RM is to forecast how many of each fare class could be sold, and match the availability of each fare class so that the same number could be sold, and optimise the revenue that could be generated.

"Airlines need to sell to business and leisure passengers at the same time. Business passengers clearly have a greater willingness and ability to pay higher fares, so fare rules and restrictions were extensively used to provide 'fences' or barriers to segment the two levels of demand that were simultaneously buying tickets for the same cabin class. This prevented business passengers from accessing lower fares," explains Darren Rickey, vice president of airline solutions

management, Air Vision Management and Planning at Sabre Airline Solutions. "Greater restrictions and rules were applied to lower fares and price points. These restrictions were gradually eased as fares increased. Most rules or restrictions were based on the availability of different fares at different times before departure. For example, some of the lowest fares were only available 21 or 14 days before departure, with the majority of business passengers buying in the last few days before departure. Other low fare classes were only available on certain days of the week. Moreover, access to most fare classes was also only possible when they were available for both segments of a return trip.

"This complex system of segmentation incurred high costs of implementation and sales. It was also a clear target for LCCs, which introduced simple fare structures, eliminated most rules and restrictions, and had lower fares and price points," continues Rickey. "Moreover, the use of the internet for direct airline sales and on-line travel agents increased the visibility of fares, making it easy for buyers to search for the best deals."

Legacy carriers were forced to adopt the same simplified fare structure and availability, and to eliminate most rules and restrictions, in order to limit and slow down the migration of leisure passengers to the LCCs. Legacy carriers also adopted the use of direct and indirect sales channels through the internet. While this reduced some of their cost of sales, the overall result was a drop in average net yields.

"The removal of rules and restrictions, and simpler fare classes and fewer price points made it easier for business passengers to access lower fares, and led to an erosion in revenue," continues Rickey. "This led to several changes in legacy airline RM philosophy."

Passenger spill & load factor

Another main function of RM is to control passenger load factor, and so limit passenger spill. "Legacy airlines used to aim for load factors of 65-75% in most cabin classes, especially premium cabins," says Rickey. "This was because demand forms a standard distribution curve around an average demand. If average demand resulted in 70% of seats being sold, then on a few occasions when demand was at its peak, sales would exceed seat numbers and revenue would be lost. Many airlines therefore changed fare availability to target load factors of 65-75%. LCCs, driven by chasing high passenger volumes, changed this philosophy. They pursued high load factors, and were not concerned with spilling demand. Demand can still be influenced, however, by using the same technique of changing fare availability. The fares that many LCCs make available prior to flights are relatively high.

"Legacy carriers were forced to adopt the same philosophy with respect to load factor and passenger spill. Legacy airlines required higher load factors to offset the revenue lost through the introduction of lower fares," explains Rickey.

At the same time, overall airline philosophy changed from trying to achieve the highest average net yield to the highest total revenue. Net yield, after deduction of taxes and sales commissions, only applies to seats sold. High yields achieved through high fares in the past were enough to generate an acceptable average revenue per seat, even after taking load factor into account. Average net yields are lower following the simplification of fare structures, hence the shift to pursuing higher load factors and accepting passenger spill. Airlines have consequently changed their focus to generating the highest

Changes to legacy airline RM philosophies have been extensive. Airlines have simplified fare structures and rules, accepted passenger spill to achieve higher load factors, and made attempts to increase their numbers of O&D passengers.

possible total revenue per flight.

These two fundamental changes have not been enough to stem the erosion of passenger numbers, yields and total revenue for the legacy carriers. Besides simplifying their in-flight services and using self-service kiosks to reduce costs, legacy airlines still have to make fundamental changes to their RM strategies.

Higher load factors are possible, of course, with better forecasting and spill management.

Ancillary revenues

"Another main development has been the unbundling of full-service products, and providing a range of ancillary services that passengers can purchase," says Barbara Vega, product director of revenue planning at Navitaire. "Legacy airlines have gradually removed some of the service features or frills of the traditional airline product, such as checking in bags, providing a meal, and assigning seats on boarding passes, and now offer unbundled services at lower fares to compete with the LCCs. They then try to claw back lost revenue by offering ancillary products.

"Airline ancillary products are increasing in number all the time. They include paying a premium for particular seats, purchasing access to business- and first-class lounges, and paying to check in baggage," continues Vega. "New products include being able to custom-order particular meals, drinks and magazines. There are also third-party ancillary products, such as car hire, hotels and insurance, from which airlines generate commission. The risk that airlines take with unbundling is that not all passengers will buy enough ancillary products for

them to claw back the revenue lost from having to offer lower fares. It also makes forecasting demand more complicated, since two streams of demand now have to be predicted. Under traditional RM, forecasting was relatively simple since airlines found it easy to compare their product, the full-service airline experience, with that of other, similar, airlines. Unbundled products vary between airlines, and ancillary products even more so.

"Although unbundled fares are lower, they still require more complex RM, because segmentation and accurate demand forecasting are still required," continues Vega. "Airlines therefore have to increase the sophistication of their RM capability, despite the simplification of fare structures, and lower yields. The advent of ancillary products adds further to the need to achieve higher load factors, since higher passenger numbers mean an increased ability to sell ancillary products."

The challenge of ancillary products is that it is not known which buyers in each fare class will buy ancillary products, and how many. A forecast for this demand can only be based on the historical buying behaviour of each passenger. This requires the airline to have a database of each passenger and their previous purchase history, which therefore means that a link is needed between an airline's RM system and its customer relationship management (CRM) system.

"RM is further complicated because it has to take into consideration the net revenue generated from both sources when trying to predict or calculate demand elasticity and determine algorithms for fare availability," says Jerome Letissier, director of marketing and portfolio management of airline IT at Amadeus.

LCC evolution

Many LCCs have progressed to a hybrid airline strategy. Faced with a plateau in leisure passenger numbers and pressure from rising oil and fuel prices, LCCs have started marketing to business passengers. This has required them to employ more sales channels, in particular travel agents via the global distribution systems and interline agreements with other airlines, as well as to adopt more sophisticated RM strategies, noticeably the introduction of fare rules and restrictions to segment the two types of demand.

Although business passengers have started to use those LCCs that have become hybrid carriers because they are using GDSs, business passengers are still displaying typical buying behaviour: buying closer to the date of travel; and using travel agents rather than the airlines' own websites. Higher yields are being realised, but only through implementation by the airlines of RM techniques.

RM systems used by LCCs have had to evolve in response. "We started with a simple RM system for LCCs that offered a single fare at a time," says Vega. "The system estimates price sensitivity depending on the demand for a given fare, and forecasts demand to determine the optimal price point that should be available. We have now upgraded our system to consider revenue from two streams, as well as to differentiate between business and leisure demand using segmentation. This has changed from using say 12 price points in a single group where the cheapest is available first, to grouping these 12 prices into three groups, and making one from each available simultaneously. The three groups are leisure, mid and high fares. The leisure group fares will have a lot of travel restrictions, be non-refundable and non-transferable, and passengers have to pay for extras such as bag check-in. The mid group of fares will have fewer restrictions, and a fee will be charged for name or date changes. The highest group will be totally flexible fares with no restrictions, and will also include some ancillary services.

"The system automatically changes fare class availability, although the user can manually override the fare changes," says Vega. "The RM system calculates the sensitivity to each price point based on past and current booking patterns to optimise average fares and load factor to deliver optimum revenue."

Despite simplifying fare structures, legacy airlines are still using segmentation techniques in an attempt to optimise yields and maximise revenues.

O&D passengers

Another response to lower yields and eroded revenues has been the increased use of origin and destination (O&D) traffic and passengers by some airlines. Point-to-point or single-segment passengers used to be given priority over O&D passengers, on the basis that O&D passengers generated lower yields.

O&D has become more important partly because airlines are moving to a strategy of accepting higher load factors. O&D fares and yields used to be low compared to point-to-point fares, but because increased competition and the use of simpler fare structures have led to a reduction in point-to-point fares, O&D now seems more attractive. Moreover, LCCs have deliberately avoided selling O&D fares due to the complexities of using additional sales channels, forming interline agreements with other carriers and revenue accounting. O&D fares have therefore not declined to the same degree as point-to-point fares.

O&D fares were less available than point-to-point classes, but airlines have redressed this imbalance in order to boost overall revenue. This means that the last few seats on a flight are now available to connecting passengers, instead of being reserved for possible point-to-point passengers. O&D passengers used to be given second priority because of the lower yields they generated. Because of the change in policy to increasing overall revenue, RM strategy has been to look at overall revenue generated, rather than yields. O&D passengers will book two or four segments on the airline in most cases. This compares to just one or two segments for point-to-point passengers. O&D fares are therefore being made more available close to departure times, since they can generate more overall revenue.

Advanced RM techniques

Several new techniques have evolved in RM. "One of the main objectives of RM is to control the availability of fares or price points," says Vega. "This requires algorithms to make fare availability changes, accurate forecasts of demand, and an ability to calculate the price sensitivity for each fare level."

Changing from trying to gain the highest yield to the highest overall revenue has brought about several new techniques to improve these functions.

One technique has been to employ more accurate forecasting and monitoring of sales generated through each sales and distribution channel, as well as the volume of sales generated at different times of the day. RM algorithms have generally changed fare class availability as the departure time gets closer and fewer seats are left open. Monitoring of buying patterns reveals that there are certain times of the day, for example, lunch breaks and the early evening, when bookings are higher than others. This kind of analysis has been used to influence when to make higher and lower fare classes available.

Fare availability changes

One major change in RM has affected fare availability. "Traditional RM systems based fare change decisions on the assumption that demand and buying activity would match that of flights in the past," says Rickey. "The RM system would therefore protect a certain number of seats and leave them for the highest fare classes, and only make them available in the last period before the flight. The assumption was also that the demand for high fare classes was totally independent of the demand for low fare classes. In other words, there was a clear segmentation between buyers willing to pay high fares and those only prepared to pay low fares. Analysts tended to examine the booking profiles of each flight once every several days, and then change fare class availability manually or through the use of algorithms. These algorithms were simple programmes based on past demand and buying activity.

"Airlines have found that there is dependency between fare classes," continues Rickey. "Clearly if a high fare class is removed, people will purchase lower fare classes. Dependency between fare classes means that replacing a low fare class with a higher class resulted in some buyers being prepared to pay the higher fare. Some buyers are still sensitive to fare changes, and the trick is to better segment the buyers and predict their sensitivity to different fares.

"Historical information and data are used to forecast this split between non-sensitive and price-sensitive buyers," continues Rickey. "Many airlines now also use competitive availability techniques to determine what fares other carriers are offering. Fare changes by competitors can be monitored in real time with the use of webcrawler software, so that better-informed fare change decisions can be made. Airlines are also using customer choice modelling. This technique models the attractiveness of a particular fare an airline has available compared to all other fares available in the marketplace. This gives a better idea of what buying behaviour will be following a fare change, with the overall aim being to predict the market's reaction to fare availability changes."

A further development is the use of real-time alerting. Certain parameters can be monitored in real time, and alerts made to analysts. This requires a link between reservation and RM systems, and provides analysts with better decision support tools. The RM system will automatically make fare changes, by using more complex decision parameters, but the analyst can still manually override the decisions.

"The current system of revenue

A new concept in revenue management is that of analysing passenger net revenue. This is the net revenue a passenger generates. This requires a large amount of data and customer resource management information to build a picture of an individual's buying behaviour.

optimisation and changing fare availability is to analyse a flight 26 times during the 200 days prior to its departure," explains Michael Mankowski, principal at Seabury Airline Planning Group. "The flight is reassessed once every two weeks to start with, and then more frequently as the departure date gets closer. It ends up being analysed on a daily basis during the last two weeks. The fare availability is re-optimised automatically on these planned reading days, but analysts can manually trigger a re-optimisation if they see a particular change. This is called dynamic re-optimisation. It is possible to have systems that re-optimise flights more frequently in the last two weeks prior to a flight. Ideally, optimisation would be done on a real-time basis, every time a booking is made, but a lack of computing power means that this is not yet possible. There is also still the constraint that current RM tools only allow 26 readings per flight.

Optimisation techniques

"Achieving optimum revenue requires dynamic systems for calculating or re-assessing demand sensitivity on a constant basis in real time," says Letissier. "We have recently launched our Active Evaluation system for this purpose. This system considers several parameters in real time to actively evaluate which fare classes to make available. These include the sales channel and point of sale, whether the buyer is a O&D or a point-to-point buyer, the date and time of travel, the O&D cities, and the number of available seats on each leg the buyer requires. Overall, the system achieves better segmentation of the market in real time, and so better revenue optimisation. The Active Evaluation system works in-hand with the user's RM

system. When the airline gets a purchase request from a sales channel, it considers all the parameters to determine if the sale should actually be made at the fare level requested by the sales channel. The system therefore basically increases the fine tuning of revenue optimisation by considering a larger number of parameters. The next step is the RM system, which also needs to consider more parameters to achieve the best optimisation. Current RM systems do not take account of ancillary revenues, so they do not really optimise them. This means there is a long way to go for many airlines to optimise revenue. Total revenue therefore needs to be managed, which includes the monitoring of each customer's buying behaviour. Other steps that airlines can take to further optimise revenue is analysis of sales achieved from different sales or distribution channels, and sales made from different areas across the carrier's route network. Passengers from certain parts of the world may be interested in different ancillary products, for example. Another possibility is to develop real-time analytics, which will provide an instant change of fares following sudden developments that influence demand. A system that re-optimises revenue after every single booking does not yet exist, but Amadeus plans to offer this in 2011 or 2012."

Net revenue analysis

The advent of ancillary products requires airlines to forecast how individual buyers are likely to behave, which requires information on historical buying behaviour. A link between RM and CRM systems is therefore required. Passenger net values (PNV) are now being used for RM and forecasting demand. PNV is the

profitability that a passenger can be expected to contribute to the airline, based on the fare classes and ancillary products they have purchased in the past. With sophisticated CRM databases it is now possible to get detailed information of each passenger's past buying patterns and behaviour. The use of the internet and airline websites also contributes to gaining intelligence on passengers' buying behaviour.

In hand with a detailed analysis of each individual passenger's buying power as an element of forecasting demand, techniques are also being used to make more informed decisions in relation to fare availability. This includes analysing in detail which sales channels generate the high net revenues. This requires an examination of the net revenues generated through each distribution and sales channel. This not only requires the gross fares and sales taxes to be taken into consideration, but also the cost of sales incurred by selling through each sales channel. Once these two factors are known, the true net revenue realised through each sales channel, or each passenger's PNV, can be determined.

The objective here is to prioritise the sales channel that generates the highest net revenue. If all information and data used are accurate, this technique can increase revenue by 1-2%. This is only possible if the airline has the software and capability to conduct a strong analysis of variations in yield from different sales channels.

Once a detailed picture of net revenue generated in each class is formed, this data and information can be integrated into the number of seats sold and the expected future demand. A detailed algorithm based on expected marginal seat revenue (EMSR) can then be used to determine when to open and close fare classes can be used.

The challenge for airlines is that calculating the true PNV requires a lot of analysis, information and processing power. If an airline is able to get a true idea of PNVs, then RM can be made on the basis of profit management, rather than just generating the highest possible yields or revenues on the assumption that this will generate the highest profits. **AC**