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TRAVEL PREDICTION APPLICATION

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TITLE: TRAVEL PREDICTION APPLICATION

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TECHNICAL FIELD

[0001] The present disclosure generally relates to the field of secure token processing systems and methods. More particularly, but not exclusively, the disclosure relates to a method and a system for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data for predicting travel behavior of the user.

BACKGROUND

[0002] A cross border transaction may be defined as a transaction in an international trade between two or more entities beyond the territorial limits of a country or a transaction in a domestic trade in which at least one of the party is located outside the country of the transaction. Cross-border transactions arise when the country of origin of the issuer is different from that of a merchant. As an example, if a person travelled from Florida to Paris and bought an item using a transaction card or payment card issued by the domestic bank, that would account as a cross-border transaction. But payments sent from one country to another are often costlier, slower, and less transparent than domestic payments. This may be partly because cross-border payments are more complex, involve more risk, and more rules than domestic payments.

[0003] Therefore, there exists a need to facilitate cross-border payments/transactions in a more efficient and a transparent manner and to predict travel behavior of user using transaction data.

SUMMARY

[0004] The present disclosure is directed to a method and system for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data for predicting travel behavior of the user. The method comprises receiving by a server computer, a plurality of authorization request messages from a plurality of access devices. The method further comprises storing, by the server computer, data relating to the plurality of authorization request messages. Thereafter, the method comprises generating, by the

server computer, a model from the stored data. Once the model is generated, the method comprises receiving, by the server computer, a request relating to a user or a class of users. Thereafter, the method comprises determining, by the server computer, a predicted travel behavior for the user or the class of users using the model and sending, by the server computer a response to the request, the response comprising the predicted travel behavior.

[0005] Other embodiments of the invention can be directed to a server to perform the above method.

[0006] These and other embodiments of the invention are described in further detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, serve to explain the disclosed principles. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears.

[0008] The same numbers are used throughout the figures to reference like features and components. Some embodiments of device or system and/or methods in accordance with embodiments of the present subject matter are now described, by way of example only, and with reference to the accompanying figures, in which:

[0009] FIG. 1 shows a block diagram of a payment system in accordance with some embodiments of the present disclosure.

[0010] FIG. 2 shows a landing page for a travel prediction application in accordance with some embodiments of the present disclosure.

[0011] FIGs. 3-5 show screenshots of travel persona pages in accordance with some embodiments of the present disclosure.

[0012] FIGs. 6-7 show screenshots of travel prediction pages in accordance with some embodiments of the present disclosure.

[0013] FIG.8a shows a flow chart illustrating data flow of the travel predict application in accordance with some embodiments of the present disclosure. FIG.8b shows a flow chart illustrating a method for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data for predicting travel behavior of the user.

[0014] FIG.9 illustrates a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure

[0015] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION

[0016] In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[0017] While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

[0018] The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a setup, device or method that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device

or method. In other words, one or more elements in a device or system or apparatus preceded by “comprises... a” does not, without more constraints, preclude the existence of other elements or additional elements in the device or system or apparatus.

[0019] The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "one or more embodiments", "some embodiments", and "one embodiment" mean "one or more (but not all) embodiments of the invention(s)" unless expressly specified otherwise.

[0020] The terms "including", "comprising", “having” and variations thereof mean "including but not limited to", unless expressly specified otherwise.

[0021] Embodiments of the present invention may provide ability for a user to predict a cardholder's travel behavior using payment transaction data such as credit card transaction data. Before discussing embodiments of the invention, some description of some terms may be helpful.

[0022] In some non-limiting embodiments, a "communication device" may comprise any suitable electronic device that may be operated by a user, which may also provide remote communication capabilities to a network. A "mobile communication device" may be an example of a "communication device" that can be easily transported. Examples of remote communication capabilities include using a mobile phone (wireless) network, wireless data network (e.g. 3G, 4G or similar networks), Wi-Fi, Wi-Max, or any other communication medium that may provide access to a network such as the Internet or a private network. Examples of mobile communication devices include mobile phones (e.g. cellular phones), PDAs, tablet computers, net books, laptop computers, personal music players, hand-held specialized readers, etc. Further examples of mobile communication devices include wearable devices, such as smart watches, fitness bands, ankle bracelets, rings, earrings, etc., as well as automobiles with remote communication capabilities. In some embodiments, a mobile communication device can function as a payment device (e.g., a mobile communication device can store and be able to transmit payment credentials for a transaction).

[0023] In some non-limiting embodiments, a "payment device" may include any suitable device that may be used to conduct a financial transaction, such as to provide payment credentials to a merchant. The payment device may be a software object, a hardware object, or a physical object. As examples of physical objects, the payment device may comprise a substrate such as a paper or plastic card, and information that is printed, embossed, encoded, or otherwise included at or near a surface of an object. A hardware object can relate to circuitry (e.g., permanent voltage values), and a software object can relate to nonpermanent data stored on a device. A payment device may be associated with a value such as a monetary value, a discount, or store credit, and a payment device may be associated with an entity such as a bank, a merchant, a payment processing network, or a person. Suitable payment devices can be hand-held and compact so that they can fit into a user's wallet and/or pocket (e.g., pocket-sized). Example payment devices may include smart cards, magnetic stripe cards, keychain devices (such as the Speedpass™ commercially available from Exxon-Mobil Corp.), etc. Other examples of payment devices include payment cards, smart media, transponders, and the like. If the payment device is in the form of a debit, credit, or smartcard, the payment device may also optionally have features such as magnetic stripes. Such devices can operate in either a contact or contactless mode.

[0024] In some non-limiting embodiments, a "credential" may be any suitable information that serves as reliable evidence of worth, ownership, identity, or authority. A credential may be a string of numbers, letters, or any other suitable characters, as well as any object or document that can serve as confirmation. Examples of credentials include value credentials, identification cards, certified documents, access cards, passcodes and other login information, etc.

[0025] In some non-limiting embodiments, "Payment credentials" may include any suitable information associated with an account (e.g. a payment account and/or payment device associated with the account). Such information may be directly related to the account or may be derived from information related to the account. Examples of account information may include a PAN (primary account number or "account number"), user

name, expiration date, and verification values such as CVV, dCVV, CVV2, dCVV2, and CVC3 values.

[0026] In some non-limiting embodiments, a "digital wallet" can include an electronic device that allows an individual to conduct electronic commerce transactions. A digital wallet may store user profile information, payment credentials, bank account information, one or more digital wallet identifiers and/or the like and can be used in a variety of transactions, such as but not limited to eCommerce, social networks, money transfer/personal payments, mobile commerce, proximity payments, gaming, and/or the like for retail purchases, digital goods purchases, utility payments, purchasing games or gaming credits from gaming websites, transferring funds between users, and/or the like. A digital wallet may be designed to streamline the purchase and payment process. A digital wallet may allow the user to load one or more payment cards onto the digital wallet so as to make a payment without having to enter an account number or present a physical card.

[0027] In some non-limiting embodiments, a "token" may be a substitute value for a credential. A token may be a string of numbers, letters, or any other suitable characters. Examples of tokens include payment tokens, access tokens, personal identification tokens, etc.

[0028] In some non-limiting embodiments, a "payment token" may include an identifier for a payment account that is a substitute for an account identifier, such as a primary account number (PAN). For example, a payment token may include a series of alphanumeric characters that may be used as a substitute for an original account identifier. For example, a token "4900 0000 0000 0001" may be used in place of a PAN "4147 0900 0000 1234." In some embodiments, a payment token may be "format preserving" and may have a numeric format that conforms to the account identifiers used in existing transaction processing networks (e.g., ISO 8583 financial transaction message format). In some embodiments, a payment token may be used in place of a PAN to initiate, authorize, settle or resolve a payment transaction or represent the original credential in other systems where the original credential would typically be provided. In some embodiments, a payment token may be generated such that the recovery of the original PAN or other account identifier

from the token value may not be computationally derived. Further, in some embodiments, the token format may be configured to allow the entity receiving the token to identify it as a token and recognize the entity that issued the token.

[0029] In some non-limiting embodiments, "Tokenization" is a process by which data is replaced with substitute data. For example, a payment account identifier (e.g., a primary account number (PAN)) may be tokenized by replacing the primary account identifier with a substitute number (e.g. a token) that may be associated with the payment account identifier. Further, tokenization may be applied to any other information that may be replaced with a substitute value (i.e., token). Tokenization enhances transaction efficiency and security.

[0030] In some non-limiting embodiments, a "token issuer," token provider" or "token service system" can include a system that services tokens. In some embodiments, a token service system can facilitate requesting, determining (e.g., generating) and/or issuing tokens, as well as maintaining an established mapping of tokens to primary account numbers (PANs) in a repository (e.g. token vault). In some embodiments, the token service system may establish a token assurance level for a given token to indicate the confidence level of the token to PAN binding. The token service system may include or be in communication with a token vault where the generated tokens are stored. The token service system may support token processing of payment transactions submitted using tokens by de-tokenizing the tokens to obtain the actual PANs. In some embodiments, a token service system may include a tokenization computer alone, or in combination with other computers such as a transaction processing network computer. Various entities of a tokenization ecosystem may assume the roles of the token service provider. For example, payment networks and issuers or their agents may become the token service provider by implementing the token services according to embodiments of the present invention.

[0031] In some non-limiting embodiments, a "token domain" may indicate an area and/or circumstance in which a token can be used. Examples of token domains may include, but are not limited to, payment channels (e.g., e-commerce, physical point of sale, etc.), POS entry modes (e.g., contactless, magnetic stripe, etc.), and merchant identifiers to uniquely

identify where the token can be used. A set of parameters (i.e. token domain restriction controls) may be established as part of token issuance by the token service provider that may allow for enforcing appropriate usage of the token in payment transactions. For example, the token domain restriction controls may restrict the use of the token with particular presentment modes, such as contactless or e-commerce presentment modes. In some embodiments, the token domain restriction controls may restrict the use of the token at a particular merchant that can be uniquely identified. Some exemplary token domain restriction controls may require the verification of the presence of a token cryptogram that is unique to a given transaction. In some embodiments, a token domain can be associated with a token requestor.

[0032] In some non-limiting embodiments, a "token expiry date" may refer to the expiration date/time of the token. The token expiry date may be passed among the entities of the tokenization ecosystem during transaction processing to ensure interoperability. The token expiration date may be a numeric value (e.g. a 4-digit numeric value). In some embodiments, the token expiry date can be expressed as a time duration as measured from the time of issuance.

[0033] In some non-limiting embodiments, a "token request message" may be an electronic message for requesting a token. A token request message may include information usable for identifying a payment account or digital wallet, and/or information for generating a payment token.

[0034] For example, a token request message may include payment credentials, mobile device identification information (e.g. a phone number or MSISDN), a digital wallet identifier, information identifying a tokenization service provider, a merchant identifier, a cryptogram, and/or any other suitable information. Information included in a token request message can be encrypted (e.g., with an issuer-specific key).

[0035] In some non-limiting embodiments, a "token response message" may be a message that responds to a token request. A token response message may include an indication that a token request was approved or denied. A token response message may also include a

payment token, mobile device identification information (e.g. a phone number or MSISDN), a digital wallet identifier, information identifying a tokenization service provider, a merchant identifier, a cryptogram, and/or any other suitable information. Information included in a token response message can be encrypted (e.g., with an issuer-specific key).

[0036] In some non-limiting embodiments, a "token requestor identifier" may include any characters, numerals, or other identifiers associated with an entity associated with a network token system. For example, a token requestor identifier may be associated with an entity that is registered with the network token system. In some embodiments, a unique token requestor identifier may be assigned for each domain for a token request associated with the same token requestor. For example, a token requestor identifier can identify a pairing of a token requestor (e.g., a mobile device, a mobile wallet provider, etc.) with a token domain (e.g., e-commerce, contactless, etc.). A token requestor identifier may include any format or type of information. For example, in one embodiment, the token requestor identifier may include a numerical value such as a ten digit or an eleven-digit number (e.g., 4678012345).

[0037] In some non-limiting embodiments, a "user" may include an individual. In some embodiments, a user may be associated with one or more personal accounts and/or mobile devices. The user may also be referred to as a cardholder, account holder, or consumer in some embodiments.

[0038] In some non-limiting embodiments, a "resource provider" may be an entity that can provide a resource such as goods, services, information, and/or access. Examples of resource providers includes merchants, data providers, transit agencies, governmental entities, venue and dwelling operators, etc.

[0039] In some non-limiting embodiments, a "merchant" may typically be an entity that engages in transactions and can sell goods or services or provide access to goods or services.

[0040] In some non-limiting embodiments, an "acquirer" may typically be a business entity (e.g., a commercial bank) that has a business relationship with a particular merchant or other entity. Some entities can perform both issuer and acquirer functions. Some embodiments may encompass such single entity issuer-acquirers. An acquirer may operate an acquirer computer, which can also be generically referred to as a "transport computer".

[0041] In some non-limiting embodiments, an "authorizing entity" may be an entity that authorizes a request. Examples of an authorizing entity may be an issuer, a governmental document repository, an access administrator, etc.

[0042] In some non-limiting embodiments, an "issuer" may typically refer to a business entity (e.g., a bank) that maintains an account for a user. An issuer may also issue payment credentials stored on a user device, such as a cellular telephone, smart card, tablet, or laptop to the consumer.

[0043] In some non-limiting embodiments, an "access device" may be any suitable device that provides access to a remote system. An access device may also be used for communicating with a merchant computer, a transaction processing computer, an authentication computer, or any other suitable system. An access device may generally be located in any suitable location, such as at the location of a merchant. An access device may be in any suitable form. Some examples of access devices include POS or point of sale devices (e.g., POS terminals), cellular phones, PDAs, personal computers (PCs), tablet PCs, hand-held specialized readers, set-top boxes, electronic cash registers (ECRs), Automated Teller Machines (ATMs), Virtual Cash Registers (VCRs), kiosks, security systems, access systems, and the like. An access device may use any suitable contact or contactless mode of operation to send or receive data from, or associated with, a mobile communication or payment device. In some embodiments, where an access device may comprise a POS terminal, any suitable POS terminal may be used and may include a reader, a processor, and a computer-readable medium. A reader may include any suitable contact or contactless mode of operation. For example, exemplary card readers can include radio frequency (RF) antennas, optical scanners, bar code readers, or magnetic stripe readers to interact with a payment device and/or mobile device. In some embodiments, a cellular

phone, tablet, or other dedicated wireless device used as a POS terminal may be referred to as a mobile point of sale or an "mPOS" terminal.

[0044] In some non-limiting embodiments, an "authorization request message" may be an electronic message that requests authorization for a transaction. In some embodiments, it is sent to a transaction processing computer and/or an issuer of a payment card to request authorization for a transaction. An authorization request message according to some embodiments may comply with ISO 8583, which is a standard for systems that exchange electronic transaction information associated with a payment made by a user using a payment device or payment account. The authorization request message may include an issuer account identifier that may be associated with a payment device or payment account. An authorization request message may also comprise additional data elements corresponding to "identification information" including, by way of example only: a service code, a CVV (card verification value), a dCVV (dynamic card verification value), a PAN (primary account number or "account number"), a payment token, a user name, an expiration date, etc. An authorization request message may also comprise "transaction information," such as any information associated with a current transaction, such as the transaction amount, merchant identifier, merchant location, acquirer bank identification number (BIN), card acceptor ID, information identifying items being purchased, etc., as well as any other information that may be utilized in determining whether to identify and/or authorize a transaction.

[0045] In some non-limiting embodiments, an "authorization response message" may be a message that responds to an authorization request. In some cases, it may be an electronic message reply to an authorization request message generated by an issuing financial institution or a transaction processing computer. The authorization response message may include, by way of example only, one or more of the following status indicators: Approval -- transaction was approved; Decline -- transaction was not approved; or Call Center -- response pending more information, merchant must call the toll-free authorization phone number. The authorization response message may also include an authorization code, which may be a code that a credit card issuing bank returns in response to an authorization request message in an electronic message (either directly or through the transaction

processing computer) to the merchant's access device (e.g. POS equipment) that indicates approval of the transaction. The code may serve as proof of authorization.

[0046] In some non-limiting embodiments, a "token presentment mode" may indicate a method through which a token is submitted for a transaction. Some non-limiting examples of the token presentment mode may include machine codes (p g., ORTM code, bar code, etc.), mobile contactless modes (e.g., near-field communication (NFC) communication), e-commerce remote modes, e-commerce proximity modes, and any other suitable modes in which to submit a token.

[0047] In some non-limiting embodiments, a "server computer" may include a powerful computer or cluster of computers. For example, the server computer can be a large mainframe, a minicomputer cluster, or a group of servers functioning as a unit. In one example, the server computer may be a database server coupled to a Web server. The server computer may comprise one or more computational apparatuses and may use any of a variety of computing structures, arrangements, and compilations for servicing the requests from one or more client computers.

[0048] FIG. 1 shows a block diagram of a transaction processing system that can use a mobile device with access data. FIG. 1 shows a user 206 that can operate a mobile device 210. The user 206 may use the mobile device 210 to pay for a good or service at a merchant. The merchant may operate a merchant computer 230 and/or an access device 220. The merchant may communicate with an issuer computer 260 via an acquirer computer 240 and a payment processing network 250. An analysis computer 256 may be in operative communication with the payment processing network 250.

[0049] The payment processing network 250 may include data processing subsystems, networks, and operations used to support and deliver authorization services, exception file services, and clearing and settlement services. An exemplary payment processing network may include VisaNet™. Payment processing networks such as VisaNet™ are able to process credit card transactions, debit card transactions, and other types of commercial transactions. VisaNet™, in particular, includes a VIP system (Visa Integrated Payments

system) which processes authorization requests and a Base II system which performs clearing and settlement services. The payment processing network may use any suitable wired or wireless network, including the Internet.

[0050] A typical payment transaction flow using a mobile device 210 at an access device 220 (e.g. POS location) can be described as follows. A user 206 presents his or her mobile device 210 to an access device 220 to pay for an item or service. The mobile device 210 and the access device 220 interact such that access data from the mobile device 210 (e.g. PAN, a payment token, verification value(s), expiration date, etc.) is received by the access device 220 (e.g. via contact or contactless interface). The merchant computer 230 may then receive this information from the access device 220 via an external communication interface. The merchant computer 230 may then generate an authorization request message that includes the information received from the access device 220 (i.e. information corresponding to the mobile device 210) along with additional transaction information (e.g. a transaction amount, merchant specific information, etc.) and electronically transmits this information to an acquirer computer 240. The acquirer computer 240 may then receive, process, and forward the authorization request message to a payment processing network 250 for authorization.

[0051] In general, prior to the occurrence of a credit or debit-card transaction, the payment processing network 250 has an established protocol with each issuer on how the issuer's transactions are to be authorized. In some cases, such as when the transaction amount is below a threshold value, the payment processing network 250 may be configured to authorize the transaction based on information that it has about the user's account without generating and transmitting an authorization request message to the issuer computer 260. In other cases, such as when the transaction amount is above a threshold value, the payment processing network 250 may receive the authorization request message, determine the issuer associated with the mobile device 210, and forward the authorization request message for the transaction to the issuer computer 260 for verification and authorization. Once the transaction is authorized, the issuer computer 260 may generate an authorization response message (that may include an authorization code indicating the transaction is approved or declined) and transmit this electronic message via its external communication

interface to payment processing network 250. The payment processing network 250 may then forward the authorization response message to the acquirer computer 240, which in turn may then transmit the electronic message to comprising the authorization indication to the merchant computer 230, and then to the access device 220.

[0052] At the end of the day or at some other suitable time interval, a clearing and settlement process between the merchant computer 230, the acquirer computer 240, the payment processing network 250, and the issuer computer 260 may be performed on the transaction.

[0053] The analysis computer 256 may be a server computer that receives plurality of authorization request messages from a plurality of access devices. It may store data relating to the plurality of authorization request messages, generate a model from the stored data, receive a request relating to a user or a class of users, determine a predicted travel behavior for the user or the class of users using the model, and send a response to the request, the response comprising the predicted travel behavior.

[0054] FIG. 2 shows a landing page for a travel prediction application. FIG. 2 shows, for a portfolio of cardholder accounts, different total spend amounts for different types of cardholders including intermittent and seasonal travelers, domestic spenders, and roadies (cardholders that do a significant amount of traveling).

[0055] FIGs. 3-5 show screenshots of travel persona pages. FIG. 3 shows charts with different market comparisons for different travel persona types. FIG. 3 shows different types of spending that different traveler persona types would perform at different types of merchants and with different types of payment devices. Different parts of the graphs can be selected to show other data. For example, clicking on one of the bars may produce a graph that shows other data related to the selected bar.

[0056] FIG. 4 shows different opportunities as well as market performance indicators for an entire credit portfolio, a perennial traveler, a roadie (someone who travels frequently), intermittent travelers with recent bookings, intermittent or seasonal travelers, and domestic spenders with recent bookings.

[0057] In some embodiments, it is also possible to define a traveler persona, by selecting such characteristics as how many countries they have traveled to, annual card spend, how much they spend on airline tickets, how recently they purchased an airline ticket, destination diversity, etc.

[0058] FIG. 5 shows a screenshot that is shown when a "perennial traveler" is selected. FIG. 5 shows volume growth, spend growth, active card growth, and activation rate growth for a cardholder portfolio relative to a larger portfolio of cardholder accounts.

[0059] In some embodiments, once a target type of cardholder is identified (e.g., a perennial traveler), then predictions can be made with respect to that cardholder type.

[0060] FIGs. 6-7 show screenshots of travel prediction pages. FIG. 6 shows a potential international travel rate and potential international face to face volume. FIG. 7 shows predicted international face to face volume and predicted spend at international merchant segments. FIG.8a shows a flow chart illustrating data flow of the travel predict application in accordance with some embodiments of the present disclosure.

[0061] FIG.8b shows a flow chart illustrating a method for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data for predicting travel behavior of the user.

[0062] As illustrated in FIG.8b, the method 800 includes one or more blocks illustrating a method for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data for predicting travel behavior of the user. The method 300 may be described in the general context of computer executable instructions. Generally, computer executable instructions can include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform specific functions or implement specific abstract data types.

[0063] The order in which the method 800 is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method. Additionally, individual blocks may be deleted from the methods

without departing from the spirit and scope of the subject matter described herein. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0064] At block 801, the method comprises receiving by a server computer, a plurality of authorization request messages from a plurality of access devices. At block 803, the method comprises storing, by the server computer, data relating to the plurality of authorization request messages. At block 805, the method comprises generating, by the server computer, a model from the stored data. At block 807, the method comprises receiving, by the server computer, a request relating to a user or a class of users. At block 809, the method comprises determining, by the server computer, a predicted travel behavior for the user or the class of users using the model and sending, by the server computer a response to the request, the response comprising the predicted travel behavior. The present disclosure enables issuer analyst to learn cross border opportunity based on historic transactions and predict travel behavior of the user. The present disclosure also enables the analyst to generate the PANs data set to run campaigns and how the campaigns aid to improve cross-border performance.

[0065] FIG.9 illustrates a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure. In an embodiment, the computer system 902 may be transaction processing system, which is used for predicting a cardholder's travel behavior using payment transaction data such as credit card transaction data. The computer system 902 may include a central processing unit (“CPU” or “processor”) 904. The processor 904 may comprise at least one data processor for executing program components for executing user or system-generated business processes. The processor 904 may include specialized processing units such as integrated system (bus) controllers, memory management control units, floating point units, graphics processing units, digital signal processing units, etc. The processor 904 may be disposed in communication with one or more input/output (I/O) devices (906 and 908) via I/O interface 910. The I/O interface 910 may employ communication protocols/methods such as, without limitation, audio, analog, digital, stereo, IEEE-1394, serial bus, Universal Serial Bus (USB), infrared, PS/2, BNC, coaxial, component, composite, Digital Visual Interface

(DVI), high-definition multimedia interface (HDMI), Radio Frequency (RF) antennas, S-Video, Video Graphics Array (VGA), IEEE 802.n /b/g/n/x, Bluetooth, cellular (e.g., Code-Division Multiple Access (CDMA), High-Speed Packet Access (HSPA+), Global System For Mobile Communications (GSM), Long-Term Evolution (LTE) or the like), etc. Using the I/O interface 910, the computer system 902 may communicate with one or more I/O devices (906 and 908). In some implementations, the processor 904 may be disposed in communication with a communication network 912 via a network interface 914. The network interface 914 may employ connection protocols including, without limitation, direct connect, Ethernet (e.g., twisted pair 10/100/1000 Base T), Transmission Control Protocol/Internet Protocol (TCP/IP), token ring, IEEE 802.11a/b/g/n/x, etc. Using the network interface 914 and the communication network 912, the computer system 902 may be connected to the mobile device 210 and the payment processing network 250.

[0066] The communication network 912 can be implemented as one of the several types of networks, such as intranet or any such wireless network interfaces. The communication network 912 may either be a dedicated network or a shared network, which represents an association of several types of networks that use a variety of protocols, for example, Hypertext Transfer Protocol (HTTP), Transmission Control Protocol/Internet Protocol (TCP/IP), Wireless Application Protocol (WAP), etc., to communicate with each other. Further, the communication network 912 may include a variety of network devices, including routers, bridges, servers, computing devices, storage devices, etc.

[0067] In some embodiments, the processor 904 may be disposed in communication with a memory 916 e.g., RAM 918, and ROM 920, etc. as shown in Figure 9, via a storage interface 922. The storage interface 922 may connect to memory 916 including, without limitation, memory drives, removable disc drives, etc., employing connection protocols such as Serial Advanced Technology Attachment (SATA), Integrated Drive Electronics (IDE), IEEE-1394, Universal Serial Bus (USB), fiber channel, Small Computer Systems Interface (SCSI), etc. The memory drives may further include a drum, magnetic disc drive, magneto-optical drive, optical drive, Redundant Array of Independent Discs (RAID), solid-state memory devices, solid-state drives, etc. The memory 916 may store a collection of program or database components, including, without limitation, user/application 924, an

operating system 926, a web browser 928, a mail client 930, a mail server 932, a user interface 934, and the like.

[0068] In some embodiments, computer system 902 may store user/application data 924, such as the data, variables, records, etc. as described in this invention. Such databases may be implemented as fault tolerant, relational, scalable, secure databases such as Oracle or Sybase.

[0069] The operating system 907 may facilitate resource management and operation of the computer system 900. Examples of operating systems 907 include, without limitation, APPLE MACINTOSH^R OS X, UNIX^R, UNIX-like system distributions (E.G., BERKELEY SOFTWARE DISTRIBUTIONTM (BSD), FREEBSDTM, NETBSDTM, OPENBSDTM, etc.), LINUX DISTRIBUTIONSTM (E.G., RED HATTM, UBUNTUTM, KUBUNTUTM, etc.), IBMTM OS/2, MICROSOFTTM WINDOWSTM (XPTM, VISTATM/7/8, 10 etc.), APPLE^R IOSTM, GOOGLE^R ANDROIDTM, BLACKBERRY^R OS, or the like. A user interface may facilitate display, execution, interaction, manipulation, or operation of program components through textual or graphical facilities. For example, user interfaces may provide computer interaction interface elements on a display system operatively connected to the computer system 900, such as cursors, icons, check boxes, menus, windows, widgets, etc. Graphical User Interfaces (GUIs) may be employed, including, without limitation, APPLE MACINTOSH^R operating systems, IBMTM OS/2, MICROSOFTTM WINDOWSTM (XPTM, VISTATM/7/8, 10 etc.), Unix^R X-Windows, web interface libraries (e.g., AJAXTM, DHTMLTM, ADOBE[®] FLASHTM, JAVASCRIPTTM, JAVATM, etc.), or the like.

[0070] The illustrated steps are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions,

variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments. Also, the words "comprising," "having," "containing," and "including," and other similar forms are intended to be equivalent in meaning and be open ended in that an item or items following any one of these words is not meant to be an exhaustive listing of such item or items, or meant to be limited to only the listed item or items. It must also be noted that as used herein and in the appended claims, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

[0071] Furthermore, one or more computer-readable storage media may be utilized in implementing embodiments consistent with the present disclosure. A computer readable storage medium refers to any type of physical memory on which information or data readable by a processor may be stored. Thus, a computer readable storage medium may store instructions for execution by one or more processors, including instructions for causing the processor(s) to perform steps or stages consistent with the embodiments described herein. The term "computer readable medium" should be understood to include tangible items and exclude carrier waves and transient signals, i.e., are non-transitory. Examples include random access memory (RAM), read-only memory (ROM), volatile memory, nonvolatile memory, hard drives, CD ROMs, DVDs, flash drives, disks, and any other known physical storage media.

[0072] Finally, the language used in the specification has been principally selected for readability and instructional purposes, and it may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the embodiments of the disclosure is intended to be illustrative, but not limiting, of the scope of the disclosure.

[0073] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

TRAVEL PREDICTION APPLICATION

ABSTRACT

The present disclosure is directed to a method and system for predicting cardholder's travel behavior using payment transaction data such as credit card transaction data. The method comprises receiving, by a server computer, a plurality of authorization request messages from a plurality of access devices. Thereafter, the method comprises storing, by the server computer, data relating to the plurality of authorization request messages. Further, the method comprises generating, by the server computer, a model from the stored data. Once the model is generated, the method comprises receiving, by the server computer, a request relating to a user or a - class of users. Thereafter, server computer determines a predicted travel behavior for the user, or the class of users using the model and sends a response to the request, the response comprising the predicted travel behavior.

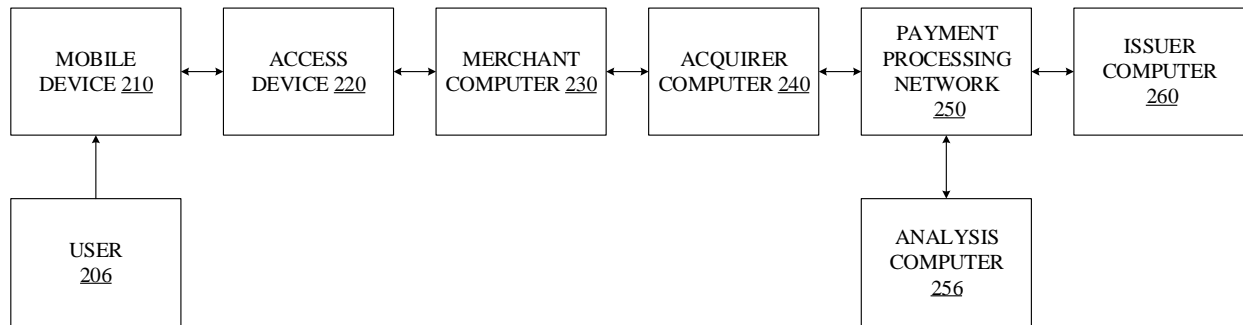
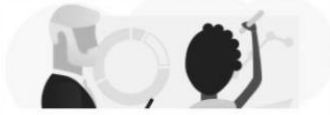


Fig.1


Travel Predict

Where should I Start?




Grab Total Opportunity
Download cards in your issuing portfolio along with Travel Predict scores.

Get Cards



Analyze Travel Personas
Identify Travel Personas based on historic spend of cards in your issuing portfolio.

Select A Persona



Apply Predictive Intelligence
Select cards based on travel-focused, predictive scores.

Use Predictive Scores

Travel Predict is a suite of predictive, machine learning scores relating to a cardholder's travel behavior. Use the Travel Persona feature to analyze a cardholder's past behavior. Create audiences that combine both historic and predictive data. [Learn more](#)

View data by:

CREDIT Debit

Incremental Revenue Opportunity

Potential revenue is an estimate of the increase in payment volume over 2 months based on historic spend and includes assumptions and projections. [Learn more](#)



Market Performance Indicators

The performance indicators below are based on the last 3 months of transaction data from your issuing portfolio. The dot plot compares your portfolio performance over the last year to market performance by using an aggregated and de-identified transaction dataset of your peers.

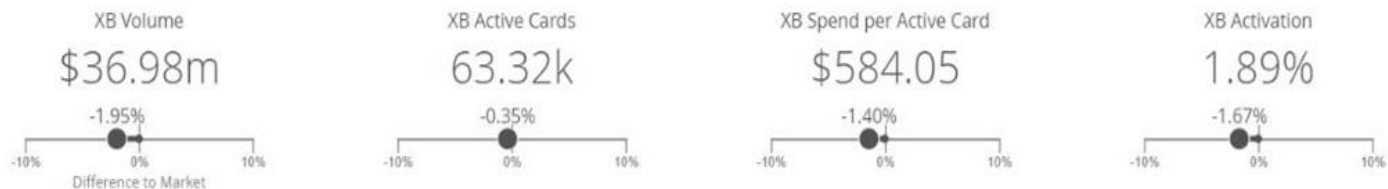


Fig.2

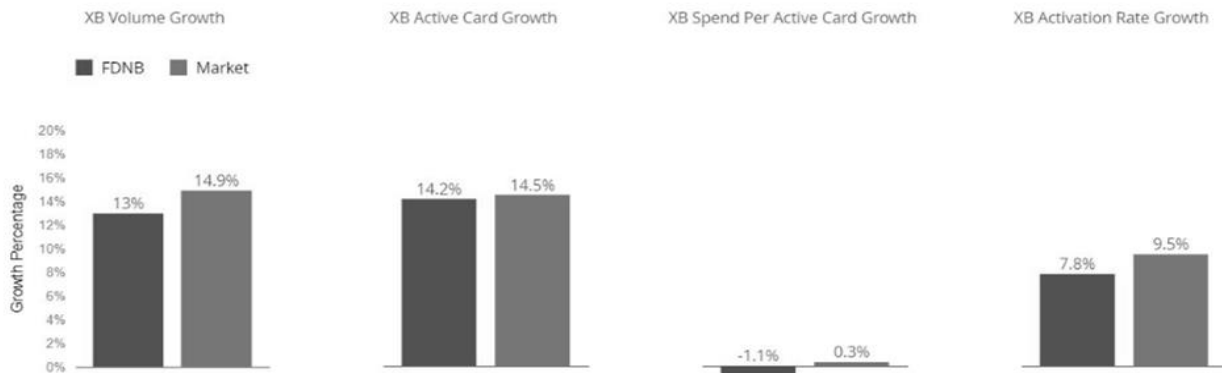
Entire Credit Portfolio

Back Edit **APPLY PREDICTIVE SCORES**

Market Comparison

Use the toggle selection to compare the performance of your selected Travel Persona or your entire issuing portfolio, if selected, to the market and over time. [Learn more](#)

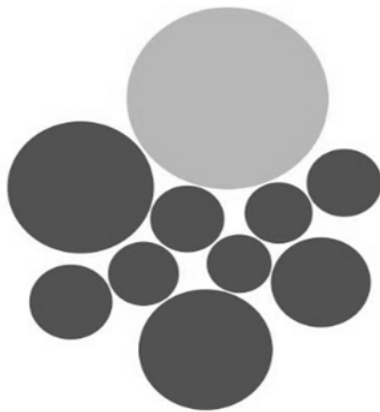
MARKET Time



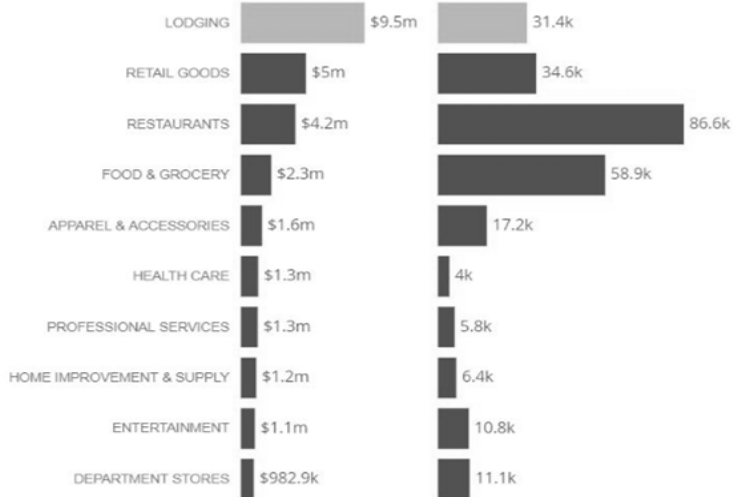
International Card Use at Merchant Segments

Review the Travel Persona's historical spend when traveling internationally by Merchant Category. Bubbles are sized by transaction volume. [Learn more](#)

Insight into what Merchant Category your selected Travel Persona spent



Rank by Cross-Border Volume:



XB Volume
\$9.49m

XB Active Cards
31.36k

XB Spend per Active Card
\$302.65

XB Activation
5.03%

Fig.3



Travel Personas

Selecting, or creating, a Travel Persona allows you to segment cardholders in your issuing portfolio based on their travel behavior. This feature provides a list of pre-defined "Travel Personas" as well as the ability to define a custom "Travel Persona" specific to your business. [Learn more](#)

NEW TRAVEL PERSONA

Personas	Market Performance Indicators ⓘ		Incremental Opportunity	Number of Cards	Opportunity Per Card
	XB Volume	XB Active Cards			
ENTIRE CREDIT PORTFOLIO Entire Portfolio for Credit			\$6.4m	3m	\$1.99
PERENNIAL TRAVELER Perennial travellers within past 4 months			\$261.2k	1k	\$207.77

Fig.4



Fig.4 Contd.



Fig.4 Contd.

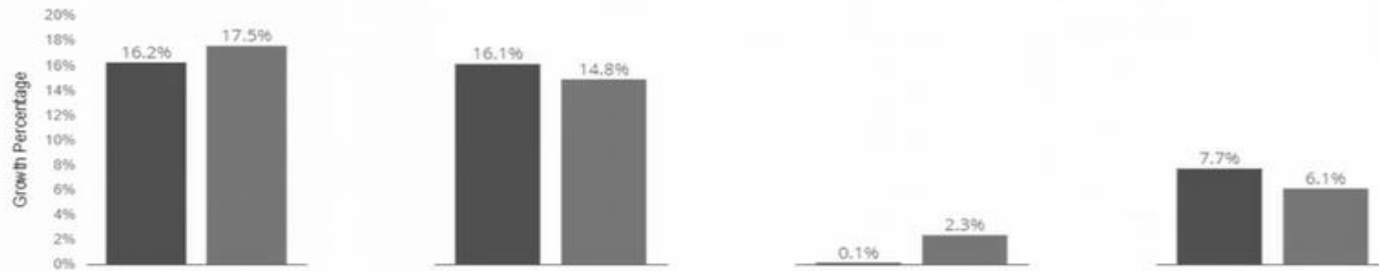
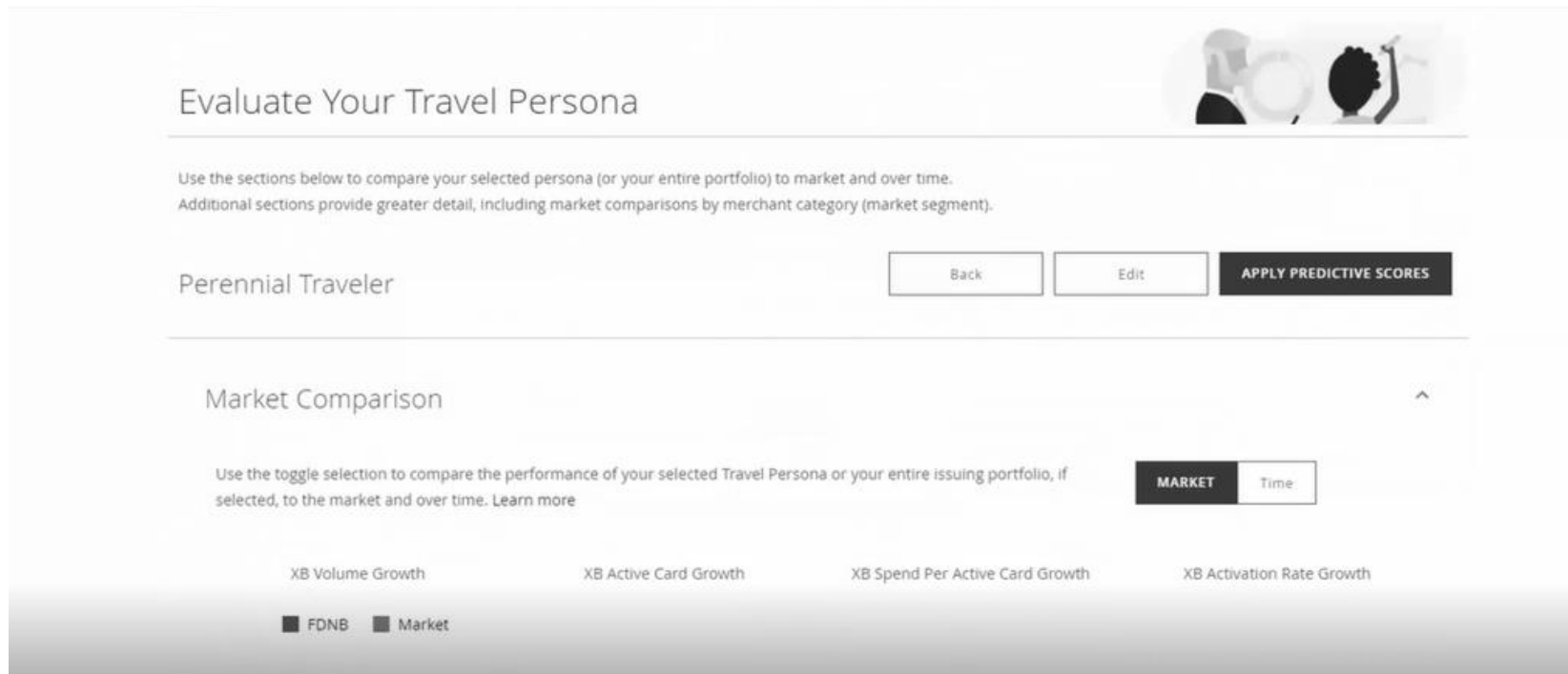


Fig.5



Apply Predictive Scores To Create Target Audience Lists

Target Audiences allow you to identify cardholders in your issuing portfolio based on defined Travel Personas and/or predictive scores.

Predicted International Travel Rate ^

The International Travel Rate is the percentage of cards from each score decile or score percentile that made at least one international face-to-face transaction during the Prediction Window. Press the toggle buttons to see scores by percentile or decile. Select percentiles or deciles from the charts to add the cards to your Target Audience.



The International Travel Propensity Score is validated by retrospectively scoring the cards in your issuing portfolio and comparing the International Travel Propensity Score to actual performance during the Prediction Window. The International Travel Rates shown below are generated based on scores from October 2018 and validated using international face-to-face card usage during December 2018 and January 2019. [Learn more](#)

By Previous Travelers

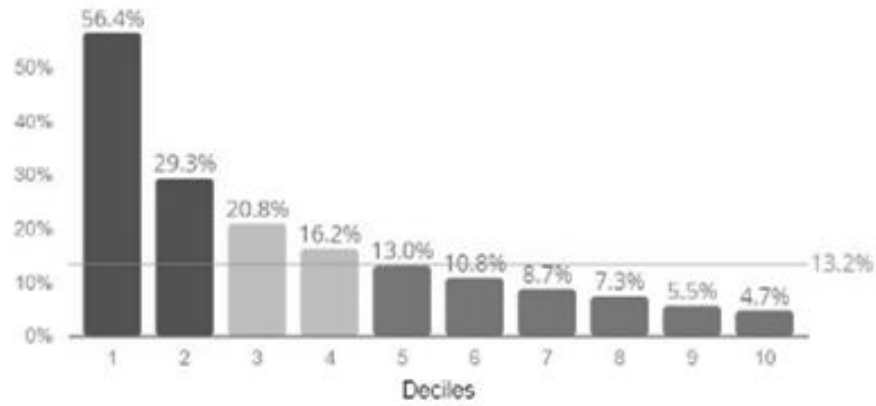
By Intl Face-to-Face Inactives



Fig.6

card usage during December 2018 and January 2019. Learn more

By Previous Travelers



By Intl Face-to-Face Inactives

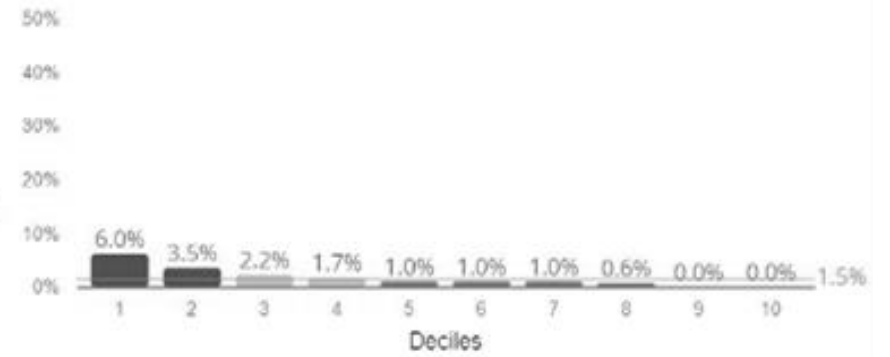
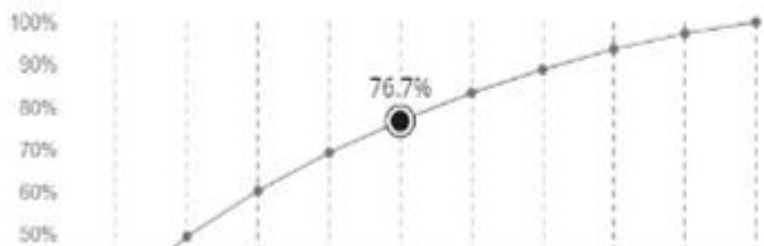
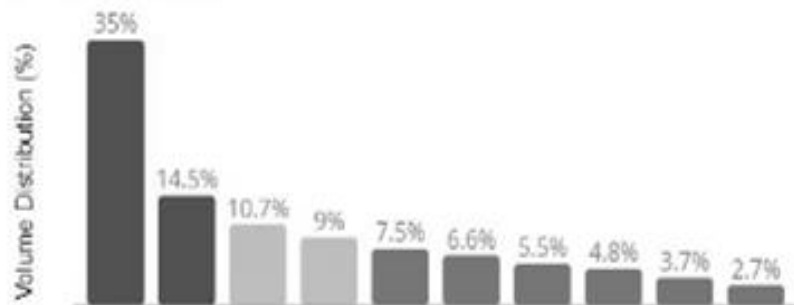


Fig.6 Contd.

Potential International Face-to-Face Volume

Potential International Face-to-Face Volume is how much potential volume in the opportunity may be captured by targeting cards in each score decile or score percentile. Press +/- toggle buttons to see scores by percentile or decile.

By Previous Travelers



By Intl Face-to-Face Inactives

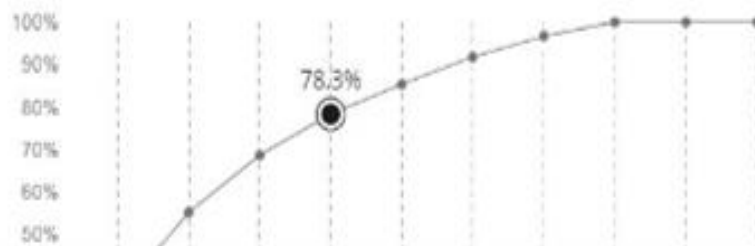
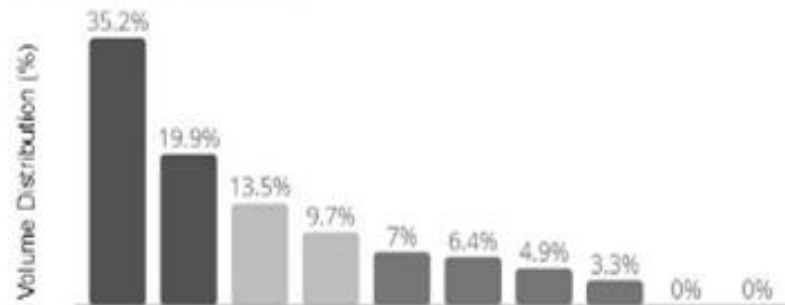
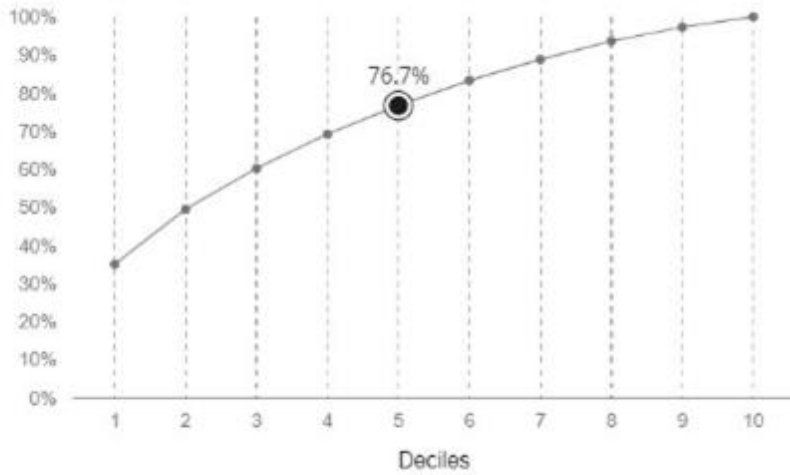
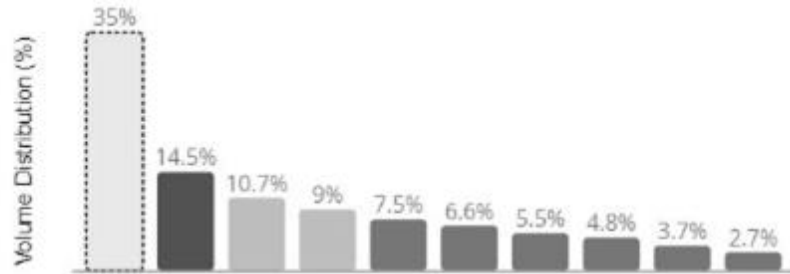


Fig.6 Contd.

Potential International Face-to-Face Volume

Potential International Face-to-Face Volume is how much potential volume in the opportunity may be captured by targeting cards in each score decile or score percentile. Press +/- toggle buttons to see scores by percentile or decile.

By Previous Travelers



By Intl Face-to-Face Inactives

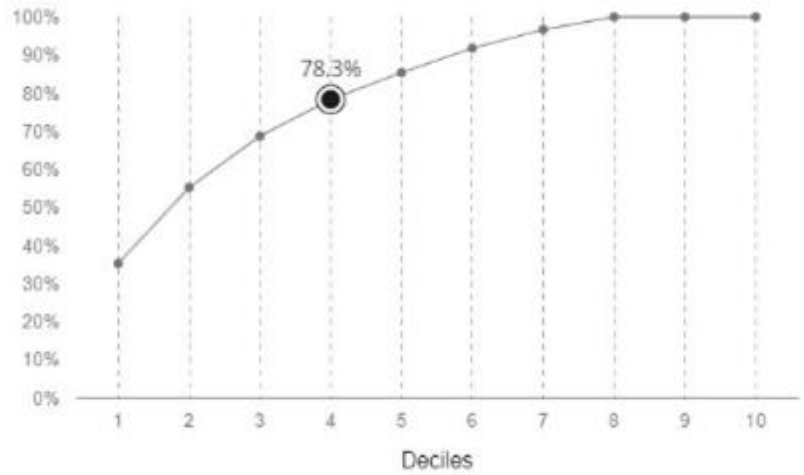
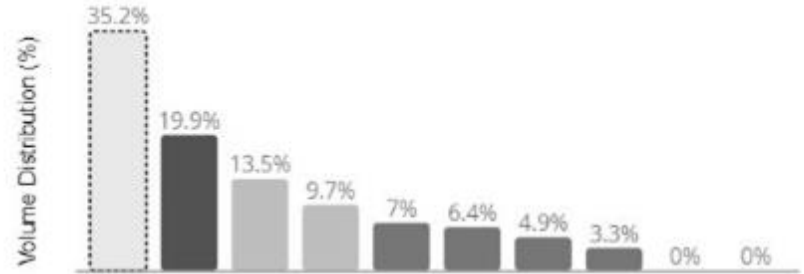
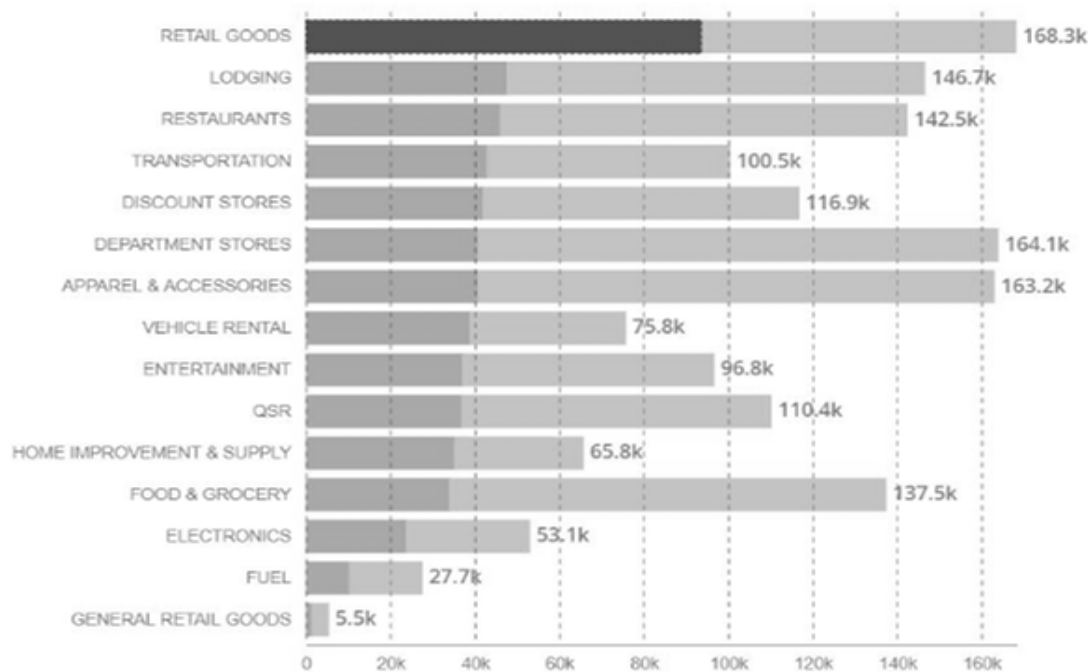


Fig.7

Predicted Spend at International Merchant Segments

Segmental Spend Propensity Score predicts the likelihood of a cardholder to spend at specific groups of Merchant Categories (Merchant Segments) if that cardholder travels internationally. [Learn more](#)

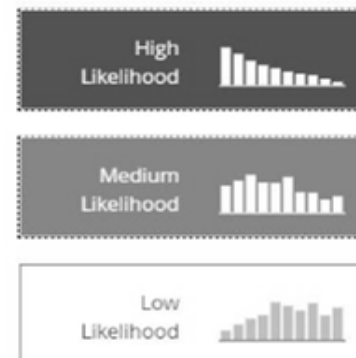
Select merchant segments to include in Target Audience



Select deciles to target



Select likelihood of spend



Clear Selection

Fig.7 Contd.

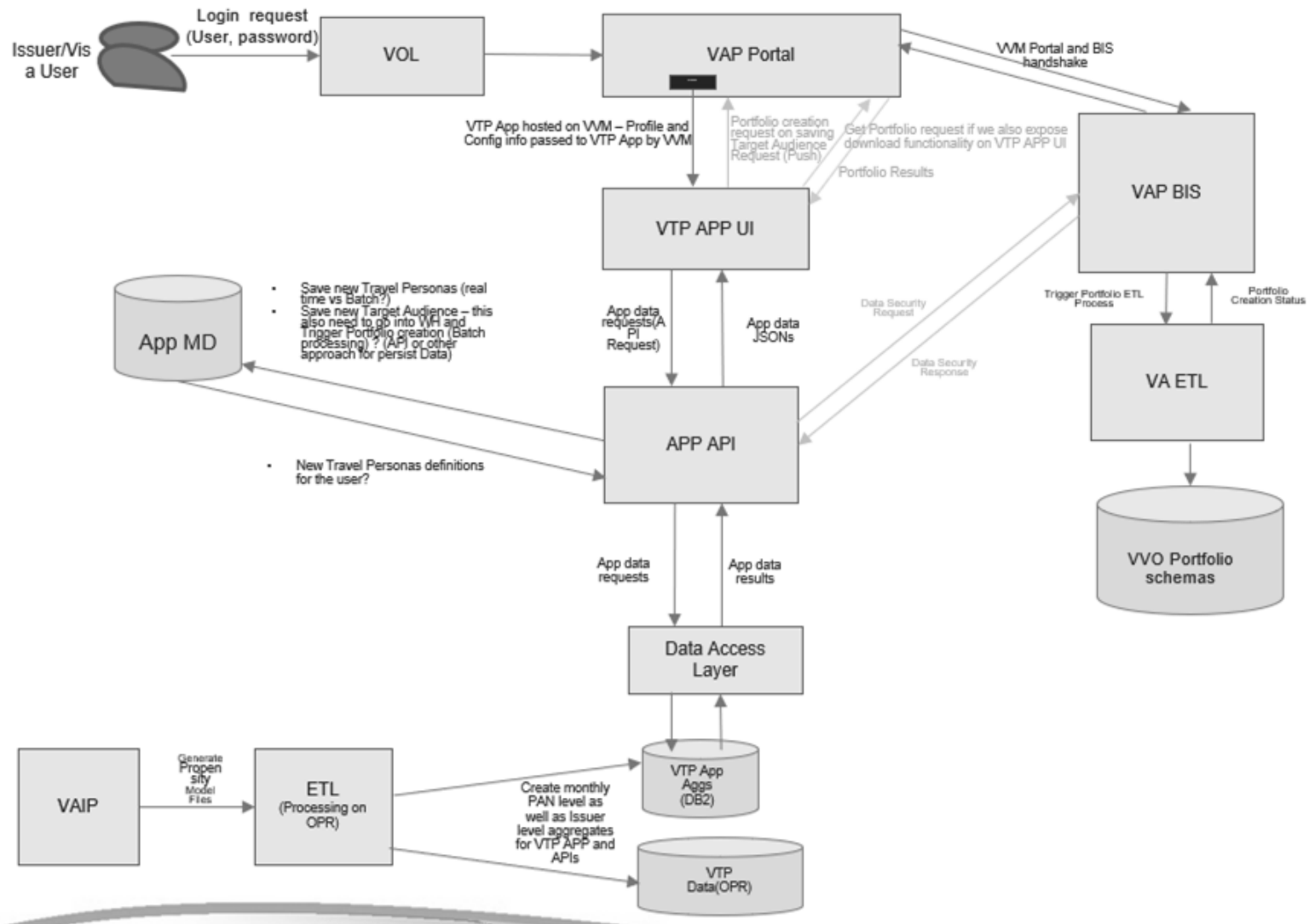


Fig.8a

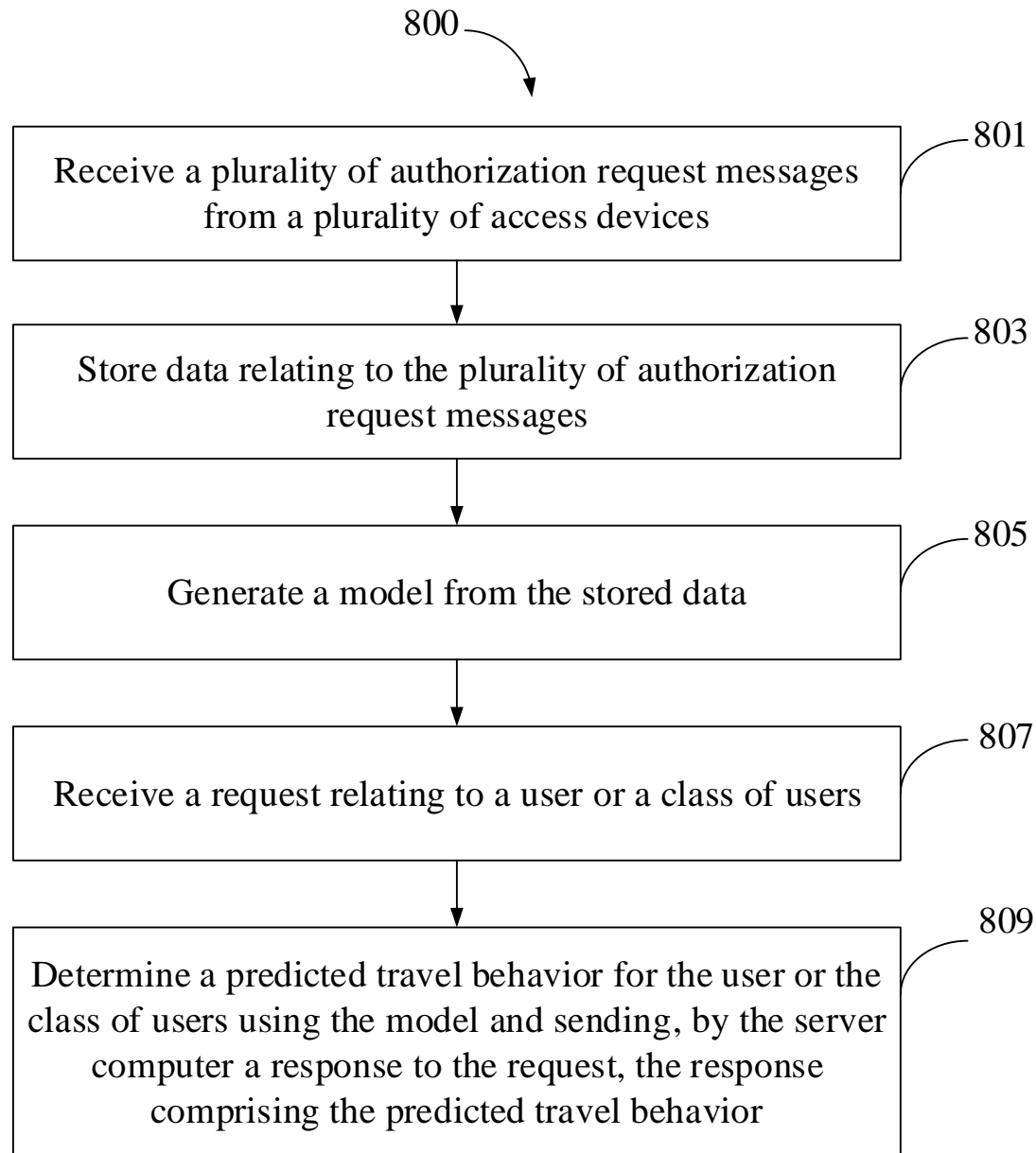


Fig.8b

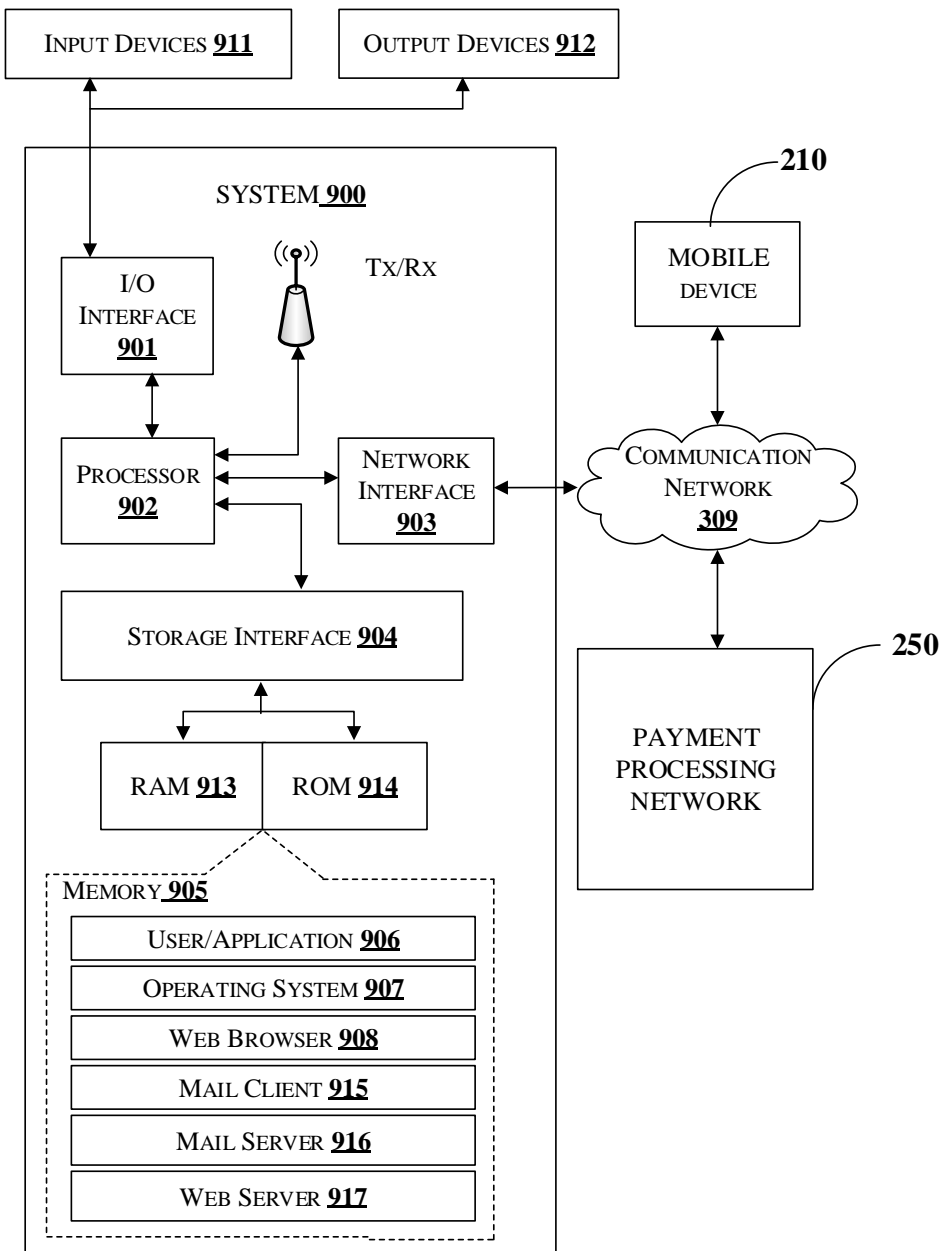


Fig.9