# IMPROVED CUSTOMER PROFILING SYSTEM AND METHOD THEREFOR

## FIELD OF THE INVENTION

This invention relates in general to a customer or user profiling system. This invention also relates to a system for uniquely distinguishing one customer or user from another customer or user. Furthermore, this invention relates to a system for providing customer or user recommendations based on a determined profile. In addition, this invention relates in general to a system for providing customer or user recommendations which may be used by an airline or other transport services provider. The invention also relates to a database for use by such a system, and to an associated data structure of the database.

## BACKGROUND OF THE INVENTION

Many legacy reservation or inventory systems for use by an airline service provider or Global Distribution System (GDS) use UNYSIS or IBM platforms. These are often programmed using TPF or FORTRAN programming languages.

Furthermore, such systems typically use passenger name records (PNR's) to store a passenger itinerary. With such systems, it is difficult to distinguish between different passengers having the same name entry in the PNR and to determine whether different PNR's relate to the same or a different individual, particularly for domestic itineraries where no passport information is captured.

This is particularly the case when a passenger has not subscribed to a loyalty scheme, because less information is available to distinguish between different PNR's having the same name entry.

Furthermore, Global Distribution Systems for airlines typically provide services to travel agents, rather than to individual users or passengers. Thus, current GDS systems do not distinguish between PNR's having the same name entry. Further more with such systems, once a passenger has taken a flight, the relevant booking information for that flight is purged from the reservations system which means that no PNR history is stored in the GDS.

Furthermore, with legacy systems, airlines are only able to calculate value for passengers who subscribe to a frequent flyer scheme which may categorise passengers as Gold, Platinum, Silver, and Bronze and so on. Such systems require active opt-in by passengers, and as a consequence, only a smaller number of passengers subscribe to frequent flyer schemes.

SUMMARY OF THE INVENTION

The invention aims to address these problems by providing a system for uniquely distinguishing a customer based on information, such as personal information provided by the customer. The information may comprise one or more of name, address, and other personal information. Embodiments of the invention may use a combination of deterministic processing logic and probabilistic processing logic or algorithms. In some aspects if a passenger provides sufficient information, then the system may determine an exact match to a profile. However, if a passenger does not provide sufficient detail for an exact match, then the system may return a plurality of profiles, and embodiments of the invention may use a probabilistic approach and request further data from a customer to uniquely distinguish a customer from a plurality of different customers.

Embodiments of the invention may associate a customer profile with the customer. The system may also associate events, such as booking, travel and service events with the customer profile. The system may provide customer recommendations based on a unique profile associated with the customer and the events.

Accordingly, embodiments of the invention may distinguish between one passenger, for example John Smith, on one flight, from a passenger on a different flight having the same name and determine that these are in fact different individuals. This may be achieved by matching each individual's personal details to their Customer Profile. Accordingly, embodiments of the invention may uniquely recognise a passenger, rather than just a booking, event though the passenger may not subscribe to a frequent flyer scheme.

In this way, embodiments of the invention may capture events associated with a particular passenger and associate a number of different events with the same profile for a particular passenger. The event types may be extensible and configurable so that new event types may be added as event types are defined by updateable content in the database.

Embodiments of the invention may determine a user or customer value from the one or more passenger attributes. Preferably, embodiments of the invention may determine a user value based on their importance to the airline and, their frequent flyer tier level. For customers without frequent flyer membership, embodiments of the invention may determine a user value based on their importance and their flight history and bookings. Further, the value may be determined not only based on future bookings but also based on previous bookings which may have occurred in the past. The history may comprise a plurality of different reservation booking designators, RBD's, each designator associated with a segment of a journey. In some examples, a segment may correspond to a leg of a journey, but legs may be relevant to defining the movement of aircraft between an origin and destination, while segments may be relevant to defining the movement of passengers between what may be in some examples, a different origin and destination. Accordingly, a segment may comprise one or more legs.

Furthermore, embodiments of the invention may determine a link-adjusted value based on relationships between different profiles. Embodiments of the invention may comprise a system which determines a link- adjusted user, customer or passenger value. In one example, a link-adjusted passenger value may be determined based on a nearest neighbour link associated with the user, customer of passenger profile. Preferably, the link-adjusted value is stored in the customer's profile with a storage means.

Embodiments of the invention may store one or more determined customer or user values and may store one or more rules in a storage means such as a hard disk, flash memory, ROM, RAM or other storage means which will be known to the skilled person. The calculated values and rules may be decoupled. Accordingly, embodiments of the invention have the advantage that a value calculation algorithm can easily be modified whilst using the same rules. Accordingly, embodiments of the invention may have the advantage that a subscriber airline may easily change the value calculation algorithm to make adjustments to suit their own business needs. Embodiments of the invention may allow airlines to directly see how these changes affect value calculated for a typical range of hypothetical customers. Thus, the system may be configurable by a subscriber airline. This allows for greater flexibility for subscriber airlines that will usually configure selected weights or thresholds for the different types of information that feed into value calculation.

Embodiments of the invention may determine a numeric value associated with a user. The value may have finer granularity than the 5-tier system used in conjunction with frequent flyer schemes. In one specific example, passenger value may be characterised by a number in the range of 1 to 100 inclusive. However, embodiments of the invention may determine a tiered customer value such as a, b, c, or d and so on.

Embodiments of the invention may calculate value for all passengers irrespective of whether the passenger has subscribed to a frequent flyer scheme.

Further, embodiments of the invention may provide value-aware recommendations for both passengers who subscribe to frequent flyer schemes as well as those who do not subscribe to a frequent flyer scheme by using flight and booking history instead of frequent flyer tier information to calculate customer value.

The recommendations may be dynamically generated at a mid-tier level by taking mid-tier data into account when determining a user value. Embodiments of the invention may use the determined value to match or associate a recommendation to a user or customers.

Preferably, embodiments of the invention associate one or more events, which occur to, for example, a particular non-uniquely named passenger and associate one or more of those events with a unique identifier associated with a passenger name.

Embodiments of the invention may comprise storage means for storing one or more events as well as storage means for storing one or more bookings. The events may be associated with one or more of bookings. Preferably, bookings may be stored for one year. In this way, embodiments of the invention may have access to much more history than is currently available to CRS using a PNR based system. Subscriber Airlines may also elect to store bookings for longer than a year.

A system embodying the invention may determine that one or more events may have occurred an airport, or even prior to arriving at the airport, for example during the booking process.

The events may be recorded in a profile uniquely associated with one passenger. For example, a passenger may call customer service helpline, and this event may be store in profile would never be stored in a PNR based system. Customer interests such as hobbies

and so on may also be taken in to account match recommendations to a particular and preferably unique passenger profile.

Embodiments of the invention may match recommendations to a profile based on a customer's events, value, birth date and interests.

Embodiments of the invention may recognise or distinguish between different customers based on information provided by a customer. This is in contrast with known PNR based systems, which only recognise bookings.

Embodiments of the invention may uniquely recognise a customer and associate one or more events with that particular customer. Preferably, the system determines a value associated with that customer.

The association of events with a particular customer and the calculation of a value associated with the customer may enable recommendations to be made for a particular customer. Optionally, interests recorded by customers may further enable recommendations to be made for a particular customer.

Embodiments of the invention may comprise an algorithm which takes customer interaction with a subscriber airline into account and whether a disservice has occurred, or/and whether it has been resolved, when providing recommendations. For example, if the system determines that the disservice has not been resolved, then assigned customer value is increased by a predetermined value.

Embodiments of the invention may provide a service, which obtains a customer, profile value and determines a modified customer profile value. Preferably, the system generates recommendations based on the rules.

Embodiments of the invention may send one or more customer values to external services for use in other value-aware algorithms such as preferential seating re-accommodation. This may be performed using XML or other structured message types to exchange information.

At a profile level, embodiments of the invention may use a profile link entity to link one profile to another, different profile. Embodiments of the invention adjust the value of the

profile based on a link distance of one. For example, a profile may be linked to a related profile.

Embodiments of the invention generate one or more recommendations based on a determined adjusted user value and a determined event associated with a user. The recommendations may be generated in real time in response to a user interacting with a touch point such as check-in, security, boarding, or departure gate. The user may interact by scanning a boarding pass or passport on a scanning device.

Events may be triggered by a number of different processes with which the customer or user interacts with a product or service provider or airport infrastructure provider. The events may comprise an indication that a user has made or changed a booking, or has completed a journey or flight.

When an event occurs, embodiments of the invention may update a profile activity associated with a unique customer with the event.

Events may trigger the system to automatically generate a recommendation. A customer service executive may use a system embodying the invention to retrieve a profile associated with a customer and display one or more events which are associated with the profile. Disservice events may remain 'unfulfilled' in the profile until a recommendation has been offered to the customer to recover from the disservice. In this way, an airline can ensure that recovery actions are always taken for customers who have experienced a disservice.

## BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of the main functional components embodying the invention;

Figure 2 is a schematic diagram of an embodiment of the invention showing a logical level architecture of a customer profile system which has been simplified for clarity;

Figure 3 is a diagram showing some example rules used by embodiments of the invention;

Figure 4 shows graphical user interface for use by a user such as a customer service executive which allows rules to be established for recommendations based on events according to airline policy on customer service;

Figure 5 shows a further graphical user interface for use by a user such as a customer service executive which allows recommendation rules to be viewed, edited, and/or deleted;

Figure 6 shows a further graphical user interface for use by a user such as an airline employee which allows a recommendation to be viewed on a reservation desktop;

Figure 7 is a flow diagram showing the processing steps performed by an embodiment of the invention as well as how an embodiment of the invention interacts with other systems;

Figure 8 shows a further graphical user interface for use by a user such as an airline employee showing a profile activity screen;

Figure 9 is a flow diagram showing the main steps performed by an embodiment of the invention;

Figure 10 shows how an event such as a booking event may trigger a customer profile or/and PNR state change;

Figure 11 shows a composite service process view according to a particular example;

Figure 12 shows the structure of an operational customer value; and

Figure 13 shows how differ OCV's associated with different customers may be compared or ranked.

The following description is of a system for use in the aviation industry, but this is exemplary and other applications of the invention will also be discussed. For example, the system may be used in any environment where a product or service is provided to a user or customer, or indeed in any environment where user profiling is performed. Thus, embodiments of the invention find application in the travel industry in general (for example rail, air, coach and the like), but also in the ticketing industry, such as ticketing for theatre, cinema, and the like. The ticket relates to a journey between an origin and destination, for example two airports.

The system may be embodied in a hosted system (for example hosted by an airline) which may use API communications protocols to communicate with external systems such as reservation systems.

Figure 1 is a schematic diagram showing the service architecture of a system embodying the invention. This service may be provided as a part of a Horizon Customer Profile product option within a SITA Reservations Desktop GUI.

In this embodiment, recommendations are built on a SOA suite Oracle BPEL platform. However, other platforms known to the skilled person may be used. For example, other platforms or programming languages may be used such as C++, JAVA, and .xml may be used as well as other programming languages which will be known to the skilled person. For example, embodiments of the invention may use one of these programming languages to provide a web-based service.

The system 200 may comprise one or more of the following components: a server 103 such as a SRDT computer server which is communicatively coupled, via wired or wireless transmission means which will be know to the skilled person, to an Oracle BPEL process manager residing on computer or server 101. In the schematic diagram of figure 1, two separate computer servers 101, 103 are shown, but in principle, a single server may be provided which both generates one or more recommendations and retrieves one or more profiles.

In the schematic diagram of figure 1, a customer profile and recommendation rules are schematically illustrated as being stored on separate storage means, but the customer profile 105 and rules 109 may be stored on a single storage means. In any case, the stored rules 109 and customer profile 105 are communicatively coupled to the BPEL layer server 101. Accordingly, the BPEL layer server 101 may retrieve one or more rules from the storage means 109. Further, the server 101 may also retrieve one or more customer profiles from the storage means 105. Finally, the system 200 may comprise a reservations or bookings system or server such as a SITA reservations or bookings system or server 107. The reservations server 107 controls the availability of seats on a flight or leg/segment of a journey, and will not be described in further detail as such reservations systems are known to the skilled person.

When a profile is retrieved, the system may use mid-tier architecture to obtain the value of the customer based on the profile and generates the recommendations by applying a rule that may be configured by an airline, to the profile that has been retrieved. Determination of the customer value is described in detail below with particular reference to figure 3 of the drawings.

The rules and recommendations will be described in further detail with reference to figures 5 and 6 below. However, recommendations may be thought of as alerts that are displayed to an agent that helps the agent understand the airline's customer service response to a specific customer given detail of that customer including their value and any events that have been recorded in the customer's profile. Recommendations may be dynamically generated based on the interaction that occurs between the agent and the customer's profile. Recommendations may comprise textual alerts and may be recorded in the profile, described in further detail below.

Figure 2 is a schematic diagram of an embodiment of the invention showing a logical level architecture of a customer profile system embodying the invention which has been simplified for clarity. This may be referred to as a drillable data dictionary comprising various different entities, attributes as well as relationships or associations between the different entities and different attributes.

An entity may also be referred to as a table, while an attribute may be referred to as columns or fields. Entities are uniquely identified by Primary Keys while relationships between different entities or attributes may be determined by one or more Foreign keys i.e. a key in an entity that is not the identifying Primary Key of the entity, but is rather a reference to the identifying Primary Key of a related Foreign entity.

One example of an entity is a booking history value entity that a subscriber (such as an airline) assigns by Distance (International/Domestic), Cabin Class and Reservations/Booking Designator (RBD) list, and so on. A

The booking history value entity may comprise one or more attributes or characteristics.

For example, the attributes may comprise a profile attribute, a frequent flyer attribute or a booking history attribute, as described in further detail with reference to figure 3 below.

Profile attributes are shown within the dashed line 301 in figure 2, while recommendation attributes are shown within the dashed line 305, and event attributes are shown within dashed line 307 in figure 2. Figure 2 also shows attributes within the dashed line 303 which may be used in the determination of a subscriber value calculation. The value determination may be performed by computer hardware or software which may be separate from the database.

The profile main tables are shown enclosed within the dashed line 301. A profile table may comprise, an individual profile subtype, INDIVIDUAL_PROFILE. The

INDIVIDUAL_PROFILE entity is a subtype of the PROFILE entity and may store details of individuals.

Each of these sub entities may comprise an IMPORTANCE_CODE attribute. This attribute may comprise code representing the importance of the Customer for use in the Value Calculation algorithm. Values include VIP = Very Important, VVIP = Extremely Important, CIP = Commercially Important.

Each of these sub entities may further comprise a CUSTOMER_VALUE attribute. This attribute may comprise a value which has been assigned to the Individual by or on behalf of the subscriber. It may represent the value of the Individual to the Subscriber.

Further each of these sub-entities may further comprise a LINK_ADJUSTED_CUSTOMER_VALUE. This value may be determined by adjusting the CUSTOMER_VALUE to take into account the value of any linked Profiles.

Embodiments of the invention may copy a profile identifier into a profile link. In this way, embodiments of the invention may only consider links where the profile identifier is present in profile link. A link usually comprises two different profile identifiers and individual customer profiles may be additionally be linked to corporate or travel agency profiles.

Shown within a dashed line 303 in figure 2 is a schematic diagram showing the different parameters or attributes which embodiments of the invention may take into account when performing a subscriber value calculation. In this example, the determination of the subscriber value may take one or more of an importance value, frequent flyer tier value, booking history value and weighted flights taken parameters into account when determining a subscriber value.

The SUBSCR_VALUE_CALC_CONFIG entity may define weightings within a Value Calculation Rule Configuration for a Subscriber. Each Subscriber may have a different set of rules for each Profile Type. As part of the rule the contribution of each attribute to the overall value calculation may be specified. This will be described in further detail below with particular reference to figure 3 of the drawings. Attributes may be in the range from 0 to 100 percent contribution and the total of all attributes may add up to 100 percent i.e. IMPORTANCE_WEIGHTING_PCT + FF_BOOKING_HIST_WEIGHTING_PCT may equal 100 in some examples.

The IMPORTANCE_VALUE attribute may comprise a value defined for the IMPORTANCE_CODE by the Subscriber for each Profile Type, as a contribution to the calculation of Profile Value.

The FF_TIER_VALUE logical entity may comprise a value defined for the FF_Tier by the Subscriber for each Profile Type, as a contribution to the calculation of Profile Value.

The BOOKING_HISTORY_VALUE logical entity may comprise values that a Subscriber assigns by Distance (International/Domestic), Cabin Class and RBD list, as a contribution to the Value Calculation algorithm, subject to the weighting defined in SUBSCR_VALUE_CALC_CONFIG.FF_BOOKING_HISTORY_WEIGHTING_PCT. These values may be multiplied by the values in WEGHTED_FLIGHTS_TAKEN to determine the contribution of a Customer's booking history to their value. In some examples, the information in this table and in WEIGHTED_FLIGHTS_TAKEN is only used as an alternative to FF Tier when the Subscriber has no Frequent Flyer Scheme or when the Customer is not a member of the Subscriber's FF scheme.

The WEIGHTED_FLIGHTS_TAKEN logical entity may comprise values that a Subscriber can define any number of ranges, each of which is a range of total flights flown, and may define values multipliers for each of those ranges to be used in the Customer Value Calculation algorithm. Only the upper bound of the range needs to be stored in order for the service to derive the actual ranges. The first range starts at 0, all subsequent ranges may be contiguous and the last range has no upper bound. For example if a Customer has flown 20 flights and there is a range defined as 16 to 21 then the Value associated with that range is incorporated into the Value Calculation algorithm to be multiplied by the Distance/Cabin Class/RBD values in BOOKING_HISTORY_VALUE and then subjected to the FF_BOOKING_HIST_WEIGHTING+PCT stored in the parent Rule in SUBSCR_VALUE_CALC_CONFIG. In some examples, the information in this table and in BOOKING_HISTORY_VALUE is only used as an alternative to FF Tier when the Subscriber has no Frequent Flyer Scheme or when the Customer is not a member of the Subscriber's FF scheme.

Shown within a dashed line 305 is a profile recommendation table, entity or data, PROFILE_RECOMMENDATION. This may comprise a list of Recommendations that have been acted upon for the Profile i.e. an Agent has noticed a recommendation relevant to a Profile and has followed or actioned the Recommendation. The Agent who actioned the Recommendation is recorded along with the date and time of actioning and if Customer acceptance of the Recommendation is needed (as determined by the ACCEPTANCE_REQUIRED_IND in SUBSCRIBER_RECOMMENDATION) then whether or not the Recommendation was accepted should also be recorded by setting the ACCEPTED_IND.

Also shown within dashed line 305 of figure 2 is a SUBSCRIBER_RECOMMENDATION entity. This may comprise data defining Recommendations entered by a Subscriber that

are available to be matched to the Subscriber's Profiles and displayed to an Agent who may elect to offer the Recommendation to a Customer. Recommendations either require acknowledgement (acceptance or rejection) or not. In some examples, recommendations that do not require acknowledgement are not stored in the Profile. Those that do are only stored in the Profile (in PROFILE_RECOMMENDATION) if the Recommendation was either Accepted or Rejected. If it was neither of those then we can infer that the Recommendation was ignored (whether by the Agent or by the Customer is irrelevant as the consequence is the same) in which case it is not stored in the Profile and it is available to be made again. Some Recommendations may be for particular Event Types and are matched to a profile containing instances of those Event Types (in PROFILE_EVENT). If such a Recommendation is stored in the Profile then it is also linked to the Event or Events that caused it to be matched to the Profile, thereby fulfilling the Event and ensuring that no further Recommendations for that PROFILE_EVENT are matched to the Profile.

Also shown within dashed line 305 is a RECOMMENDATION_EVENT_TYPE entity. This may comprise data which enables Subscribers to associate Recommendations with Event Types for the purpose of matching Recommendations to Profiles, for example, to offer service recovery for an adverse Event Type such as an Offload, or flight disruption event such as delay, cancellation, or re-route event.

Finally, also shown within dashed line 305 of figure 2 is RECOMMENDATION_INTEREST logical entity. This may comprise data which enables Subscribers to associate Recommendations with Interests for the purpose of matching Recommendations to Profiles having the same or similar Interests.

Logical entities associated with events are also shown within figure the dashed line 307 of figure 2. Shown within dashed line 307 is an event table, entity or data. This entity records the details of the occurrence of events, which involves particular profiles. By definition, an Event always involves at least one Profile. An Event may also involve more than one Profile; for example, a Booking Event will involve all of those Profiles which are travelling on that Booking. An Event has an Origin which must be one, and only one, of an Agent, a System or a Profile. In some examples, this entity is not updatable.

As can be seen from figure 2, events are associated with a particular profile, and as previously described, each profile may be associated with a value. Further, each profile may also be associated with a LINK_ADJUSTED value.

The following section describes how the link between a particular event and a particular customer is made. When a PNR or Customer Journey (i.e. booking) is created the Customer Profile ID of the Customer(s) is included in the booking information so when an event is generated for the booking it is passed to the Customer Profile service with the

Customer Profile Id(s) included in the Event message. This allows the Event to be matched to the Customer Profile(s) on the unique identifier(s) of the Profile. The creation of a Booking and the subsequent generation of a Booking Event are not described in the CP data dictionary because those functions are not part of the Customer Profile domain - they are part of the Customer Journey domain.

Other (non-booking) Events can also be matched to Customer Profiles usually this relies on the Customer Profile ID(s) being known by the Service generating the Event at the time of Event Creation and included in the Event message. Customers only have to identify themselves to a Service for the Service to retrieve their Customer Profile(s), complete with ID(s), and subsequently generate Events that can be uniquely matched to the Customer Profile(s) by way of the Customer Profile ID(s).

The event may be associated with a profile or user based on a link between a Profile Identifier and a Reference to that Identifier within the Event.

The link may be a direct or indirect link, and in the example shown in figure 2 the profile attribute and event attribute are indirectly linked via a profile event, which may be a sub attribute of the event attribute. An Event may involve many Profiles and, similarly, a Profile may be involved in many Events. This entity captures these details by mapping particular pairs of Profiles and Events.

Thus, regarding the association described in the previous paragraph, it should be noted that the attribute in question is the Identifier of the Profile (the Customer Profile ID). The Event message may contain a list of Customer Profile identifiers which is what enables the Event to be linked to the Profiles.

Thus it will be appreciated that an Identifier of an Entity is not an attribute in the context of the Entity it identifies (it is an Identifier and not an attribute) but it may be an attribute in the context of other entities - an attribute of type "Foreign Key" or "Reference".

From the foregoing, it will be apparent that according to the previously described relational data model, the way in which events are matched to profiles is somewhat different to the way in which recommendations are matched to profiles.

The matching of Recommendations to Profiles is done on the basis of matching attributes of Recommendation to attributes of Profiles while the matching of Events to Profiles is done on the basis of matching the Identifiers of the Profiles to one or more references to those Identifiers contained within the Events. One CP Identifier within the Event can match to only one Customer Profile which is the most direct and accurate form of matching there can be in databases, whereas with Recommendations, one attribute within the Recommendation could match to many hundreds or even thousands of Profiles which is a much less direct and (intentionally) less accurate form of matching - the intention is that any attribute within a recommendation should indeed match to hundreds or perhaps thousands of Profiles. By using more than one attribute within a Recommendation the intersection of the sets of Customer Profiles that the attributes match to reduces the final matched set of Profiles for a Recommendation to tens or perhaps hundreds of Customer Profiles.

In one example, a particular customer profile identifier, for example the identifier of a profile associated with a first customer, such as the daughter of an executive of a company, may be included in a profile link, wherein the link comprises two different profile identifiers, one associated with the first customer and the other associated with a second customer for example an executive of a company.

For example, the processor may determine a link-adjusted customer value based on data associated with the profile link. In some specific examples, a link-adjusted customer value may be determined by determining the customer value associated with a profile identifier, for a second customer, stored in a profile link. In one specific example, the processor may increase a customer value by a predetermined value if the processor determines that the customer value associated with the customer profile for the second customer is greater than the customer value associated with the second customer profile.

Next nearest neighbour links may be taken into account when determining the link adjusted value. For example, a first customer profile associated with a customer may comprise a profile link. The profile link may comprise first and second profile identifiers associated with the first customer and a second customer respectively.

A second customer profile may be associated with the second customer. The second customer profile may have a further profile link. The further profile link may comprise two different profile identifiers, one associated with the second customer and a third profile identifier associated with a further, third customer.

In this example, the processor may determine a link-adjusted customer value based on data associated with the profile link and data associated with the further profile link.

In one specific example, a link-adjusted customer value may be determined by determining the customer value associated with a profile identifier stored in the profile link and the customer value associated with a profile identifier stored in the further profile link.

In one specific example, a link-adjusted customer value may be determined by determining the customer value associated with a profile identifier, for a second customer, stored in a profile link, and the customer value associated with a further profile identifier, for a third customer stored in a further profile link where the third profile link is associated with the first customer and a third customer, and not the second customer.

The processor may increase a customer value by a predetermined value if the processor determines that the customer value associated with the customer profile for the third customer is greater than the customer value associated with the first customer profile, irrespective of whether the processor has increased the customer value for the first customer, as previously described with reference to nearest neighbour links.

In addition, even if the processor has previously increased the customer value for a first customer by a predetermined amount, the processor may make a determination of whether the customer value associated with the customer profile for the third customer is greater than the customer value associated with the second customer profile. The processor may then increase or further increase the customer value for the first customer by a predetermined amount. Any of these values may be stored in storage means.

In this way, recommendations may be provided to a subscriber airline based on an event or/ value or both. Figure 2 also shows a PROFILE_INTEREST logical attribute. This attribute may comprise data, for a particular Individual Profile, which records details of the Customer's Interests. Typical examples include 'Football' and 'Opera'. Note that this entity is not updatable.

Figure 3 is a diagram showing some example rules used by embodiments of the invention and how different values may be associated with different profile attributes. In figure 3, some specific example values are shown, but of course, these are only examples. For example, a Blue level frequent flyer tier level is associated with value of 5, a Bronze tier

frequent flyer level is associated with a value of 15, a Silver tier frequent flyer level is associated with a value of 20, a Gold tier frequent flyer level is associated with a value of 30, and a Platinum tier frequent flyer level is associated with a value of 50. Further, as shown in figure 3, a domestic first class booking history RBD is associated with a value of 3, a domestic business class booking history is associated with a value of 2, a domestic premium economy booking history RBD is associated with a value of 1.5 and a domestic economy RBD is associated with a value of 1. The specific RBDs are not shown in figure 3, but these usually comprise one or more alpha-numeric or alphabetic characters such as F, J, Y, S, L, X or Z which may be associated with different ticket types sold by an airline.

In one example, a Horizon Customer Profile system embodying the invention may either calculate a value itself with an algorithm or it may store a value calculated by another source such as an external CRM system. In the example shown in figure 3, for a specific customer, a value of 20 is determined by summing the booking history values for that customer or passenger of 3, 2, 1.5 and 1 which equals 7.5, which falls within the second banding of weighted flights taken of between 3 to 16. A mapping may be provided from the determined sum of booking history values of 7.5 to a value of 20, such as a customer value.

The algorithm for customer value calculation within Horizon Customer Profile may be performed with the following options but configured and weighted by an airline.

The value may be a number between 1-100 with 100 being the highest value. The items that are included in this value calculation are:

1. Frequent Flier tier level;
2. No. and value of bookings (by RBD) in a 12 month period; and
3. Profile attributes (e.g. VIP, Commercially important)

Each area has a percentage of the total and a value associated with it. The value may be determined by adding of all the factors provides a value to be used in processes throughout the Passenger Service System (PSS).

In the Customer Value Rules there may be 5 tables which may be used to calculate the Customer's Value to the airline or subscriber. The tables are described in further detail below:

- Weighting Criteria – This table splits the customer value between the customer's attribute, as determined by the subscriber, and the customer's frequent flyer status or booking history, if the customer does not have a frequent flyer status. These 2 fields may not be greater than 100%.
- CP Attribute – The subscribing airline may assign a designation to a customer such VIP. The subscriber assigns each designation a value indicating its importance.
- Frequent Flyer (FF) Tier – If a subscriber has a frequent flyer program it will have levels which provide specific benefits to the customer. The subscriber will assign a value to each level. The actual tiers will be pulled from the subscriber's FF database. The levels shown here are for explanation purposes only.
- Distance/Cabin – Booking history has 2 tables. The first is the Distance/Cabin. The distance portion is either domestic or international. There are 4 cabins which are associated with each distance. The cabin is determined by the RBD shown in the Value Rules Configuration. Each distance/cabin combination, there are 8, has multiplication factor (multiplier column) assigned by the subscriber which indicates the distance/cabin value to the subscriber. For instance the least expensive domestic economy may be valued at 1 and the most expensive, international first class may have a value of 4. Intermediate value fares may be associated with any value between 1 and 4.
- Weighted Flights Taken – This table gives the booking value of the flights as determined by totalling the distance/cabin flight segments.

In the following examples, one uses frequent flyer data and one using booking history data.

The passengers in these examples are made up on 50% Customer Profile Attribute and 50% FF Tier Level/Booking History

**Example 1: Passenger 1:** Normal and Blue

1. Normal has an Attribute Value of 10.
2. The Weighted Value of the CP Attribute is 50%. Multiply 10 by 50% = 5.
3. Blue Tier has a value of 10.
4. Weighted Value of the FF Tier is 50%. Multiply 10 by 50% = 5.

5. Weighted CP Attribute + Weighted FF Tier = Customer Value 5 + 5 = 10
6. 10 is the Customer Value which would be entered into the Customer Profile.

**Example 2: Passenger 6:** Normal, 1 Int'l economy, 4 Domestic economy.

1. Normal has an Attribute Value of 10.
2. The Weighted Value of the CP Attribute is 50%. Multiply 10 by 50% = 5.
3. Int'l economy has a value weighting of 1.5. Multiply the number of flights (1) by the multiplier (1.5) = 1.5
4. Domestic economy has a value weighting of 1. Multiply the number of Domestic economy (4) by the multiplier (1) = 4.
5. Total the weighted flights to get the total weighted value of the distance/cabin 1.5 + 4 = 5.5.
6. The answer in Step 5 is greater than 3 but less than 15. The Booking Value is 10.
7. Weighted Value for Booking History is 50%. Multiply 10 by 50% = 5.
8. CP Attribute + Booking History = Customer Value. 5 + 5 = 10
9. 10 is the Customer Value which would be entered into the Customer Profile.

In one example, a customer profile value rules simulator may be provided. The simulator may allow customers such as airlines to determine how customisation of their value calculation rules impacts the actual values calculated for a range of typical customers.

The simulator may determine a customer profile value as previously described to produce a table which may be displayed in a Graphical User Interface running on a computer or server. The Graphical User Interface may display the data shown in Table 1 below.

In the example table of values shown in Table 1 below, the current value is determined as a 50% weighting of CP Attribute and 50% weighting of Frequent Flyer (FF) tier Level/Booking History. Note that Passenger 4 calculates to 100. However, due to a mainframe restriction it is shown as 99. Further note that Passenger 8 calculates to 62.5. However, due to a mainframe limitation it is rounded off, in this case rounded up to 63.

| Passengers | Type | Previous Value | Current Value |
|---|---|---|---|
| Passenger 1 | Normal, Blue | | 10 |
| Passenger 2 | VIP, Silver | | 40 |
| Passenger 3 | VVIP, Silver | | 70 |
| Passenger 4 | VVIP, Platinum | | 99 |
| Passenger 5 | CIP, Bronze | | 60 |
| Passenger 6 | Normal, 1 International Economy, 4 Domestic Economy | | 10 |
| Passenger 7 | CIP, 12 International First Class, 2 International Business Class, 20 Domestic First Class | | 90 |
| Passenger 8 | CIP, 20 Domestic First Class | | 63 |
| Passenger 9 | VVIP, 6 International Business Class, 2 International Premium Economy, 8 Domestic Economy | | 60 |
| Passenger 10 | VIP, 36 Domestic Business Class, 4 Domestic Economy | | 50 |

Table 1: Determined customer profile values.

Thus, in this example, the agent originally created the Value Rules for Individual Customer Profiles with a 50/50 split. In order to see what impact an 80/20 and a 70/30 split has on the customer value, an agent may use the simulator to run these scenarios without changing the actual settings.

In the example table of value shown in Table 2 below, the current value is determined as an 80% weighting of CP Attribute and 20% weighting of FF Tier Level/Booking History as listed in the Current Value column. Note that Passenger 4 calculates to 100 at both 50/50 and at 80/20. However, due to a mainframe restriction it is shown as 99.

| Passengers | Type | Previous Value | Current Value |
|---|---|---|---|
| Passenger 1 | Normal, Blue | 10 | 10 |
| Passenger 2 | VIP, Silver | 40 | 40 |
| Passenger 3 | VVIP, Silver | 70 | 88 |
| Passenger 4 | VVIP, Platinum | 99 | 99 |
| Passenger 5 | CIP, Bronze | 60 | 84 |
| Passenger 6 | Normal, 1 International Economy, 4 Domestic Economy | 10 | 10 |
| Passenger 7 | CIP, 12 International First Class, 2 International Business Class, 20 Domestic First Class | 90 | 96 |
| Passenger 8 | CIP, 20 Domestic First Class | 63 | 85 |
| Passenger 9 | VVIP, 6 International Business Class, 2 International Premium Economy, 8 Domestic Economy | 60 | 84 |
| Passenger 10 | VIP, 36 Domestic Business Class, 4 Domestic Economy | 50 | 44 |

Table 2: Determined customer profile values according to a changed weighting.

In the example table of value shown in Table 3 below, the current value is determined as a 30% weighting of CP Attribute and 70% weighting of FF Tier Level/Booking History is in the Current Value column and 80/20 figures are in the Previous Value column. Note that Passenger 4 calculates to 100. However, due to a mainframe restriction it is shown as 99.

Also note that Passenger 8 calculates to 47.5. However, due to a mainframe limitation it is rounded off, in this case rounded up to 48.

| Passengers | Type | Previous Value | Current Value |
|---|---|---|---|
| Passenger 1 | Normal, Blue | 10 | 10 |
| Passenger 2 | VIP, Silver | 40 | 40 |
| Passenger 3 | VVIP, Silver | 88 | 58 |
| Passenger 4 | VVIP, Platinum | 99 | 99 |
| Passenger 5 | CIP, Bronze | 84 | 44 |
| Passenger 6 | Normal, 1 International Economy, 4 Domestic Economy | 10 | 10 |
| Passenger 7 | CIP, 12 International First Class, 2 International Business Class, 20 Domestic First Class | 96 | 86 |
| Passenger 8 | CIP, 20 Domestic First Class | 85 | 48 |
| Passenger 9 | VVIP, 6 International Business Class, 2 International Premium Economy, 8 Domestic Economy | 84 | 44 |
| Passenger 10 | VIP, 36 Domestic Business Class, 4 Domestic Economy | 44 | 54 |

Table 3: Determined customer profile values according to a further weighting.

Figure 4 shows a GUI embodying the invention which may allow a subscriber airline to establish rules for recommendations based on events. In one example, the events may comprise booking events or service/disservice events that may be recorded in a profile, together with the value or value range for a customer. Other events may comprise a new booking event, and update booking event, a cancel booking event, a check-in event, a departure status – flown event, a paid for a booking event an upgrade event, a downgrade event, a denied boarding event, a disruption event, a voluntary offload event, an involuntary offload event, a birthday event, a compliment event, a complaint event and a customer enquire event, but other events will be known to the skilled person.

In the specific example shown in figure 4, a user is in the process of creating a recommendation associated with a user in the value range from 10 to 50, which is also associated with a validity date range from 3 July 2014 to 31 July 2014. Further, in the example shown in figure 5, only some of the check boxes associated with one or more events have been ticked. This may mean that the particular recommendation is only associated with certain events such as denied boarding or disruption or involuntary offload event, and not the other events shown adjacent the tick boxes shown in figure 4. As previously described, rules may be established for recommendations based on events according to airline policy on customer service.

Once a recommendation has been entered in the text box adjacent “recommendation”, for example “Upgrade to business class” or “Complementary ticket”. Other recommendations may comprise text which may prompt a customer service executive to wish the customer a

happy birthday, apologise for offloading them last time on a previous flight, offer free 1st class lounge access, offer cheap ticket to a sporting or cultural event in their place of destination, offer free upgrade to a high-value customer and so on.

The user may then save the recommendation rule by clicking the “Save” button shown in figure 4. The airline may configure the text that is displayed to the user if the rule criteria are true. This may save the rule in a database, such as that previously described referring particularly to figure 2 of the drawings. In the example of figure 4, the recommendation rule can be flagged to indicate that acknowledgement is required. This may require the agent to ask the customer if they want to accept the recommendation or not.

The acknowledgement may be stored as an attribute and maybe associated with one or more entities by way of the relationships previously described with reference to figure 2, particularly referring to the elements enclosed with dashed lines.

In this way, a feedback loop between recommendations proposed to a customer by an airline user or subscriber may be made by storing data associated with a recommendation, which is indicative as to whether one or more recommendations have been accepted by a user.

In this way, an airline subscriber can manage recommendations based on whether a customer has accepted one or more recommendations, and figure 5 shows a GUI embodying the invention which allows recommendation rules to be viewed, edited, deleted and searched.

In this example, a rule is associated with a denied boarding event and involuntary offload event. The rule is also associated with a customer value range of 10 to 50, which may be determined as previously described. Furthermore, in this example the rule is also associated with a particular validity period from 3 July 2014 to 31 July 2014. Furthermore, in this example, the recommendation is “Offer lounge access” and an acknowledge field is also associated with the recommendation. This may mean that if a customer wishes to accept the recommendation, that an acknowledgement is sent from the server running the GUI and that the acknowledgement may indicate that the recommendation has been accepted.

As previously noted, with reference to figure 1, a customer profile and recommendation rules are schematically illustrated as being stored on separate storage means, however, the customer profile 105 and rules 109 may be stored on a single storage means. A recommendation may be retrieved from a storage means, for example one of the storage means shown in the schematic diagram of figure 1 in the following manner.

A system embodying the invention may first check for a recommendation by calling the Recommendation Service in the Mid-Tier. The system then receives a recommendation for each event and non-event type. The system responds with all the recommendations, usually, up to a maximum of 30 recommendations that apply to a passenger. These may be both event and non-event based. If none of the recommendations apply to the passenger, no recommendation will be returned. The recommendations are usually displayed in groups of 5 until all 30 have been displayed. In this way, the system responds with the recommendation associated to the customer profile matching the event/non event types.

Figure 6 shows a GUI for use by a subscriber such as an airline employee and how recommendations may be viewed on a reservation desktop. For example, an airline may view these recommendations when the profile is retrieved during an interaction with the customer.

In the example shown in figure 6, data associated with a particular customer profile is displayed, for example one or more of title, first name, middle name, last name, gender, data of birth, country, number of dependencies, attribute such as a customer value associated with a customer profile, occupation such as executive, and industry sector.

If the recommendation requires acknowledgement – the agent selects to accept/reject the recommendation. If the customer rejects the recommendation, then a user selects the reject button in the GUI, and this may be recorded in the activity profile. The recommendation is then not shown again to the user.

Recommendations may be recorded in the profile activity and this can show what recommendations are being accepted and what are being rejected. In this way, an airline can change rules to provide better control of their service situations.

In some examples, recommendations may be linked to merchandising to utilise recommendations to drive selling directly to customers based on profile attributes, events and value to differentiate – e.g. a higher value customer can buy an ancillary service but with a higher discount.

Figure 7 is a flow diagram showing the processing steps performed by an embodiment of the invention as well as how an embodiment of the invention interacts with other systems.

For example, as shown in figure 7, a customer may trigger an event via an interaction with a subscriber agent using a system embodying the invention, for example by making or changing a booking. Furthermore, a customer may also trigger an event by making or changing a booking via a computer, laptop computer or other portable computing device. A customer may also trigger an event based on an interaction with a kiosk at an airport, such as Kiosk for printing a boarding pass.

In this embodiment, a trigger event is received by a computer server or system embodying the invention. The event may be processed as previously described to produce an event recommendation, or according to the flow diagram of figure 9, or to produce some other post event activity as shown in figure 7. For example, the post event activity may comprise no further action or the trigger event may be processed by the system to trigger another event.

Event Errors

Events may be notified from various sources to the Customer Profile system where they are processed and recorded against related customer profiles. Some of these events may be rejected by the system based on business rules or system failures. The rejected events may be logged in the Event Error Log. Usually, rejected events are manually processed.

Figure 8 shows a further graphical user interface for use by a user such as an airline employee showing a profile activity screen. This shows current bookings and recorded events. As previously described, recommendations may be recorded in a profile activity and the profile activity screen may show which recommendations are being accepted and what are being declined. This may allow an airline subscriber to adapt rules so that recommendations are more likely to be accepted by a user or customer such as a passenger In this way, a subscriber may have better control of their service situations.

In the specific example of figure 8, the profile activity screen shows data associated with a particular named user identified by name such as first name or surname. The user may have an associated customer number, which in this example is a numeric value, such as 501003130.

In this example, a plurality of different records are associated with this user. Each record may be identified by a record locator identifier which may comprise an alpha-numeric sequence of characters. Each record locator identifier may be associated with a departure date identifier and preferably a travel identifier. The departure date may be in the form of DAY/MONTH/YEAR. The travel identifier may identify a journey between two airports such as Bengaluru (BLR) to London Heathrow (LHR). The journey may be a non-stop flight or may comprise one or more stops between the passenger's origin and destination. Thus, in the specific example of figure 8 each record may be associated with a leg or segment of travel.

In the Profile activity screen shown in figure 8, no time or date filters have been applied to the text boxes adjacent "From" or "To". However, by selecting a "Customer Journey Event" filter from the drop down box shown in figure 8, only Customer Journey Events are shown in the Results pane in figure 8. However, all events are shown since no particular event category has been selected in the Event drop down box of Figure 8.

The results shown in the results pane of figure 8 show a number of different events associated with a particular customer profile. As previously described, the events may comprise one or more of Check-in, Departure Status – Flown, Update Booking, Cancel Booking, New Booking and so on. Further details of the event may be obtained by selecting the underlined text under the details column shown in figure 8.

In the specific example shown in figure 8, no recommendations or acknowledgments are associated with a particular event. However, other examples of how recommendations and acknowledgements may be associated with particular events have been previously described.

Various method steps which may be performed by an embodiment of the invention will now be described with reference to figure 9 of the drawings. In general, messages may be sent to or/and received by different components of the system using XML messages or other

structured message types. This may allow for the exchange information between components of the system.

Referring now to figure 9, the process starts at step 901. At step 903, a customer service executive may make a request for a profile, for example using a GUI as shown in figure 8 which may be running on a server, laptop or other computer.

At step 905, a particular customer or user profile may be retrieved from the storage means on the basis of matching Frequent Flyer number, if the processor determines that the customer has a Frequent Flyer number stored in a database. In this way, a profile may be retrieved from the storage means by means of definitive search criteria. Definitive search criteria may include one or more of Customer Number/Reference, Frequent Flyer Number, and so on. When such details are available the system will retrieve a single profile matching the search criteria.

If the processor determines that the customer does not have a Frequent Flyer number stored in the database, then a profile is retrieved from the storage means on the basis of name plus any or more of the following personal details comprising credit card details, postal address, business address, mobile phone number and email address. Thus, a search key may be used to retrieve one or more profiles from the data base. The key may comprise information such as name and optionally one or more further details outlined above.

If a single profile entry matches the key, then that single profile is returned to the mid tier processing. If a number of records match the search key, then a message is sent to an airline's agent (travel agent or check-in agent) or directly to the customer requesting the customer to provide more information in order to match them uniquely to a single profile.

Accordingly, one or more of customer name plus any of the fields mentioned above may be used to search for a customer. Usually, only when multiple matches are retrieved (for example same name and same address) embodiments of the invention request more details to deterministically and usually uniquely match the customer to a stored customer profile. However, in some specific examples, only the previously described details are used in the search, and embodiments of the invention do not necessarily search for Age or any other details not previously described.

In either case, at step 907, a get profile request is made to retrieve the profile which is uniquely associated with the user from a database.

A value, for example a customer value may be calculated or determined. This may be performed at any stage before the customer value is used when recommendations are generated. For example, the value may be determined after a profile is retrieved at step 905 but before recommendations are generated at step 913. The value may be calculated using value rules 911 as previously described. At step 913, one or more recommendations are generated as previously described based on the determined value and based on one or more recommendation rules retrieved from a storage means, at step 915. A value may also be determined by retrieving a previously determined value associated with the profile from a database.

At step 917, one or more of the profile, value and recommendations may be displayed, for example using a GUI as shown in figures 4 to 6. At step 919, if the recommendation is accepted or rejected, then an acknowledgement is stored 921 in the customer profile database.

At step 923, the activity is displayed along with the recorded recommendation. The agent will usually then take any action implied by the recommendation if it was accepted. Finally, at step 925, the process ends.

From the foregoing, it will be appreciated that the mobile communication or client device may include a computing device, such as a desktop computer, a laptop computer, a tablet computer, a personal digital assistant, a mobile telephone, a smartphone, an internet enabled television, an internet enabled television receiver, an internet enabled games console or portable games device.

The server may comprise a computer processor running one or more server processes for communicating with client devices. The server processes comprise computer readable program instructions for carrying out the operations of the present invention. The computer readable program instructions may be or source code or object code written in or in any combination of suitable programming languages including procedural programming languages such as C, object orientated programming languages such as C#, C++, Java, scripting languages, assembly languages, machine code instructions, instruction-set-architecture (ISA) instructions, and state-setting data.

The wired or wireless communication s networks described above may be public, private, wired or wireless network. The communications network may include one or more of a local area network (LAN), a wide area network (WAN), the Internet, a mobile telephony communication system, or a satellite communication system. The communications network may comprise any suitable infrastructure, including copper cables, optical cables or fibres, routers, firewalls, switches, gateway computers and edge servers.

The system described above may comprise a Graphical User Interface. Embodiments of the invention may include an on-screen graphical user interface. The user interface may be provided, for example, in the form of a widget embedded in a web site, as an application for a device, or on a dedicated landing web page. Computer readable program instructions for implementing the graphical user interface may be downloaded to the client device from a computer readable storage medium via a network, for example, the Internet, a local area network (LAN), a wide area network (WAN) and/or a wireless network. The instructions may be stored in a computer readable storage medium within the client device.

As will be appreciated by one of skill in the art, the invention described herein may be embodied in whole or in part as a method, a data processing system, or a computer program product including computer readable instructions. Accordingly, the invention may take the form of an entirely hardware embodiment or an embodiment combining software, hardware and any other suitable approach or apparatus.

The computer readable program instructions may be stored on a non-transitory, tangible computer readable medium. The computer readable storage medium may include one or more of an electronic storage device, a magnetic storage device, an optical storage device, an electromagnetic storage device, a semiconductor storage device, a portable computer disk, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), a static random access memory (SRAM), a portable compact disc read-only memory (CD-ROM), a digital versatile disk (DVD), a memory stick, a floppy disk.

Exemplary embodiments of the invention may be implemented as circuit board which may include a CPU, a bus, RAM, flash memory, one or more ports for operation of connected

I/O apparatus such as printers, display, keypads, sensors and cameras, ROM, a communications sub-system such as a modem, and communications media.

The flowchart of Figures 7 and 9 illustrate the operation of an example implementation of systems, methods, and computer program products according to various embodiments of the present invention. Each block in the flowchart or block diagrams may represent a module comprising one or more executable computer instructions, or a portion of an instruction, for implementing the logical function specified in the block. The order of blocks in the diagram is only intended to be illustrative of an example. In alternative implementations, the logical functions illustrated in particular blocks may occur out of the order noted in the figures. For example, two blocks shown as adjacent one another may be carried out simultaneously or, depending on the functionality, in the reverse order. Each block in the flowchart may be implemented in software, hardware or a combination of software and hardware.

Figure 9 shows an example of a recommendations process in which value is not calculated. In the example flow process, shown, it is not necessary to calculate value because a value has previously been calculated, as described above, which is then stored in a storage means. The stored value is associated with a particular profile.

Figure 10 shows representation of state transition in Customer Affinity. Events are triggered from external systems such as Reservation and Frequent flier system. As soon as the event messages reach mid-tier composite layer the Customer Affinity engine triggers, and a value is calculated or recalculated based on rules. Once a value has been calculated, the state of the profile changes from one state to another. Subsequent action triggers events back to RES system to label PNR with the new Profile Value.

Referring now to figure 11, this shows how a number of different components may be deployed on a computer or server. The components may be coupled to each other. This is schematically represented in figure 11 by lines. The components may be deployed at a mid-tier software level. The components may perform one or more of the method steps previously described. A customer affinity mediator service component 1101 may provide mediation for intra-component interaction. The main driver is the performance requirements and the method of interaction. A typical service bus (OSB) interaction is usually stateless and synchronous. Mediation is only necessary to implement a Validate, Enrich, Transform, Route, Operate (VETRO) pattern if necessary within the Service Component Architecture,

SCA layer. The VETRO pattern may provide typical functionalities of an Enterprise Service Bus. The Mediator may be a bus within the Mid-tier.

The SCA layer may be used to construct applications based on Service-Oriented Architecture (SOA) by assembling and composing existing Services to create new Services.

The mediator uses the underlying Event Driven Network to publish subscribe events between components. The VETRO pattern is a common composite pattern that combines multiple actions taken on a message when it is received.

When the mid-tier calculate value process determines that the customer value is same as an existing value, it is not necessary to call the create profile component 1103 or update profile component 1105.

In the example shown in figure 11, the customer affinity component 1101 is coupled to a retrieve customer profile component 1107. Further, if no customer exists or the customer value associated with a profile is not up to date, then the customer affinity component 1101 sends data to the create 1103 or update components 1105 as appropriate. In this example, the create component 1103 and update component 1105 are coupled to the customer value component 1109 which determines a customer value as previously described.

Figure 11 also shows a booking events process component 1111 and a frequent flyer service component 1113. Each of the booking events process component 1109 and frequent flyer service component 1111 is coupled to the customer value service component 1109. Accordingly, components 1109 and 1111 may send data to the customer value service component 1109. The customer value service component 1109 may use this data to determine the customer value as previously described. As represented by the lines to and from each of the above components, each component may receive data from other systems and may also output data to other systems as previously described.

The customer affinity mediator service component 1101 may perform a VETRO pattern and may route to the create/update components 1103/1105 or the retrieve component 1107 depending on the particular http request which has been received.

The create component 1103 and update components 1105 flow into the Customer Value process component 1109. The update component 1105, during the Customer Value process compares a newly determined customer value to a previously determined customer value. Based on the comparison, the customer value may be updated in the database.

Similarly, the booking event component 1111 and frequent flyer event component 1113 flow into the customer value component. The customer value component 1109 may determine a customer value based on data received from each of these components. Furthermore, from the foregoing it will be appreciated that embodiments of the invention may also be used by airport infrastructure operators who may wish to use a profiling system.

For example, if a user registers with an airport infrastructure provider to use a free wireless internet service by providing an email address and password, provided, of course, customer privacy is respected, airport operators may target offers or services to particular users.

Based on a reason provided by the user for being at the airport such as picking-up, travelling, dropping off, airport infrastructure provides may transmit, usually via wireless communications protocols which will be known to the skilled person, particular data to the customer. A system embodying the invention may also be used to send (usually via a wireless communication protocol) information or discounts to use retail establishments in the airport. For example if the user's propose at the airport is to pick up, then details of the arrival process, or an alert when plane has landed, baggage in hall etc may be transmitted to a user's portable communication device.

Further, merchandising processes may use embodiments of the invention to push offers directly to the customer based on the information known about the customer – attributes of the profile or activity.

From the foregoing, it will be appreciated that embodiments of the invention may relate to a Customer Profiling system for example where a Customer may be a passenger, a travel or airline agent, or a company or other organisation. It also relates to a travel customer profiling system

Embodiments of the invention find particular application for use within the Travel Industry but also finds application in the retail industry or other customers.

For example, it may find application for customers by providing a system capable of taking orders, such as a booking, from identifiable customers and which generates events that are linked to, or associated with, their Customer Profile.

Preferences may be extended to include the ability to define any type of preference. The preferences may be user definable. The value calculation algorithm may be extended to be specific to the retail industry sectors.

Moreover, embodiments of the invention do not necessarily determine a customer value calculation or events since embodiments of the invention may relate to a profiling system.

Embodiments of the invention may not only capture preferences but may also capture a customer's hobbies and interests, their birthday and their frequent flyer tier information.

The following examples describe some additional ways in which the determined customer value may be used.

- In any over-booking situation, the determined customer value may be used to determine a customer ranking order. This can help an agent make an informed choice in accepting or moving customers to Standby.
- If a customer value-Assisted Acceptance flag is ON, Customers can be put on STBY automatically hence reducing load on STBY clearance and saving time for agents.
- If a customer checks in together with other customers, his chances of being accepted can be improved (or reduced) based on the determined customer value.
- The determined customer value may be used for determining a customer's seating. For example, the determined customer value may be used to provide the best seat / pre-seat a customer. This may reduce the need for manually pre-seating groups.
- The determined customer value may be used for an Aircraft change scenario to provide best seats to particular customers.
- The determined customer value may be used to process whether a seat can be allocated for an auto service request, ASR.
- In an Equipment Change or disruption (transfer) scenario, the first customers who move to the transfer or "TO" flight may be those with highest determined customer value.

Since the determined customer value may be based on operational parameters; a customer with special needs may be transferred first.

- When customers need to be regraded to make space in their current cabin, the determined customer value may be used to pick a customer for an upgrade or downgrade.
- Any list in the departure control system may be sorted based on the determined customer value. This may help agent to make an informed choice and override system's preferred order while performing the operation. A Standby list may use two forms of Ranking. The first ranking gives the order in which system will select customers for standby processing / recommendation. The second ranking sorts which customer to move (upgrade or downgrade) to make space in the cabin. The ranking may be hard-coded. However, the determined customer value may be used to make it flexible and in line with an Airline's policy for standby clearance.

**Operational Customer Value**

In a further example, a modified customer value, which is referred to as an Operational Customer Value (OCV) may be determined. As described in further detail below, this may be determined as an alternative or additional value to the Customer Profile Value previously described. However, usually, a key parameter for determining the OCV is the CPV. In cases where CPV has been used as an OCV parameter and the customer has not subscribed to Customer Profile or if a customer's profile Value cannot be retrieved, the value will be considered as 0. Both the Operational Customer Value (OCV) and the Customer Profile Value (CPV) may provide a unique and flexible and way for Airlines to rank their customers in a departure control system, DCS.

The OCV may be the customer value used for specific operations in a DCS. The Customer Profile Value (CPV) will usually be one of the key parameter used in OCV. Other parameters used for computing OCV may be operational in nature such as the Check-in Time and so on.

**Structure of the OCV**

An OCV of a customer may be a whole number that reflects weights for different parameters.

a. The range of OCV for customer is between 0 and 9999999999 inclusive.

b. Parameter weights may be within a scale of 0 to 99, both inclusive.

c. A single digit weight is converted to a 2 digit string by adding a leading 0.

d. A maximum of 5 parameters is supported initially.

In the example shown in figure 12, the OCV comprises 8 digits. The OCV is determined by concatenating four 2 digit values associated with 4 different parameters. In this example, the OCV is determined or calculated based on a first parameter such as a CPV and 3 other parameters. Weights may be assigned to one or more of the values of these parameters and the resultant number 89029919 is set as the OCV of a particular customer. For example, parameter 2 may be a frequent flyer value which may be weighted, parameter 3 may be a parameter which reflects a ticket class, and parameter 4 may be a parameter which reflects a booking time or check in time which is weighted to give more weight to passengers who book well in advance or passengers who check in early.

For example, a lower value for parameter 2 may indicate a passenger is a less valued customer, a lower parameter for value 3 may indicate a lower ticket class, while a lower value for parameter 4 may indicate that a passenger has not booked early or checked in early and may be regarded as less valuable. Other parameters which may be used to compute the OCV are listed in the table below.

**Parameters to compute the OCV**

| **Attribute** | **Impact on Customer Value** |
|---|---|
| Passenger Type | This attribute can be used to distinguish between commercials and staff and also within each group. |
| Weighting based on staff's seniority. | Using this attribute, an Airline can assign more weight to own customers as opposed to codeshare ones. |
| Airline Tier | This attribute is used to provide suitable weights to customers in Airlines own Frequent Flyer Tiers. |
| Alliance / Partner Tier | This attribute is used to provide suitable weights to customers in Airlines alliances or partner Frequent Flyer Programme Tiers. |
| Booking Cabin / Class | Booking Cabin or Class can be used as a weight during Regrade or other processes. |
| Booking Status | In general a confirmed booking status (HK) has more priority / weight over an unconfirmed status. |
| Booking Date / Time | Acceptance process could give more weight to passenger who booked well in advance. |
| Check-in Date / Time | Passengers checking in early could be given more weight in certain scenarios. |
| Number of Segments | During disruption (i.e. Transfer scenarios), this attribute could be used to assign more |

| | |
|---|---|
| | weight or priority to customers who have maximum number of segments. |
| Customer Profile Value | This is the strategic value that an Airline may determine for each customer. |
| Staff Date of Joining | Weighting based on staff's length of service. |
| Staff Onload / Standby Priority | Weighting based on staff's seniority. |
| Passenger SSRs | Any special requests added by the passenger. |

It will be appreciated that other parameters known to the skilled person may be used to determine the OCV.

When setting up the OCV, airlines usually select one or more of the above attributes. Airlines usually select a subset of the parameters listed above. Once airlines have selected a set or subset of parameters, the order of the parameters in the OCV may be selected. This is usually an important step because it usually has a major influence on the ranking, and comparison of OCV's. For example, if the CPV is set as the first parameter, customers with a higher CPV will have a higher ranking than customers with a lower CPV. Finally, airlines may define a default value or weight of the parameter, if for example no value is present for a particular parameter.

**Comparing OCV's**

Operational Customer Values associated with different customers may be compared as numerical values. The greater the OCV number, the higher the value. For example, as shown in figure 13, 4 different OCV's may be associated with four different customers which are sorted in ascending customer number in the first 2 columns of figure 13. These may be sorted by descending order, and the customer values shown at the right hand side of figure 13 have been sorted by descending OCV. Thus, the OCV associated with customer number 2 is ranked as highest, while the OCV for customer number 1 is ranked as second highest, while the OCV for customer number 4 is ranked as third highest, and finally the OCV for customer number 3 is ranked as lowest.

Further, a minimum, or maximum or average of a plurality of OCV's associated with different customers may be determined.

For example, when more than one customer is considered the minimum, maximum or average is determined from the whole OCV. Suppose that a first customer has an OCV = 504030 and second customer has an OCV = 402030. In this scenario, the minimum of the

two OCV values, Min = 402030 and is applied to both customers. Similarly, the maximum of the two OCV values, Max, = 504030. This may also be applied for both customers. The average of the two OCV values may also be determined, and computed as Ave= 453030. This may also be applied to both customers. Thus, a group OCV may be determined for a plurality of customers, and the group OCV may be associated with the plurality of customers

Further, the processed OCV values may be compared by ranking them in ascending or descending order of the processed OCV values.

Once the OCV has been setup, the OCV may be activated for passenger acceptance by means of an airline option. For example, the OCV may be used for all airports and flights during passenger acceptance, or the OCF may be used only in conjunction with particular flights, such as MH100, and all flights from London Heathrow (LHR).

In an alternative example, the OCV may not be used for assisting acceptance anywhere. Alternatively, the OCV may not be used for assisting in acceptance when the departing airport is Kuala Lumpur (KUL) and the flight is MH200.

When more than one customer checks in together two airline options may control the acceptance behaviour. In one example, group logic may be applied when 2 to 4 customers check-in together. Alternatively, customers in a group may share the maximum, minimum or average OCV of other customers.

From the foregoing, it will be appreciated that the operational customer value, OCV, may:

- be generated based on an optional CPV and other operational parameters. It is usually valid for customer's present journey;
- vary from one operation to another and also from one flight to another;
- be based on operational customer attributes (SSRs) and also product (Flight) attributes (e.g. Number of segments, travelling alone or in a group etc.);
- for the same customer be different depending on whether he is travelling alone or in a group;
- may have a similar or same ranking value if they have a certain value 1 or a value 2.

The following numbered clauses provide further detail of the invention:

1. A user profiling system comprising:

communication means for receiving event trigger data in response to a user interacting with an environment;

processing means configured to:

uniquely determine user identifier data associated with the event trigger data; and

associate the event trigger data with a user profile associated with the unique user identifier.

2. A user profiling system according to clause 1 further comprising mapping a plurality of different booking history RBD's each to a different numerical value and further comprising summing each of the values associated with each to produce a weighted flights taken value associated with a customer.

3. A graphical user interface comprising the system of any preceding clause.

4. A user profiling system comprising:

receiver for receiving event trigger data in response to a user interacting with an environment;

a processor configured to:

uniquely determine user identifier data associated with the event trigger data;

associate the event trigger data with a user profile associated with the unique user identifier.

5. A user profiling system according to clause 4, wherein the user is an airline passenger and wherein the system preferably further comprises determining a user profile value based on a user importance code, a user frequency value, and a user history.

6. A user profiling system according to clause 5, wherein the importance code comprises a tiered importance code and wherein a different numerical value is associated with each importance code tier.

7. A user profiling system according to clause 2, wherein the user frequency value comprises a tiered frequency value and wherein a different numerical value is associated with each frequency value tier.

8. A user profiling system according to clause 5, wherein the history comprises a plurality of different reservation booking designators, RBD's, each designator associated with a segment of a journey.

9. A user profiling system according to clause 4 further comprising determining a user profile value based on an equal weighting of a value associated with an importance code and a value associated with a frequent flyer tier level or a value associated with a booking history for a segment of a journey.

10. A user profiling system according to clause 4 further comprising determining whether a frequent flyer attribute is associated with the user profile.

11. A user profiling system according to clause 4 further comprising determining whether a frequent flyer attribute is associated with the user interacting with the environment and preferably searching a customer profile database for a profile comprising a matching frequent flyer attribute and in particular wherein if it is determined that no frequent flyer attribute is associated with the user interacting with the environment, searching a customer profile database based on personal information comprising any one or more of name and credit card details, postal address, business address, mobile telephone number and email address.

12. A user profiling system according to clause 4 further comprising determining whether a frequent flyer attribute is associated with the user profile and wherein if no frequent flyer attribute is associated with the user profile then determining the number of different flight types associated with the customer profile and determining the a customer value for the user based on the sum of weighted values associated with each flight type.

13. A user profiling system according to clause 4 further comprising associating a plurality of different numerical values with a plurality of different RBDs associated with the user booking history.

14. A user profiling system according to clause 4 further comprising determining a customer value on a numerical scale such as 1 to 100 based on the profile attribute and frequent flyer attribute or booking history attribute and preferably storing the determined value in a customer profile database associated with the user.

15. A user profiling system according to clause 4 further comprising determining a whether a profile comprises a profiling link entity linking the profile to a different user profile and preferably wherein the processor determines whether the profile link entity is a link to a nearest neighbour profile and further preferably adjusting the customer value based on the customer value associated with the linked customer profile.

16. A user profiling system according to clause 4 further comprising detecting the occurrence of one or more events and preferably wherein the events comprise one or more of an airport check-in event, a departure status – flown event, an update booking event, a cancel booking event, or a new booking event.

17. A user profiling system according to clause 4 further comprising detecting an event in response to a user scanning a boarding pass, passport or travel document with a scanning means, in particular optical scanning means.

18. A user profiling system according to clause 4 further comprising displaying on a display means a recommendation selected from a plurality of recommendations, wherein the recommendation is selected based on determined value, event and preferably whether one or more recommendations have previously been accepted by the user and preferably wherein the processor is configured to dynamically generate one or more recommendations at a mid-tier processing level based on received events.

19. A user profiling system according to clause 4 further comprising storage means for storing a relational customer profile database and wherein the processor is configured to provide a web-based service.

20. A user profiling system according to clause 4 further comprising receiving means arranged to receive data associated one or more future bookings and preferably to store the received data in a customer profile database stored in a storage means.

21. A user profiling system according to clause 20 further comprising updating the customer value based on the received data associated with one or more future bookings.

22. A computer-implemented user profiling method comprising;

a. receiving event trigger data, with a receiver, in response to a user interacting with an environment; and

with a processor:

uniquely determining user identifier data associated with the event trigger data; and

associating the event trigger data with a user profile associated with the unique user identifier.

23. A computer readable medium which when executed undertakes the method of clause 22.

**CLAIMS**

1. A customer profiling system comprising:

communication means for receiving event data in response to a customer interacting with an environment;

means for uniquely determining customer identifier data associated with the event data;

means for associating the event data with the customer;

means for determining a customer profile value based on one or more of a customer importance code, a customer frequency value, and a customer history; and

means for determining whether a customer profile comprises a profiling link entity linking the customer profile to a different customer profile and wherein the processor determines whether the profile link entity is a link to a neighbour profile and further adjusting the customer profile value based on the customer profile value associated with the linked customer profile;

means for generating a recommendation based on the customer profile value and a determined event associated with a customer; and

means for storing the recommendation in the customer profile only if the recommendation i) requires acknowledgement and ii) has been either accepted or rejected by the customer.

2. A customer profiling system according to claim 1 wherein the associating means is configured to associate the event data with a customer profile associated with the unique customer identifier data.

3. A customer profiling system according to any preceding claim further comprising storage means for storing the event data and preferably the association between the event and the customer.

4. A customer profiling system according to any preceding claim wherein the communication means is further arrange to receive customer identification information in particular a unique alpha-numeric string associated with the customer or one or more of customer number, or frequent flyer number.

5. A customer profiling system according to any one of claims 3 to 4 wherein the storage means further stores a plurality of different customer profiles associated with different customers, and further comprising means for searching the storage means for a profile comprising identification data corresponding to a search key.

6. A customer profiling system according any preceding claim wherein the customer is a passenger

7. A customer profiling system according to claim 6, wherein the importance code comprises a tiered importance code and wherein a different numerical value is associated with each importance code tier.

8. A customer profiling system according to claim 6, wherein the customer frequency value comprises a tiered frequency value and wherein a different numerical value is associated with each frequency value tier.

9. A customer profiling system according to claim 6, wherein the history comprises a plurality of different reservation booking designators, RBD's, each designator associated with a segment of a journey.

10. A customer profiling system according to any preceding claim further comprising means for determining the customer profile value based on an equal weighting of a value associated with an importance code and a value associated with a frequent flyer tier level or a value associated with a booking history for a segment of a journey.

11. A customer profiling system according to any one of claims 2 to 10 further comprising means for determining whether a frequent flyer attribute is associated with the customer profile.

12. A customer profiling system according to any one of claims 2 to 10 further comprising means for determining whether a frequent flyer attribute is associated with the customer profile or customer interacting with the environment and preferably further comprising means for searching a customer profile database for a profile comprising a matching frequent flyer attribute and in particular wherein if it is determined that no frequent flyer attribute is associated with the customer interacting with the environment, the searching means searches a customer profile database based on personal information comprising any one or more of name and credit card details, postal address, business address, mobile telephone number and email address.

13. A customer profiling system according to any one of claims 6 to 10 further comprising means for determining a number of different flight types associated with the customer profile and for determining the customer profile value for the customer based on the sum of weighted values associated with each flight type.

14. A customer profiling system according to any one of claims 6 to 13 further comprising means for associating a plurality of different numerical values with a plurality of different reservation booking designators, RBDs, associated with the customer booking history.

15. A customer profiling system according to any preceding claim further comprising means for determining a customer value on a numerical scale such as 1 to 100 based on the profile attribute and frequent flyer attribute or booking history attribute and preferably storing the determined value in a customer profile database associated with the customer.

16. A customer profiling system according to any preceding claim wherein the processor determines whether the profile link entity is a link to a nearest neighbour profile.

17. A customer profiling system according to any preceding claim further comprising means for detecting the occurrence of one or more events and preferably wherein the events comprise one or more of an airport check-in event, a departure status flown event, an update booking event, a cancel booking event, a new booking event, a paid for a booking event, an upgrade event, a downgrade event, a denied boarding event, a disruption event, a voluntary offload event, an involuntary offload event, a birthday event, a compliment event, a complaint event and a customer enquire event.

18. A customer profiling system according to any preceding claim wherein each event comprises associated data defining the event and preferably wherein the event data comprises data defining the event origin such as one of an agent event or system event or profile event.

19. A customer profiling system according to any preceding claim further comprising means for determining whether an event is an adverse event such as one or more of an offload event, flight disruption event, delay event, cancel event or re-route event based on the event data.

20. A customer profiling system according to any preceding claim further comprising means for detecting the occurrence of an event in response to a customer scanning

a boarding pass, passport or travel document with a scanning means, in particular optical scanning or wireless scanning means.

21. A customer profiling system according to any preceding claim further comprising means for selecting a recommendation from a plurality of predetermined recommendations, and preferably wherein the recommendation is selected based on the customer profile value and the event data and preferably further comprising a display means for displaying the recommendation.

22. A customer profiling system according to claim 21 further comprising means for determining whether one or more of the recommendations have previously been accepted by the customer and preferably wherein the processor is configured to dynamically generate one or more recommendations at a mid-tier processing level based on received events.

23. A customer profiling system according to any preceding claim further comprising storage means for storing a relational customer profile database and preferably wherein a processor is configured to provide a web-based service.

24. A customer profiling system according to any preceding claim further comprising receiving means arranged to receive data associated one or more bookings and preferably to store the received data in a customer profile database stored in a storage means.

25. A customer profiling system according to claim 24 further comprising means for updating the customer value based on the received data associated with the one or more bookings.

26. A customer profiling system according to any preceding claim further comprising means for matching the event data to the customer profile by matching one or more identifiers associated with the profile to one or more references to corresponding identifiers associated with the event.

27. A customer profiling system according to any preceding claim further comprising means for matching the or a recommendation to the customer profile based on one or more attributes associated with the recommendation which correspond to one or more attributes associated with the profile.

28. A customer profiling system according to any preceding claim further comprising means for determining an operational customer value preferably based on a customer value and one or more of a frequent flyer value, a ticket class, a booking time, and a check-in time.

29. A customer profiling system according to claim 28 wherein the operational customer value is determined by concatenating a plurality of 2 digit values associated with the customer.

30. A customer profiling system according to claim 28 further comprising means for determining a plurality of operational customer values associated with a plurality of different customers.

31. A customer profiling system according to claim 28 further comprising ranking each of the operational customer values preferably based on a maximum, or minimum or average of a plurality of operational customer values.

32. A customer profiling method comprising;

receiving event data, with a receiver, in response to a customer interacting with an environment;

uniquely determining customer identifier data associated with the event data;

associating the event data with the customer;

determining a customer profile value based on one or more of a customer importance code, a customer frequency value, and a customer history; and

determining whether a customer profile comprises a profiling link entity linking the profile to a different customer profile and wherein the processor determines whether the profile link entity is a link to a neighbour profile and further adjusting the customer profile value based on the customer profile value associated with the linked customer profile;

generating a recommendation based on the customer profile value and a determined event associated with a customer; and

storing the recommendation in the customer profile only if the recommendation i) requires acknowledgement and ii) has been either accepted or rejected by the customer.

33. A computer readable medium which when executed undertakes the method of claim 32.

34. A customer profiling system according to claim 1 further comprising means for mapping a plurality of different booking history reservation booking designators, RBD',s each to a different numerical value and further comprising summing each of the values associated with each value to produce a weighted flights taken value associated with a customer.

35. A graphical user interface comprising the system of any of claims 1 to 31 and 34.