ELECTRONIC SYSTEM AND COMPUTERIZED METHOD FOR FACILITATING CREDIT PROFILING OF CONSUMERS BASED ON MERCHANT TRANSACTION DATA

Technical Field

[0001] The present disclosure generally relates to an electronic system and computerized method for facilitating credit profiling of consumers. Particularly, the present disclosure describes various embodiments of an electronic system and computerized method for facilitating credit profiling of consumers based on merchant transaction data.

Background

[0002] A significant portion of the consumer population globally has easy access to mainstream financial services and products usually offered by banks, such as banking account services, credit card facilities, loans, etc. These consumers are banked consumers who often have several bank accounts and credit cards which they use frequently. However, there is a portion of the consumer population that does not have, or has insufficient, access to such mainstream financial services and products. These consumers are known as underbanked consumers. Some reports indicate that some 45 million Americans do not have any credit events or profiles.

[0003] The underbanked consumers are often deprived of banking services such as credit cards or loans, and have to rely on non-traditional or alternative forms of finance often associated with the disadvantaged and the poor, such as cheque cashers, money lenders, and pawnbrokers. Some of these underbanked consumers may not even have any bank facilities or accounts, and are also known as unbanked consumers. Broadly, underbanked consumers include consumers who have limited access to traditional banking services and products, and also include unbanked consumers who do not have any access to the same. Examples of underbanked consumers include people with language barriers such as migrant workers, and people who are unable to or prefer not to access retail banks such as elderly people.

[0004] The aggregated payments volume globally by the underbanked consumers is estimated to be US$3 trillion, which is about 42% of the total payments volume globally. The underbanked consumers thus represent an immense market opportunity for mainstream financial products and services. Some of the underbanked consumers may be budding entrepreneurs with a consistent capacity to earn and spend, but may not want to use mainstream financial products and services for various reasons. Some of these reasons could be lack of trust in traditional retail banks and financial institutions, lack of credit history, absence of collaterals, and lack of financial education / literacy.

[0005] From the perspective of these retail banks and financial institutions, they have limited understanding about the diversity and needs of the underbanked consumer population. There is limited information about underbanked consumers since they do not use their financial products and services, inhibiting the retail banks and financial institutions from offering financial products and services to the underbanked consumers. Particularly, these underbanked consumers do not use credit cards and have no credit history, ratings, or scores. It would be difficult for financial institutions to measure the credit risk of lending to the underbanked consumers without information on their credit history. Without any credit facility offer from banks, some underbanked consumers may resort to borrowing from money lenders or loan sharks at unfair conditions or high interest rates, thereby perpetuating a poverty cycle.

[0006] Therefore, in order to address or alleviate at least one of the aforementioned problems and/or disadvantages, there is a need to provide an improved electronic system and computerized method for facilitating credit profiling of consumers.

Summary

[0007] According to a first aspect of the present disclosure, there is a payment network server, a computerized method, and a non-transitory computer-readable storage medium comprising instructions for facilitating credit profiling of consumers. The method is performed by the payment network server and comprises steps of:

receiving, from one or more wallet servers, digital wallet data of digital wallets of the consumers, the digital wallet data comprising identification data of the consumers; retrieving, from a transaction database, merchant transaction data of merchant transactions made by the consumers using their digital wallets; obtaining a set of behavioral data for each of the consumers, the behavioral data associated with the merchant transactions; determining a cumulative score for each of the consumers based on the set of behavioral data; generating a set of compiled data comprising the cumulative scores and identification data of each of the consumers; and distributing the set of compiled data to institutions for said credit profiling of the consumers.

[0008] According to a second aspect of the present disclosure, there is a wallet server, a computerized method, and a non-transitory computer-readable storage medium comprising instructions for facilitating credit profiling of consumers. The method is performed by the wallet server and comprises steps of: identifying the consumers from a wallet database, each of the consumers having identification data; identifying, from the wallet database, digital wallets of the consumers based on the identification data thereof, retrieving, from the wallet database, merchant transaction data of merchant transactions made by the consumers using their digital wallets; obtaining a set of behavioral data for each of the consumers, the behavioral data associated with the merchant transactions; determining a cumulative score for each of the consumers based on the set of behavioral data; generating a set of compiled data comprising the cumulative scores and identification data of each of the consumers; and distributing the set of compiled data to institutions for said credit profiling of the consumers.

[0009] An electronic system and computerized method for facilitating credit profiling of consumers according to the present disclosure are thus disclosed herein. Various features, aspects, and advantages of the present disclosure will become more apparent from the following detailed description of the embodiments of the present disclosure, by way of non-limiting examples only, along with the accompanying drawings briefly described below.

Brief Description of the Drawings

[0010] Figure 1 is an illustration of an electronic system for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0011] Figure 2A is a block diagram illustration of modules of a payment network server for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0012] Figure 2B is a flowchart illustration of a computerized method performed on the payment network server for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0013] Figure 3 is another flowchart illustration of a computerized method performed on the payment network server for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0014] Figure 4A is a flowchart illustration of a computerized method performed on the payment network server for determining aggregated transaction scores of the consumers, in accordance with embodiments of the present disclosure.

[0015] Figure 4B and Figure 4C illustrate tables in relation to the aggregated transaction scores, in accordance with embodiments of the present disclosure.

[0016] Figure 5A is a flowchart illustration of a computerized method performed on the payment network server for determining mobile communication scores of the consumers, in accordance with embodiments of the present disclosure.

[0017] Figure 5B illustrates tables in relation to the mobile communication scores, in accordance with embodiments of the present disclosure.

[0018] Figure 6A is a flowchart illustration of a computerized method performed on the payment network server for determining age scores of the consumers, in accordance with embodiments of the present disclosure.

[0019] Figure 6B illustrates a table in relation to the age scores, in accordance with embodiments of the present disclosure.

[0020] Figure 7A is a flowchart illustration of a computerized method performed on the payment network server for determining aggregated utilities scores of the consumers, in accordance with embodiments of the present disclosure.

[0021] Figure 7B and Figure 7C illustrate tables in relation to the aggregated utilities scores, in accordance with embodiments of the present disclosure.

[0022] Figure 8 illustrates a table in relation to the cumulative scores of the consumers, in accordance with embodiments of the present disclosure.

[0023] Figure 9A is a block diagram illustration of modules of a wallet server for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0024] Figure 9B is a flowchart illustration of a computerized method performed on the wallet server for facilitating credit profiling of consumers, in accordance with embodiments of the present disclosure.

[0025] Figure 10 is a block diagram illustration of the technical architecture of a server, in accordance with embodiments of the present disclosure.

Detailed Description

[0026] In the present disclosure, depiction of a given element or consideration or use of a particular element number in a particular figure or a reference thereto in corresponding descriptive material can encompass the same, an equivalent, or an

analogous element or element number identified in another figure or descriptive material associated therewith. The use of "/" in a figure or associated text is understood to mean "and/or" unless otherwise indicated. For purposes of brevity and clarity, descriptions of embodiments of the present disclosure are directed to an electronic system and computerized method for facilitating credit profiling of consumers, in accordance with the drawings. While aspects of the present disclosure will be described in conjunction with the embodiments provided herein, it will be understood that they are not intended to limit the present disclosure to these embodiments. On the contrary, the present disclosure is intended to cover alternatives, modifications and equivalents to the embodiments described herein, which are included within the scope of the present disclosure as defined by the appended claims. Furthermore, in the following detailed description, specific details are set forth in order to provide a thorough understanding of the present disclosure. However, it will be recognized by an individual having ordinary skill in the art, i.e. a skilled person, that the present disclosure may be practiced without specific details, and/or with multiple details arising from combinations of aspects of particular embodiments. In a number of instances, known systems, methods, procedures, and components have not been described in detail so as to not unnecessarily obscure aspects of the embodiments of the present disclosure.

Overview

[0027] In representative or exemplary embodiments of the present disclosure, there is an electronic or computer system 100 including a payment network server 102 for facilitating credit profiling of consumers 104, as illustrated in Figure 1. The consumers 104 represent a consumer population which may include one or more groups or types of consumers 104. For example, the consumer population includes a group of banked consumers and a group of underbanked consumers, the latter referring to consumers 104 with limited or lack access to traditional banking services and products. Notably, those among the underbanked consumers who lack access or are unable to access to traditional banking services and products may be referred to as unbanked consumers. Said credit profiling may be performed for one or more of these groups of consumers 104, such as for banked consumers, underbanked

consumers, or both banked and underbanked consumers collectively. More specifically, said credit profiling is based on consumer behavior / activities which can be derived and analyzed from merchant transaction data of merchant transactions made by the consumers 104 with merchants 106. The merchant transactions may be through merchant websites, or through merchant billing machines or point-of-sale (POS) terminals at traditional brick-and-mortar retail stores.

[0028] The system 100 includes an electronic device 108 belonging to each of the consumers 104. The electronic device 108 is configured to execute and operate a digital wallet 110 containing funds for payment of the transactions with the merchants 106. The system 100 further includes one or more servers 112 of the merchants 106, one or more aggregator servers 114 for the merchants 106, one or more acquirer servers 116 for the merchants 106, and one or more wallet servers 118 for wallet institutions providing the digital wallets 110. The payment network server 102, consumer electronic devices 108, merchant servers 112, aggregator servers 114, acquirer servers 116, and wallet servers 118 are communicable with one another through a communication network 120. Transaction data of the transactions processed by the payment network server 102 are stored on a transaction database 122, such as the merchant transaction data from the merchant transactions. The system 100 optionally includes one or more utility servers 124 for one or more utility institutions that issue utility bills to the consumers 104. Utility transactions may be performed by the consumers 104 for settlement of the utility bills, and utility transaction data of the utility transactions are stored on the transaction database 122.

[0029] In some exemplary transactions between a consumer 104 and a merchant 106, the consumer 104 uses the digital wallet 110 operative on the consumer electronic device 108 to pay for the transaction. In one embodiment, the digital wallet 110 generates a Quick Response (QR) code which is displayed on the consumer electronic device 108. The POS terminal of the merchant 106 scans the QR code to receive digital wallet data of the digital wallet 110 for payment of the transaction. The merchant server 112 communicates the digital wallet data and transaction data to the acquirer server 116 or aggregator server 114, and the transaction is

subsequently processed by the payment network server 102 in a standard manner. In another embodiment, the consumer electronic device 108 scans a QR code displayed at the POS terminal of the merchant 106. The digital wallet 110 generates the transaction data based on the information embedded in the QR code and other inputs by the consumer 104. The consumer electronic device 108 communicates the transaction data, together with the digital wallet data, to the wallet server 118 and the transaction is subsequently processed by the payment network server 102 in a standard manner.

[0030] Although the consumers 104 may or may not have a traditional bank account, it is possible that the consumers 104 use cashless payment modes such as the digital wallets 110 for payment of transactions. It will be appreciated that it may not be necessary to have a bank account linked to a digital wallet 110, as the digital wallet 110 can be funded by alternative means such as cash top-ups and funds transfers from other digital wallets 110. The digital wallet 110 may even be funded by government subsidies, especially if the consumer 104 belongs to a lower income group.

[0031] Further with reference to Figure 2A and Figure 2B, there is shown a computer-implemented or computerized method 200 implemented on the payment network server 102 for facilitating credit profiling of the consumers 104. The payment network server 102 includes various modules / components for performing various operations or steps of the method 200, including a wallet communication module 102a, a transaction module 102b, a scoring module 102c, and a compilation module 102d. Optionally, the payment network server 102 includes other modules for performing other operations or steps of the method 200, such as a utilities communication module 102e. Each module 102a-e includes suitable logic, circuitry, and/or interfaces to execute such operations or steps.

[0032] In a step 202 of the method 200, the wallet communication module 102a of the payment network server 102 receives, from one or more wallet servers 118, digital wallet data of digital wallets 110 of the consumers 104, the digital wallet data including identification data of the consumers 104. Identification of the consumers

104 may be achieved by obtaining the credit profiles of the consumers 104 from various credit agencies / bureaus / institutions. Underbanked consumers may be filtered out from the consumers 104 and pre-identified by the wallet servers 118 based on absence of pre-existing credit profiles.

[0033] In a step 204 of the method 200, the transaction module 102b of the payment network server 102 retrieves, from the transaction database 122, merchant transaction data of merchant transactions made by the consumers 104 using their digital wallets 110. For each of the merchant transactions processed by the payment network server 102, the merchant transaction data thereof are stored on the transaction database 122. The merchant transaction data include the digital wallet data of the digital wallet 110 used to pay for the merchant transaction. The digital wallet data enable the transaction module 102b to identify the merchant transactions performed using the digital wallets 110.

[0034] In a step 206, the scoring module 102c of the payment network server 102 obtains a set of behavioral data for each of the consumers 104, the behavioral data associated with the merchant transactions. In a step 208, the scoring module 102c determines a cumulative score for each of the consumers 104 based on the set of behavioral data.

[0035] In a step 210, the compilation module 102d of the payment network server 102 generates a set of compiled data including the cumulative scores and identification data of each of the consumers 104. Specifically, the set of compiled data includes, for each of the consumers 104, his/her cumulative score determined based on the set of behavioral data, as well as the consumer identification data that are representative of his/her identity.

[0036] In a step 212, the compilation module 102d distributes the set of compiled data to institutions for said credit profiling of the consumers 104. These institutions may be, but are not limited to, government organizations, financial institutions, banks, and non-profit organizations. The set of compiled data facilitate the institutions to credit profile the consumers 104. For consumers 104 who are underbanked, the

compiled data would help the institutions to create credit profiles for the underbanked consumers. Banks may benefit from these credit profiles by targeting suitable consumers 104 to market their financial products and services.

[0037] In some embodiments, the set of behavioral data for each of the consumers 104 optionally includes an aggregated transaction score. The scoring module 102c is further configured for determining the aggregated transaction scores from the merchant transaction data.

[0038] In some embodiments, the set of behavioral data is further associated with mobile communication activity of the consumers 104. The set of behavioral data for each of the consumers 104 optionally includes a mobile communication score. The scoring module 102c is further configured for determining the mobile communication scores from mobile communication data of the consumers 104. The mobile communication data are receivable by the wallet communication module 102d from the wallet servers 118.

[0039] In some embodiments, the set of behavioral data is further associated with current ages of the consumers 104. The set of behavioral data for each of the consumers 104 optionally includes an age score. The scoring module 102c is further configured for determining the age scores from the identification data of the consumers 104.

[0040] In some embodiments, the set of behavioral data is further associated with utilities settlement promptness of the consumers 104. The set of behavioral data for each of the consumers 104 optionally includes an aggregated utilities score. The scoring module 102b is further configured for determining the aggregated utilities scores from utility bills and utility transactions of the consumers 104. The utility transactions are made by the consumers 104 using the digital wallets 110 for settlement of the utility bills. Utility bill data of the utility bills are receivable by the utilities communication module 102e from one or more utility servers 124,Utility transaction data of the utility transactions are stored on the transaction database 122 and retrievable by the transaction module 102b from the transaction database 122.

Description of Embodiments

[0041] References to “an embodiment / example”, “another embodiment / example”, “some embodiments / examples”, “some other embodiments / examples”, and so on, indicate that the embodiment(s) / example(s) so described may include a particular feature, structure, characteristic, property, element, or limitation, but that not every embodiment / example necessarily includes that particular feature, structure, characteristic, property, element or limitation. Furthermore, repeated use of the phrase “in an embodiment / example” or “in another embodiment / example” does not necessarily refer to the same embodiment / example.

[0042] The terms “comprising”, “including”, “having”, and the like do not exclude the presence of other features / elements / steps than those listed in an embodiment. Recitation of certain features / elements / steps in mutually different embodiments does not indicate that a combination of these features / elements / steps cannot be used in an embodiment.

[0043] As used herein, the terms “component”, “module,” “system”, “apparatus”, “interface”, and the like are generally intended to refer to a computer-related entity, either hardware, a combination of hardware and software, software, or software in execution. For example, a component or a module may be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a controller and the controller can be a component / module. One or more components / modules may reside within a process and/or thread of execution. A component / module may be localized on one computer and/or distributed among a plurality of computers.

[0044] As used herein, the terms “a” and “an” are defined as one or more than one. The term “set” is defined as a non-empty finite organization of elements that mathematically exhibits a cardinality of at least one (e.g. a set as defined herein can correspond to a unit, singlet, or single-element set, or a multiple-element set), in

accordance with known mathematical definitions. The recitation of a particular numerical value or value range herein is understood to include or be a recitation of an approximate numerical value or value range.

[0045] While various terms as used in representative or exemplary embodiments of the present disclosure are defined herein, the definitions of these terms are not intended to be limited as such and are in addition to their plain meanings according to standard English dictionaries.

[0046] In various embodiments of the present disclosure as illustrated in Figure 1, the electronic system 100 includes the payment network server 102 for facilitating credit profiling of consumers 104. The system 100 further includes the consumer electronic devices 108, digital wallets 110, merchant servers 112, aggregator servers 114, acquirer servers 116, wallet servers 118, wherein one or more or all of which are communicable with one another through the communication network 120. Optionally, the system 100 includes the utility servers 124 also communicable through the communication network 120.

[0047] The payment network server 102 is a computer server associated with a payment network of various payment instruments and which is operated by an intermediary entity. Typically, the intermediary entity is a card association, such as a credit card association, that facilitates communications between acquirer institutions and issuer institutions to authorize and process transactions. The payment network settles the transactions between various acquirer institutions and issuer institutions, when payment instruments such as credit cards are used for initiating transactions. Some examples of payment networks operated by intermediary entities include the Banknet payment network operated by Mastercard®. In many embodiments, the payment network server 102 and the payment network associated therewith facilitate the processing of transactions between the consumers 104 and the merchants 106, the merchant transactions paid using the digital wallets 110. The payment network settles the merchant transactions between the acquirer servers 116 for the merchants 106 and the wallet servers 118 for the digital wallets 110. The payment network may be integrated with or complements the communication network 120 to

facilitate said processing. The payment network server 102 generates credit and/or debit notifications based on processing of a merchant transaction. The credit and/or debit notifications are communicated to the acquirer server 116 and digital server 118 for crediting and/or debiting the respective accounts corresponding to the merchant transaction. More specifically, upon processing of the merchant transaction, funds are debited from the digital wallet 110 of the consumer 104, and funds are credited to a financial account of the merchant 106 held at the acquirer institution operating the acquirer server 116. Accordingly, funds are transferred from the digital wallet 110 to the merchant financial account. Data of the processed merchant transaction are stored on the transaction database 122.

[0048] In one example of a merchant transaction, a consumer 104 uses the digital wallet 110 to generate a QR code which is displayed on the consumer electronic device 108. The merchant billing machine / POS terminal at the retail premises of the merchant 106 scans the QR code to receive digital wallet data of the digital wallet 110 for payment of the merchant transaction. The merchant server 112 communicates the digital wallet data together with its merchant data and data of the merchant transaction to the acquirer server 116 or aggregator server 114, depending on which institution the merchant 106 has an account with. The acquirer server 116 or acquirer server 114 subsequently communicates the data to the payment network server 102 for subsequent processing in a standard manner. The data communicated to the payment network server 102 is in accordance with one or more standards for the interchange of payment transaction messages, such as the ISO 8583 standard. It will be appreciated that processing of the merchant transaction is standard regardless of whether the system 100 operates with the acquirer server 116 or aggregator server 114. Upon processing of the merchant transaction, funds are transferred from the digital wallet 110 to the merchant account.

[0049] In another example of a merchant transaction, the consumer electronic device 108 scans a QR code displayed at a merchant billing machine / POS terminal at the retail premises of the merchant 106 to receive the merchant data. The consumer 104 then inputs data of the transaction via the digital wallet 110, such as payment amount. The consumer electronic device 108 communicates the transaction data,

together with the digital wallet data and merchant data, to the wallet server 118. The wallet server 118 subsequently communicates the data to the payment network server 102 for subsequent processing in a standard manner.

[0050] Upon processing of the merchant transaction, funds are transferred from the digital wallet 110 to the merchant account. Data of the processed merchant transaction are stored on the transaction database 122. In both examples of the merchant transaction, QR codes are either consumer-presented or merchant-presented for communication of data to the other party. It will be appreciated that other forms of codifed data may be used, such as barcode, EZcode, high capacity color barcode, ShotCode, MaxiCode, GTIN12 code, GTIN-13 code, and Aztec code.

[0051] A consumer 104 may be banked or underbanked. A banked consumer is an individual who is an account holder of an account which refers to any financial account, such as current account, savings account, trading account, or any account associated with a payment instrument. The account may be a bank account maintained by a financial institution, such as an issuer institution or bank. The account may be linked to a digital wallet 110 maintained by a wallet institution or service provider. An underbanked consumer may or may not hold any type of financial or bank account, and does not use traditional types of payment instruments offered by banks, such as credit cards. Non-limiting examples of underbanked consumers include people with language barriers (e.g. migrant workers) and people who are unable to or prefer not to access retail banks (e.g. elderly people).

[0052] Instead of traditional payment instruments, the consumers 104 may use digital wallets 110 to pay for transactions with merchants 106, wherein such transactions may be performed online or at the merchant retail premises. The digital wallet 110 is operative on an electronic device 108 of the consumer 104. A local software or mobile application is installed / resident on the consumer electronic device 108 for operating / executing the digital wallet 110. The digital wallet 110 is provided by a wallet institution or service provider which operates a wallet server 118 whereon a host application is executed to cooperate with the local application on the consumer electronic device 108. The consumer electronic device 108 is communicable with the

wallet server 118 in performing various operations of the digital wallet 110. Some non-limiting examples of a digital wallet 110 include mPAY and PromptPay which are available in Thailand. The wallet institution may be an issuer institution or bank that also provides bank accounts to consumers to fund the digital wallet 110, or a third party service provider such as a financial technology company.

[0053] The digital wallet 110 may be funded by the consumer 104 through various means. For example, if the consumer 104 has a bank account, the digital wallet 110 may be funded by transferring funds from the bank account. The digital wallet 110 may also be funded by cash top-ups at designated locations, by receiving funds from other consumers 104 using digital wallets 110, and/or by government subsidies. The wallet server 118 updates the digital wallet 110 upon successful transfer of funds. The digital wallet funds are stored electronically in memory of the consumer electronic device 108. The digital wallet 110 is configured with the digital wallet data during setup thereof, some of which are being used for payment of merchant transactions, such as a wallet identifier and authentication code (e.g. PIN). The digital wallet data include identification data of the consumer 104, such as name, residential address, date of birth, email address, mobile phone number, and national identification number. The wallet identifier is used to login and access the digital wallets 110 and may be identical to the one of the consumer identification data, such as national identification number and mobile phone number. The wallet identifier may alternatively be a unique wallet identification number generated by the wallets server 118. In some embodiments, the digital wallet 110 may be configured with biometric authentication, and the digital wallet data may further include biometric data such as retina scans and fingerprints.

[0054] The consumer electronic device 108 is an electronic / communication device that enables the consumer 104 to purchase goods, products, and/or services through e-commerce sites or at a POS terminal (e.g. physical in-store payment transactions) associated with the merchant 106. The consumer electronic device 108 may be a mobile device, mobile phone, smartphone, personal digital assistant (PDA), key fob, transponder device, NFC-enabled device, tablet, phablet, laptop, computer, other communication device, or the like.

[0055] The merchant 106 is a business or commercial entity that offers various goods, products, and/or services in exchange for payments. The merchant 106 may establish an account with a financial institution, such as an acquirer institution or bank to accept the payments from the consumers 104 by use of the digital wallets 110. Alternatively, the merchant 106 may establish an account with a payment aggregator which provides a service for merchants 106 to process payment of transactions. The merchant 106 operates the merchant server 112 that is a computer server associated with a merchant apparatus or a POS terminal in a merchant retail premises or an e-commerce site on which transactions can be initiated by the consumers 104.

[0056] The aggregator server 114 is a computer server operated by a payment aggregator that aggregates various merchants 106 on a single platform. The payment aggregator serves as an interface between the merchant server 112 and payment network server 102, so that the merchant 106 does not need to setup an account with the acquirer institution. In some embodiments, the payment network server 102 and aggregator server 114 are separate entities. The aggregator server 114 receives the merchant transaction data from the merchant server 112 and communicates the merchant transaction data to the payment network server 102. In some other embodiments, the functionalities of the aggregator server 114 are integrated into the payment network server 102 such that they operate as an integrated or single entity.

[0057] The acquirer server 116 is a computer server operated by an acquirer institution or bank at which merchants 106 maintain merchant accounts to receive and accept payments for goods, products, and/or services purchased by the consumers 104. Account data of the merchant accounts established with the acquirer institution is stored as account profiles in an acquirer database of the acquirer institution. The acquirer database may reside locally on the acquirer server 116, or alternatively on a remote or cloud server communicatively linked to the acquirer server 116. The acquirer institution processes merchant transactions received from the merchant server 112 by using the acquirer server 116. The

acquirer server 116 communicates the merchant transaction data to the payment network server 102 through the communication network 120 for further processing. The acquirer server 116 is configured for crediting the account of the merchant 106 maintained in the acquirer institution upon processing of the merchant transaction.

[0058] The wallet server 118 is a computer server operated by the wallet institution or service provider of a digital wallet 110. The wallet institution ensures payment for authorized transactions using the digital wallet 110 in accordance with various payment network regulations and local legislation. Account data of the digital wallets 110 established by the consumers 104 with the wallet institution is stored as account profiles in a wallet database of the wallet institution. The wallet database may reside locally on the wallet server 118, or alternatively on a remote or cloud server communicatively linked to the wallet server 118. The account data may include an account or fund balance of the digital wallet 110 and transaction history of the account holder. The account data may further includes identification data of the digital wallet 110. The wallet server 118 is configured for debiting funds from the digital wallet 110 upon processing of the merchant transaction. It will be appreciated the wallet server 118 operates similarly to an issuer server of an issuer institution in terms of authorization of funds for payment of merchant transactions.

[0059] It will be appreciated that the acquirer server 116 and wallet server 118 receive various credit and debit notifications / messages from the payment network server 102. Based on the credit and debit notifications, the acquirer server 116 credits the merchant account and wallet server 118 debits the digital wallet 110. It will be further appreciated that said crediting and debiting via the acquirer server 116 and wallet server 118 respectively will be readily apparent to the skilled person and may include processing via the conventional four-party system or three-party system.

[0060] As used herein, the term “institution” is not necessarily limited to organizations which are legally constituted as banks. In some jurisdictions or countries, other organizations may be permitted to maintain financial accounts. An institution can be one of the following: a bank, financial technology company, financial institution, and wallet institution / service provider. An institution may also include credit agencies or

bureaus that provide credit profiles of consumers 104. An institution may also include government organizations, non-profit organizations, and service providers of utilities such as telecommunications, electricity, water, gas, internet, and the like.

[0061] The utility server 124 is a computer server operated by a public utilities or utility institution / service provider. The utility institution maintains the infrastructure for a public utility service and provides a utility service using that infrastructure to consumers 104 including those who are underbanked . The utility service may be for telecommunications, internet, electricity, water, or gas. The consumers 104 are charged or billed according to their usage of the utilities. Specifically, each utility institution issues a utility bill to the consumers 104 periodically, e.g. monthly. The consumers 104 would be required to settle the utilities bill within a stipulated period from the issuance date. The utilities bill may be settled by making a utility transaction to pay the amount due. The utility transaction may be paid with the digital wallet 110, thereby transferring funds from the digital wallet 110 to the utility institution. It will be appreciated that the utility transaction is processed by the payment network server 102 in a standard manner. Account data of the consumers 104 using the utilities are stored as account profiles in a utility database of the utility institution. The utility database may reside locally on the utility server 124, or alternatively on a remote or cloud server communicatively linked to the utility server 124. The account data may include identification data of an account holder, utility usage history of the account holder, account identification data, and the like. The identification data of the account holder may include a consumer identifier (e.g. national identification number and/or mobile phone number), name, age, gender, date of birth, physical attributes, email addresses, and the like of the account holder. The utility server 124 is configured for communicating utility bill data of utility bills of the consumers 104 to the payment network server 102 upon request and with permission or consent by the consumers 104.

[0062] The transaction database 122 is a repository of transaction data of transactions processed through the payment network by the payment network server 102. The processed transactions include merchant transactions between the consumers 104 and merchants 106, as well as utility transactions made by

consumers 104 for settlement of their utility bills. The transaction database 122 may reside locally on the payment network server 102, or alternatively on a remote or cloud server communicatively linked to the payment network server 102.

[0063] The communication network 120 is a medium or environment through which content, notifications, and/or messages are communicated among various entities, including the payment network server 102, consumer electronic device 108, merchant server 112, aggregator server 114, acquirer server 116, wallet server 118, and utility server 124. Some non-limiting examples of the communication network 120 include a virtual private network (VPN), wireless fidelity (Wi-Fi) network, light fidelity (Li-Fi) network, local area network (LAN), wide area network (WAN), metropolitan area network (MAN), satellite network, Internet, fiber optic network, coaxial cable network, infrared (IR) network, radio frequency (RF) network, and any combination thereof. Various entities in the communication network 120 may connect to the communication network 120 in accordance with various wired and wireless communication protocols, such as Transmission Control Protocol / Internet Protocol (TCP/IP), User Datagram Protocol (UDP), 2nd to 5th Generation (2G to 5G) communication protocols, Long Term Evolution (LTE) communication protocols, and any combination thereof. Each of the payment network server 102, consumer electronic device 108, merchant server 112, aggregator server 114, acquirer server 116, wallet server 118, and utility server 124 includes a data communication or transceiver module to communicate and transmit / receive data over the communication network 120. Some non-limiting examples of a transceiver module include an antenna module, a radio frequency transceiver module, a wireless transceiver module, a Bluetooth transceiver module, an Ethernet port, a Universal Serial Bus (USB) port, or any other module / component / device configured for transmitting and receiving data.

[0064] In various embodiments with reference to Figure 3, there is a computer-implemented or computerized method 300 implemented on the system 100. The method 300 is performed by the payment network server 102 for facilitating credit profiling of the consumers 104 based on a set of behavioral data for each of the consumers 104. Furthermore, the method 300 is iteratively performed at predefined

intervals, wherein the set of behavioral data is associated with a predefined period before each predefined interval.

[0065] In a step 302 of the method 300, the wallet communication module 102a of the payment network server 102 receives, from one or more wallet servers 118, digital wallet data of digital wallets 110 of the consumers 104, the digital wallet data including identification data of the consumers 104. Each of the consumers 104 has identification data such as a wallet identifier, name, residential address, date of birth, email address, national identification number, mobile phone number, and the like. Identification of the consumers 104 may be achieved by obtaining the credit profiles of the consumers 104 from various credit agencies / bureaus / institutions. Underbanked consumers may be filtered out from the consumers 104 and pre-identified by the wallet servers 118 based on absence of pre-existing credit profiles, such that said credit profiling is performed for the underbanked consumers.

[0066] The credit institutions may be known in various terms in different countries, such as a consumer reporting agency in the United States, a credit reference agency in the United Kingdom, and the Credit Bureau Singapore in Singapore. The credit profiles provide information on the consumers' 104 borrowing and settlement habits, and also include credit information derived from the consumers' 104 use of credit instruments such as loans and credit cards. The credit profiles are useful for assessing credit worthiness of the consumers 104. The underbanked consumers can be filtered out because they do not have pre-existing credit profiles from the credit institutions, likely due to them not using credit instruments such as credit cards and loans, and the underbanked consumers can be credit profiled by creating credit profiles for them. In one embodiment, the wallet servers 118 obtain the credit profiles from credit institutions. In another embodiment, some government agencies disburse financial aid / benefits / subsidies to the underbanked consumers who use digital wallets 110 such as mPAY and PromptPay. The underbanked consumers are pre-identified by the government agencies and receive the financial aid via their digital wallets 110. The wallet servers 118 would be able to identify their digital wallets 110 and obtain the identification data of the underbanked consumers.

[0067] In the step 304, the transaction module 102b of the payment network server 102 retrieves, from the transaction database 122, merchant transaction data of the merchant transactions made by the consumers 104 using their digital wallets 110. The merchant transactions may also be known as peer-to-merchant (P2M) transactions. For each of the merchant transactions processed by the payment network server 102, the merchant transaction data are stored on the transaction database 122. The merchant transaction data include digital wallet data of the digital wallet 110 used to pay for the merchant transaction. For example, the digital wallet data include wallet identifiers and/or consumer identification data that enable the transaction module 102b to identify the merchant transactions performed using the digital wallets 110 of the consumers 104, and subsequently to retrieve the merchant transaction data of the merchant transactions. In one embodiment, the wallet identifier of a digital wallet 110 is identical to one of the consumer identification data or a consumer identifier of a consumer 104, such as national identification number or mobile phone number. Merchant transactions made by the consumer 104 using the digital wallet 110 can be identified by the wallet identifier. In another embodiment, the wallet identifier is a unique wallet identification number different from the consumer identifier.

[0068] In the step 306, the scoring module 102c of the payment network server 102 obtains a set of behavioral data for each of the consumers 104, the behavioral data associated with the merchant transactions. For example, the behavioral data may relate to scores or parameters which can be determined from in the merchant transaction data of the merchant transactions made by the consumer 104 with the merchants 106. In the step 308, the scoring module 102c determines a cumulative score for each of the consumers 104 based on the set of behavioral data. Specifically, the scoring module 102c is configured with various rules and/or algorithms to process the behavioral data and determine the cumulative scores. The scoring module 102c may also be programmed with machine learning capabilities to refine the rules / algorithms to process the behavioral data based on continuous collection of the behavioral data of an increasing number of consumers 104.

[0069] In the step 310, the compilation module 102d generates a set of compiled data including the cumulative scores and identification data of each of the consumers 104. Specifically, the set of compiled data includes, for each of the consumers 104, his/her cumulative score determined based on the set of behavioral data, as well as the identification data of the consumer 104 that are representative of his/her identity. In one embodiment, the consumers 104 are grouped into different groups based on the score ranges which their cumulative scores fall within. For example, a consumer 104 with a cumulative score from 0 to 50 may be considered as having a poor credit rating, while another consumer 104 with a cumulative score from 150 to 200 may be considered as having a good credit rating. Accordingly, each of the consumers 104 can be grouped and benchmarked against all the consumers 104.

[0070] In the step 312, the compilation module 102d distributes the set of compiled data to institutions for said credit profiling of the consumers 104. These institutions may be, but are not limited to, government organizations, financial institutions, banks, and non-profit organizations. The set of compiled data facilitate the institutions to credit profile the consumers 104, such as the underbanked consumers who have been pre-identified. The compiled data would help the institutions to create credit profiles for the underbanked consumers. For banked consumers, the set of compiled data may be used to complement and update the existing credit profiles. Banks may benefit from these credit profiles by targeting suitable consumers 104 to market their financial products and services. For banks that lend money to consumers, the credit profiles can provide adequate information to them that could facilitate them in screening and monitoring the consumers 104, as well as avoiding loaning to consumers 104 who are considered as high risk individuals.

[0071] In a step 314, the method 300 is reiterated and returns to the step 302. Specifically, the method 300 and all steps thereof are performed iteratively at predefined intervals, such as at the end of every month. The step 306 of obtaining the set of behavioral data for each of the consumers 104 and the step 308 of determining the cumulative score for each of the consumers 104 based on the set of behavioral data may be performed iteratively at the end of every month. Furthermore,

the set of behavioral data is associated with a predefined period before the predefined interval, such as the month immediately before the month end. As an example, if the method 300 is iteratively performed on 30th / 31st of every month, the behavioral data will be based on 1st to 30th / 31st of that particular month only. Accordingly, only merchant transactions performed from 1st to 30th / 31st of the month will be considered for the behavioral data. Iteratively performing the method 300 provides constant updates on the cumulative scores of the consumers 104, such that institutions that receive the compiled data of the consumers 104 can constantly update their credit profiles and improve the institutions' risk assessment procedures. It will be appreciated that the predefined interval and/or predefined period can be adjusted accordingly to refine the method 300 of facilitating credit profiling the consumers 104.

[0072] In some embodiments, the set of behavioral data for each of the consumers 104 includes an aggregated transaction score derived from the merchant transactions. The method 300 includes a method 400 of determining the aggregated transaction scores from the merchant transaction data of the merchant transactions. The payment network server 102, specifically the transaction module 102b and scoring module 102c thereof, is configured for performing the method 400, as illustrated in Figure 4A.

[0073] The method 400 includes a step 402 wherein the transaction module 102b identifies a merchant category code of each of the merchant transactions. A merchant category code or MCC is defined as a four-digit number listed in the ISO 18245 standard for retail financial services and relates to the business of a merchant 106. In a step 404, the scoring module 102c assigns each of the merchant category codes to one of a number of merchant types, each of the merchant types having a predefined merchant score for scoring the merchant transactions.

[0074] In some embodiments, all merchant category codes are assigned to one of three merchant types, specifically constructive merchant type, consumption merchant type, and inhibitive merchant type. Expenditure at merchants 106 with merchant category codes of the constructive merchant type shows a saving /

investment mindset and has a positive connotation for credit scores / ratings. Expenditure at merchants 106 with merchant category codes of the consumption merchant type has a neutral connotation for credit scores / ratings. Expenditure at merchants 106 with merchant category codes of the inhibitive merchant type is considered as expenditure on vices and has a negative connotation for credit scores / ratings. Each of the merchant category codes of the constructive merchant type may have a predefined merchant score of +1. Each of the merchant category codes of the consumption merchant type may have a predefined merchant score of 0. Each of the merchant category codes of the inhibitive merchant type may have a predefined merchant score of -1. Figure 4B illustrates tables showing various merchant category codes and their respective merchant types and predefined merchant scores.

[0075] In a step 406, the scoring module 102c scores each of the merchant transactions based on the merchant category code. Specifically, a score is assigned to each of the merchant transactions based on the merchant category code and predefined merchant score for the merchant category code. In a step 408, the scoring module 102c determines the aggregated transaction score for each of the consumers 104 by aggregating the merchant transaction scores. The cumulative score for each of the consumers 104 is determined from the behavioral data and includes the aggregated transaction score.

[0076] In some embodiments with reference to Figure 4C, in the step 408, the consumers 104 are first grouped into different groups, e.g. percentiles, based on their merchant transaction scores. For example, in one iteration of the method 300 performed at month-end, only merchant transactions for the month are considered in determining the merchant transaction scores. A first consumer 104a has the merchant transaction scores summing up to 24, a second consumer 104b has the merchant transaction scores summing up to 8, and a third consumer 104c has the merchant transaction scores summing up to -2.

[0077] Comparing the summed merchant transaction scores among all the consumers 104, the first consumer 104a is grouped in the 80-100 percentile group,

the second consumer 104b is grouped in the 20-40 percentile group, and the third consumer 104c is grouped in the 0-20 percentile group. Each percentile group is assigned to a predefined percentile score, and the percentile groups benchmark each of the consumers 104 against all the consumers 104. The aggregated transaction score for each of the consumers 104 is the predefined percentile score of the percentile group which the consumer 104 is in.

[0078] The inclusion of merchant transaction information in determining the set of behavioral data and cumulative scores is useful as it shows whether a consumer 104 is responsible in his/her spending habits. For example, responsible spending towards long term investment decisions like spend on education, health, and/or financial products is considered to be positively correlated with credit worthiness. On the contrary, irresponsible spending on vices such as gambling and alcohol is negatively correlated with credit worthiness.

[0079] In some embodiments, the set of behavioral data is further associated with mobile communication activity of the consumers 104. The set of behavioral data for each of the consumers 104 includes a mobile communication score. The method 300 includes a method 500 of determining the mobile communication scores from mobile communication data of the consumers 104. The payment network server 102, specifically the wallet communication module 102a and scoring module 102c thereof, is configured for performing the method 500, as illustrated in Figure 5A.

[0080] The method 500 includes a step 502 wherein the wallet communication module 102a receives, from the wallet servers 118 of the digital wallets 110. The mobile communication data is collected by the wallet servers 118 from electronic devices 108 of the consumers 104, wherein the consumer electronic devices 108 operate the digital wallets 110. In a step 504, the wallet communication module 102a determines, from the mobile communication data and for each of the consumers 104, a number of calls communicated and/or number of messages communicated. Thus, for each of the consumers 104, he/she would have configured the appropriate permissions on the digital wallet 110 that would enable the wallet servers 118 to collect mobile communication data from call and message logs stored in memory of

the consumer electronic device 108. The mobile communication data relate to calls and/or messages communicated to and from the consumer electronic devices 108. The mobile communication data may be collected in real time or periodically, such as daily or weekly, to ensure that the data archive is up to date.

[0081] In a step 506, the scoring module 102c determines the mobile communication score for each of the consumers 104 based on the number of calls and/or number of messages. The cumulative score for each of the consumers 104 is determined from the behavioral data and includes the mobile communication score.

[0082] In some embodiments with reference to Figure 5B, in the step 506, the consumers 104 are first grouped into different groups, e.g. percentiles, based on their number of calls (incoming and outgoing) and number of messages (incoming and outgoing). For example, in one iteration of the method 300 performed at month-end, only calls and messages for the month are considered. The first consumer 104a has the 18 calls and 120 messages, the second consumer 104b has 14 calls and 185 messages, and the third consumer 104c has 7 calls and 90 messages.

[0083] Comparing the summed numbers of calls and messages among all the consumers 104, the first consumer 104a is grouped in the 80-100 percentile group and 40-60 percentile group for calls and messages respectively, the second consumer 104b is grouped in the 60-80 percentile group and 80-100 percentile group for calls and messages respectively, and the third consumer 104c is grouped in the 20-40 percentile groups for calls and messages. Each percentile group is assigned to a predefined percentile score, and the percentile groups benchmark each of the consumers 104 against all the consumers 104. In one embodiment, the mobile communication score for each of the consumers 104 is the predefined percentile score of the percentile groups for calls which the consumer 104 is in. In another embodiment, the mobile communication score is the predefined percentile score of the percentile groups for messages. In yet another embodiment, the mobile communication score includes two separate scores – a calls score being the predefined percentile score of the percentile groups for calls and a messages score being the predefined percentile score of the percentile groups for messages. The

mobile communication score may be the sum of the calls score and messages score, or an average thereof.

[0084] The inclusion of mobile communication activity information in determining the set of behavioral data and cumulative scores is useful as it indicates the social connectivity of a consumer 104. Consumers 104 with a high degree of social connectivity are indicative of being more networked and thus more likely to have gainful employment and the right connections. A highly connected consumer 104 is assumed to be established in a location that creates social commitment, such as a business person who uses calls or messages for the business relations. Such consumers 104 are considered to be socially answerable and thus are less likely to default on debt out of social censure.

[0085] In some embodiments, the scoring module 102c is configured for determining a number of unique parties of the calls and/or messages, wherein the mobile communication score for each of the consumers 104 is determined based additionally on the number of unique parties. By considering the number of unique parties in the calls and/or messages instead of the total number of calls and/or messages, there is a better indication of the social connectivity of a consumer 104. For example, a consumer 104 may make many calls and send many messages, but this does not mean he/she is socially connected as the calls and messages can be for one or few persons only, such as spouse, siblings, or parents. A consumer 104 with a higher number of unique parties involved in calls and/or messages is more indicative that he/she is social connected, thereby providing a better assessment of his/her credit worthiness.

[0086] In some embodiments, the set of behavioral data is further associated with current ages of the consumers 104. The set of behavioral data for each of the consumers 104 includes an age score. The method 300 includes a method 600 of determining the age scores from the identification data of the consumers 104. The payment network server 102, specifically the scoring module 102c thereof, is configured for performing the method 600, as illustrated in Figure 6A.

[0087] The method 600 includes a step 602 wherein the scoring module 102c determines the current age of each of the consumers 104 based on the identification data of the consumer 104. For example, the consumer identification data include the date of birth of the consumer 104. The current age of the consumer 104 can be calculated from the date of birth. In a step 604, the scoring module 102c determines the age score for each of the consumers 104 based on the current age. The cumulative score for each of the consumers 104 is determined from the behavioral data and includes the age score.

[0088] In some embodiments with reference to Figure 6B, in the step 604, a raw age score is determined as half of the difference between 100 and the current age of the consumer 104. Notably, as the minimum age to use a digital wallet 110 is 18, the maximum age score is 41. The raw age scores may be normalized to a maximum of 50. The current age is as of the month end during which the method 300 is performed. For example, the current age of the first consumer 104a is 32 and the corresponding raw age score is 34 (normalized to 41), the current age of the second consumer 104b is 27 and the corresponding raw age score is 36.5 (normalized to 45), and the current age of the third consumer 104c is 45 and the corresponding raw age score is 27.5 (normalized to 34).

[0089] The age scores are inversely related to the current ages of the consumers 104. A younger consumer 104 has a higher age score than an older consumer 104. Younger consumers 104 are considered as more credit worthy as they have more years in their lifetime to repay loans. Furthermore, younger consumers 104 have a high scope for employment in the longer term.

[0090] In some embodiments, the set of behavioral data is further associated with utilities settlement promptness of the consumers 104, i.e. how quickly the consumers 104 settle their utilities bills. The set of behavioral data for each of the consumers 104 includes an aggregated utilities score derived from the utility bills and utility transactions for settling the utility bills. The method 300 includes a method 700 of determining the aggregated utilities scores from the utility bills and the utility transactions of the consumers 104. The payment network server 102, specifically the

transaction module 102a, scoring module 102c, and utilities communication module 102e thereof, is configured for performing the method 700, as illustrated in Figure 7A.

[0091] The method 700 includes a step 702 wherein the utilities communication module 102e receives, from one or more utility servers 124, utility bill data of the utility bills issued to the consumers 104. In one embodiment, the utilities communication module 102e communicates, to the utility servers 124, the consumer identification data of the consumers 104, such as their national identification numbers, to request for the utility bills. The utility servers 124 identify, from the utility database, the respective utility bills for the consumers 104 based on the consumer identification data. The utility servers 124 subsequently communicate the utility bill data of the utility bills to the payment network server 102. The utility bill data include the issuance dates of the utility bills.

[0092] In the step 704, the transaction module 102b of the payment network server 102 retrieves, from the transaction database 122, utility transaction data of the utility transactions made by the consumers 104 using their digital wallets 110 for settlement of the utility bills. For each of the utility transactions processed by the payment network server 102, the utility transaction data are stored on the transaction database 122. The utility transaction data include digital wallet data of the digital wallet 110 used to pay for the utility transaction and merchant data of the utility institutions that receive the payments. The digital wallet data include the consumer identification data which may include an account number, e.g. national identification number, associated with the utility bill to enable the transaction module 102b to identify the utility transaction corresponding to the utility bill. Additionally, for each of the utility transactions, the utility transaction data thereof include the merchant category code (which is 4900 for utilities) and the transaction date of the utility transaction, i.e. the date on which the consumer 104 performed the utility transaction.

[0093] In a step 706, the scoring module 102c determines a time duration between the issuance date of each of the utility bills and the transaction date of the corresponding utility transaction for settlement of the utility bill. For example, a utility bill is issued on 1 January 2018 and the transaction date of the corresponding utility

transaction is 5 January 2018. The time duration is determined as 4 days from the issuance date. In a step 708, the scoring module 102c scores each of the utility bills based on the time duration. The utility bill scores are inversely related to the time durations, such that a consumer 104 who quickly settles his/her utility bills has a higher utility bill score than another consumer 104 who takes more time to settle. For example, with reference to Figure 7B, a consumer 104 who settles a utility bill within 1 week from the issuance date scores 5 points for the utility bill. A utility bill is scored -10 points if the time duration is more than 2 months.

[0094] In a step 710, the scoring module 102c determines the aggregated utilities score for each of the consumers 104 by aggregating the utility bill scores. The cumulative score for each of the consumers 104 is determined from the behavioral data and includes the aggregated utilities score.

[0095] In some embodiments with reference to Figure 7C, in the step 710, each of three consumers 104 has been issued three utility bills for water, gas, and electricity. For example, in one iteration of the method 300 performed at month-end, only the most recent utility bills are considered. The first consumer 104a has utility bill scores summing up to 20, the second consumer 104b has utility bill scores summing up to 0, and the third consumer 104c has utility bill scores summing up to -5.

[0096] Comparing the summed utility bill scores among all the consumers 104, the first consumer 104a is grouped in the 80-100 percentile group, the second consumer 104b is grouped in the 20-40 percentile group, and the third consumer 104c is grouped in the 0-20 percentile group. In one embodiment, the summed utility scores for each of the consumers 104 is averaged over the number of utility bills before grouping in the percentile groups, as not all the consumers 104 receive the same type and/or number of utility bills. Each percentile group is assigned to a predefined percentile score, and the percentile groups benchmark each of the consumers 104 against all the consumers 104. The aggregated utilities score for each of the consumers 104 is the predefined percentile score of the percentile group which the consumer 104 is in.

[0097] The inclusion of utilities settlement promptness information in determining the set of behavioral data and cumulative scores is useful as it indicates a consumer's 104 dependability and a sense of responsibility, which are positively correlated to credit worthiness. Most utility bills require recurring payments and timely settlement of these recurring payments can be an indicator of a steady source of income as well as exemplary consumer payment behavior.

[0098] In some embodiments, the set of behavioral data of a consumer 104 is associated with the merchant transactions, mobile communication activity, current age, and utilities settlement promptness. Specifically, the set of behavioral data includes an aggregated transaction score, a mobile communication score, an age score, and an aggregated utilities score. The cumulative score of a consumer 104 is determined from each of the aggregated transaction score, mobile communication score, age score, and aggregated utilities score. Figure 8 illustrates the respective scores for some consumers 104. The respective scores may be weighted according to various factors, such as importance or significance to credit profiling.

[0099] In some other embodiments, the set of behavioral data of a consumer 104 is associated with one or more of the merchant transactions, mobile communication activity, current age, and utilities settlement promptness. Specifically, the set of behavioral data includes one or more of an aggregated transaction score, a mobile communication score, an age score, and an aggregated utilities score. The cumulative score of a consumer 104 is determined from one or more of the aggregated transaction score, mobile communication score, age score, and aggregated utilities score.

[00100] The compiled data of the consumers 104 including their cumulative scores are communicated to institutions for credit profiling of the consumers 104. These institutions may be government organizations, financial institutions, banks, and non-profit organizations. The compiled data facilitate the institutions to credit profile the consumers 104, such as the underbanked consumers. For example, the compiled data facilitate the institutions to create credit profiles for underbanked consumers who are pre-identified, such as based on absence of pre-existing credit

profiles. For banked consumers, the set of compiled data may be used to complement and update the pre-existing credit profiles Banks may benefit from these credit profiles by targeting suitable consumers 104 to market their financial products and services. The compiled data is derived from merchant transaction information and optionally mobile communication information to enable the banks to create / update the credit profiles more accurately and robustly. As consumers 104 who are relatively more responsible in their spending behavior have better credit worthiness, the banks can effectively target consumers 104 with strong credit worthiness based on their credit profiles to market their financial products and services, such as to provide them with loans for entrepreneurship purposes.

[00101] With the new / updated credit profiles, banks will have greater confidence in lending to consumers 104, especially those who are entrepreneurs. There may be some entrepreneurs who are underbanked and may lack access to funding. The credit profiles can provide adequate information to banks that could facilitate the banks in screening and monitoring the consumers 104, as well as avoiding loaning to consumers 104 who are considered as high risk individuals. The system 100 described herein can be used as a gateway to reach out to consumers 104, and specifically underbanked consumers to bring them into the traditional or formal banking system. Banks would be able to extend credit on a large scale to new consumer pools, potentially opening up new market opportunities for the banks.

[00102] The system 100 and various methods 200 / 300 / 400 / 500 / 600 / 700 described herein can be offered to various institutions such as government agencies / organizations and issuer banks to facilitate credit profiling of consumers 104, especially in developing markets with a large proportion of underbanked consumers who may not have pre-existing credit profiles. Such offering may be in the form of a subscription model, wherein the payment network server 102 periodically distributes updated compiled data to the institutions. This subscription model would enable the institutions to gain insights on the consumer population including underbanked consumers and how to address their needs.

[00103] As described above, each of the aggregated transaction score, mobile communication score, age score, and aggregated utilities score is normalized among all the consumers 104. However, the cumulative score is an absolute number that is included in the compiled data distributed to institutions. Optionally, the compiled data includes credit ratings of the consumers 104 according to their cumulative scores. For example, the first consumer 104a with a cumulative score of 221 may be considered as having an excellent credit rating, the second consumer 104b with a cumulative score of 175 may be considered as having a good credit rating, and the third consumer 104c with a cumulative score of 94 may be considered as having an average credit rating. It is up to the institutions' discretion to credit profile the consumers 104 based on the cumulative scores. For example, a bank may be risk averse to lending to consumers 104 and may set a higher threshold for the cumulative scores.

[00104] In various embodiments described above, the set of behavioral data is associated with the merchant transactions or P2M transactions made by the consumers 104. In some other embodiments, the set of behavioral data is further associated with peer-to-peer (P2P) transactions and/or peer-to-government (P2G) transactions. P2P transactions refer to payment transactions made between a consumer 104 with other consumers 104 (consumer recipients) via the digital wallet 110. The behavioral data may be determined based on transaction parameters such as the transaction amount, transaction frequency, identity of the consumer recipients. For example, frequent payments to a few consumer recipients may suggest the consumer 104 has a source of income and may be financially providing for some people. P2G transactions refer to payment transactions made between a consumer 104 and the government or government agencies / organizations, such as tax authority, via the digital wallet 110. The behavioral data may be determined based on transaction parameters such as the tax payment amount and tax payment frequency. The tax payment amount can be used to estimate the taxable income of the consumer 104, and may suggest that he/she has a source of income.

[00105] In some embodiments, the set of behavioral data is associated with telecommunication transactions, such as for recharging a prepaid telecommunication

plan or recurring payments for a postpaid telecommunication contract. The behavioral data may be determined based on transaction parameters such as the transaction amount and frequency. Regular telecommunication transactions may suggest that there is a steady source of income that allows such recharging or recurring payments to be made periodically. Other related parameters such as the telecommunications company and the type of postpaid telecommunication contract can also be used to indicate the financial status of the consumer 104.

[00106] In some embodiments, the set of behavioral data is associated with locations of the consumer 104. The behavioral data may be determined based on location data collected by the wallet servers 118 from the consumer electronic devices 108, with permission or consent from the consumers 104. The consumer electronic devices 108 have a geolocation module to determine the location data of where the consumer 104 has been. The location data may be collected in real time or periodically, such as daily or weekly, to ensure that the data archive is up to date. The location data may indicate sparse locations or dense locations and can be used to understand consumer behavior. Dense locations may mean that a consumer 104 has a job or some recurrent activity at a specific location, especially if the location is recurrent on weekdays. This may suggest that the consumer 104 has a stable job and a steady source of income. Sparse locations on weekdays and with some route patterns may mean that the consumer 104 has a transport-related job, such as driver or security service. Sparse locations on weekends or holiday periods may mean that the consumer 104 is able to have vacations outside of his residential area. This may suggest that the consumer 104 is financially capable of going for vacations.

[00107] In various embodiments described above, facilitating credit profiling of the consumers 104 is performed by the payment network server 102. In some other embodiments, facilitating credit profiling of the consumers 104 may instead be performed by one or more wallet servers 118, since merchant transactions also flow through the wallet servers 118 and behavioral data can be obtained from the wallet servers 118.

[00108] With reference to Figure 9A and Figure 9B, there is shown a computer-implemented or computerized method 900 implemented on a wallet server 118 for facilitating credit profiling of the consumers 104. The wallet server 118 includes various modules / components for performing various operations or steps of the method 900, including an identification module 118a, a transaction module 118b, a scoring module 118c, and a compilation module 118d. Each module 118a-d includes suitable logic, circuitry, and/or interfaces to execute such operations or steps. It will be appreciated that various aspects of the methods 200 and 300 apply similarly or analogously to the method 900, and such aspects are omitted from the description of the method 900 for purpose of brevity.

[00109] In a step 902 of the method 900, the identification module 118a of the wallet server 118 identifies the consumers 104 from a wallet database, each of the consumers 104 having identification data. In a step 904, the identification module 118a identifies, from the wallet database, digital wallets 110 of the consumers 104 based on the identification data of the consumers 104. The wallet database is a repository of digital wallet data of the digital wallets 110 of the consumers 104, identification data of the consumers 104, and transaction data of transactions processed via the wallet server 118.

[00110] In a step 906, the transaction module 118b of the wallet server 118 retrieves, from the wallet database, merchant transaction data of merchant transactions made by the consumers 104 using their digital wallets 110. In a step 908, the scoring module 118c of the wallet server 118 obtains a set of behavioral data for each of the consumers 104, the behavioral data associated with the merchant transactions. In a step 910, the scoring module 118c determines a cumulative score for each of the consumers 104 based on the set of behavioral data.

[00111] In a step 912, the compilation module 118d of the wallet server 118 generates a set of compiled data including the cumulative scores and identification data of each of the consumers 104. In a step 914, the compilation module 118d distributes the set of compiled data to institutions for said credit profiling of the consumers 104.

[00112] In some embodiments, the identification module 118a of the wallet server 118 identifies, from among the consumers 104, underbanked consumers based on absence of pre-existing credit profiles, wherein said credit profiling is performed for the underbanked consumers. In some embodiments, there is a step 916 in which the method 900 is reiterated and returns to the step 902. Specifically, the method 900 and all steps thereof are performed iteratively at predefined intervals, as described above in the method 300.

[00113] In some embodiments, the set of behavioral data for each of the consumers 104 optionally includes an aggregated transaction score. The method 900 includes determining the aggregated transaction scores from the merchant transaction data. Specifically, the wallet server 118 identifies a merchant category code of each of the merchant transactions, scores each of the merchant transactions based on the merchant category code, and determines the aggregated transaction score for each of the consumers 104 by aggregating the merchant transaction scores. It will be appreciated that various aspects of the method 400 are applicable here, but are excluded for purpose of brevity.

[00114] In some embodiments, the set of behavioral data is further associated with mobile communication activity of the consumers 104. The set of behavioral data for each of the consumers 104 optionally includes a mobile communication score determined from mobile communication data of the consumers 104. Specifically, the wallet server 118 collects mobile communication data from the consumer electronic devices 108 operating the digital wallets 110, determines, from the mobile communication data and for each of the consumers 104, a number of calls communicated and/or number of messages communicated, and determines the mobile communication score for each of the consumers 104 based on the number of calls and/or number of messages. It will be appreciated that various aspects of the method 500 are applicable here, but are excluded for purpose of brevity.

[00115] In some embodiments, the set of behavioral data is further associated with current ages of the consumers 104. The set of behavioral data for each of the

consumers 104 optionally includes an age score. Specifically, the wallet server 118 determines the current age of each of the consumers 104 based on the identification data of the consumer 104, and determines the age score for each of the consumers 104 based on the current age. It will be appreciated that various aspects of the method 600 are applicable here, but are excluded for purpose of brevity.

[00116] In some embodiments, the set of behavioral data is further associated with utilities settlement promptness of the consumers 104. The set of behavioral data for each of the consumers 104 optionally includes an aggregated utilities score. Specifically, the wallet server 118 receives, from one or more utility servers 124, utility bill data of the utility bills issued to the consumers 104, the utility bill data including issuance dates of the utility bills. The wallet server 118 retrieves, from the wallet database, utility transaction data of the utility transactions made by the consumers 104 using their digital wallets 110 for settlement of the utility bills, the utility transactions data including transaction dates of the utility transactions. The wallet server 118 determines a time duration between the issuance date of each of the utility bills and the transaction date of the corresponding utility transaction, scores each of the utility bills based on the time duration, and determines the aggregated utilities score for each of the consumers 104 by aggregating the utility bill scores. It will be appreciated that various aspects of the method 700 are applicable here, but are excluded for purpose of brevity.

[00117] In some embodiments, the scoring module 102c / 118c is programmed with machine learning capabilities to refine the rules / algorithms to process the behavioral data based on continuous collection of the behavioral data of an increasing number of consumers 104. Various forms of machine learning capabilities may be implemented, such as but not limited to, decision tree learning, support vector machines (SVM), and logistic regression. For example, SVM is used to train the scoring module 102c / 118c with existing behavioral data and to analyze new behavioral data for classification and regression analysis. Logistic regression is typically used to determine which independent variables in the credit profiles have statistically significant correlations with the important dependent variables such as late payments.

Technical Architecture

[00118] As used herein, a server is a physical or cloud data processing system on which a server program runs. The server may be implemented in hardware or software, or a combination thereof. Some non-limiting examples of the payment network server 102, merchant server 112, aggregator server 114, acquirer server 116, wallet server 118, and utility server 124 include computers, laptops, mini-computers, mainframe computers, any non-transient and tangible machines that can execute a machine-readable code, cloud-based servers, distributed server networks, and a network of computer systems.

[00119] Figure 10 is a block diagram illustrating a technical architecture 1000 of the payment network server 102. The merchant server 112, aggregator server 114, acquirer server 116, wallet server 118, and utility server 124 may share a similar technical architecture.

[00120] The technical architecture 1000 includes a processor 1002 (also referred to as a central processor unit or CPU) that is in communication with memory devices including secondary storage 1004 (such as disk drives or memory cards), read-only memory (ROM) 1006, and random-access memory (RAM) 1008. The processor 1002 may be implemented as one or more CPU chips. Various modules or components for performing various operations or steps of the methods 200-900 are configured as part of the processor 1002 and such operations or steps are performed in response to non-transitory instructions operative or executed by the processor 1002. The processor 1002 includes suitable logic, circuitry, and/or interfaces to execute such operations or steps. Some non-limiting examples of the processor 1002 include an application-specific integrated circuit (ASIC) processor, a reduced instruction set computing (RISC) processor, a complex instruction set computing (CISC) processor, a field-programmable gate array (FPGA), and the like.

[00121] The technical architecture 1000 further includes input/output (I/O) devices 1010, and system connectivity / network devices 1012. The secondary

storage 1004 typically includes one or more memory cards, disk drives, tape drives, or other storage devices and is used for non-volatile storage of data and as an over-flow data storage device if RAM 1008 is not large enough to hold all working data. Secondary storage 1004 may be used to store programs which are loaded into RAM 1008 when such programs are selected for execution.

[00122] The secondary storage 1004 has a processing component 1014 including non-transitory instructions operative by the processor 1002 to perform various operations or steps of the methods 200-900 according to various embodiments of the present disclosure. The ROM 1006 is used to store instructions and perhaps data which are read during program execution. The secondary storage 1004, the ROM 1006, and/or the RAM 1008 may be referred to in some contexts as computer-readable storage media and/or non-transitory computer-readable media. Non-transitory computer-readable media include all computer-readable media, with the sole exception being a transitory propagating signal per se.

[00123] The I/O devices 1010 may include printers, video monitors, liquid crystal displays (LCDs), plasma displays, touch screen displays, keyboards, keypads, switches, dials, mice, track balls, voice recognizers, card readers, paper tape readers, and/or other known input devices.

[00124] The system connectivity / network devices 1012 may take the form of modems, modem banks, Ethernet cards, universal serial bus (USB) interface cards, serial interfaces, token ring cards, fibre distributed data interface (FDDI) cards, wireless local area network (WLAN) cards, radio transceiver cards that promote radio communications using protocols such as code division multiple access (CDMA), global system for mobile communications (GSM), long-term evolution (LTE), worldwide interoperability for microwave access (WiMAX), near field communication (NFC), radio frequency identity (RFID), and/or other air interface protocol radio transceiver cards, and other known system connectivity / network devices. These system connectivity / network devices 1012 may enable the processor 1002 to communicate with the Internet or one or more intranets. With such a system / network connection, it is contemplated that the processor 1002 might receive

information from the network, or might output information to the network in the course of performing the operations or steps of the methods 200-900. Such information, which is often represented as a sequence of instructions to be executed using processor 1002, may be received from and outputted to the network, for example, in the form of a computer data signal embodied in a carrier wave.

[00125] The processor 1002 executes instructions, codes, computer programs, scripts which it accesses from hard disk, floppy disk, optical disk (these various disk-based systems may all be considered secondary storage 1004), flash drive, ROM 1006, RAM 1008, or the system connectivity / network devices 1012. While only one processor 1002 is shown, multiple processors may be present. Thus, while instructions may be discussed as executed by a processor, the instructions may be executed simultaneously, serially, or otherwise executed by one or multiple processors.

[00126] The technical architecture 1000 may be formed by one computer, or multiple computers in communication with each other that collaborate to perform a task. For example, but not by way of limitation, an application may be partitioned in such a way as to permit concurrent and/or parallel processing of the instructions of the application. Alternatively, the data processed by the application may be partitioned in such a way as to permit concurrent and/or parallel processing of different portions of a data set by the multiple computers. In an embodiment, virtualization software may be employed by the technical architecture 1000 to provide the functionality of a number of servers that is not directly bound to the number of computers in the technical architecture 1000. In an embodiment, the functionality disclosed above may be provided by executing the application and/or applications in a cloud computing environment. Cloud computing may include providing computing services via a system / network connection using dynamically scalable computing resources. A cloud computing environment may be established by an enterprise and/or may be hired on an as-needed basis from a third-party provider.

[00127] It is understood that by programming and/or loading executable instructions onto the technical architecture 1000, at least one of the CPU 1002, ROM 1006, and RAM 1008 are changed, transforming the technical architecture 1000 in part into a specific purpose machine or apparatus having the functionality as taught by various embodiments of the present disclosure. It is fundamental to the electrical engineering and software engineering arts that functionality that can be implemented by loading executable software into a computer can be converted to a hardware implementation by known design rules.

[00128] Furthermore, various embodiments of the present disclosure may be implemented as a method, apparatus, or article of manufacture using standard programming and/or engineering techniques to produce software, firmware, hardware, or any combination thereof to control a computer to implement the disclosed embodiments. For instance, various embodiments may be implemented as a computer-readable medium embedded with a computer-executable program, which encompasses a computer program accessible from any computer-readable storage device or storage media. For example, computer-readable media can include but are not limited to magnetic storage devices (e.g. hard disk, floppy disk, or magnetic strips), optical discs (e.g. compact disc (CD), digital versatile disc (DVD), or Blu-ray disc), smart cards, flash memory devices (e.g. card, stick, or key drive), and solid state drives / memory devices.

[00129] In the foregoing detailed description, embodiments of the present disclosure in relation to an electronic system and computerized method for facilitating credit profiling of consumers 104 are described with reference to the provided figures. The description of the various embodiments herein is not intended to call out or be limited only to specific or particular representations of the present disclosure, but merely to illustrate non-limiting examples of the present disclosure. For example, while embodiments of the present disclosure are described with reference to, and provide advantages for, consumers 104 who may be underbanked, the various embodiments are not intended to be limited to any specific group or type of consumers 104. The present disclosure serves to address at least one of the mentioned problems and issues associated with the prior art. Although only some

embodiments of the present disclosure are disclosed herein, it will be apparent to a person having ordinary skill in the art in view of this disclosure that a variety of changes and/or modifications can be made to the disclosed embodiments without departing from the scope of the present disclosure. Therefore, the scope of the disclosure as well as the scope of the following claims is not limited to embodiments described herein.

Claims

1. A payment network server for facilitating credit profiling of consumers, the payment network server comprising:

a wallet communication module configured for:

receiving, from one or more wallet servers, digital wallet data of digital wallets of the consumers, the digital wallet data comprising identification data of the consumers;

a transaction module configured for:

retrieving, from a transaction database, merchant transaction data of merchant transactions made by the consumers using their digital wallets;

a scoring module configured for:

obtaining a set of behavioral data for each of the consumers, the behavioral data associated with the merchant transactions; and

determining a cumulative score for each of the consumers based on the set of behavioral data; and

a compilation module configured for:

generating a set of compiled data comprising the cumulative scores and identification data of each of the consumers; and

distributing the set of compiled data to institutions for said credit profiling of the consumers.

2. The server according to claim 1, the set of behavioral data for each of the consumers comprising an aggregated transaction score, the scoring module further configured for determining the aggregated transaction scores from the merchant transaction data.

3. The server according to claim 2,

the transaction module further configured for:

identifying a merchant category code of each of the merchant transactions; and

the scoring module further configured for:

scoring each of the merchant transactions based on the merchant category code; and

determining the aggregated transaction score for each of the consumers by aggregating the merchant transaction scores.

4. The server according to claim 3, wherein each of the merchant category codes is assigned to one of a number of merchant types, each of the merchant types having a predefined merchant score for scoring the merchant transactions.

5. The server according to any one of claims 1 to 4, the set of behavioral data further associated with mobile communication activity of the consumers, the set of behavioral data for each of the consumers comprising a mobile communication score, the scoring module further configured for determining the mobile communication scores from mobile communication data of the consumers.

6. The server according to claim 5,

the wallet communication module further configured for:

receiving, from the wallet servers, the mobile communication data collected by the wallet servers from electronic devices of the consumers operating the digital wallets; and

determining, from the mobile communication data and for each of the consumers, a number of calls communicated and/or number of messages communicated; and

the scoring module further configured for:

determining the mobile communication score for each of the consumers based on the number of calls and/or number of messages.

7. The server according to claim 6, the scoring module configured for determining a number of unique parties of the calls and/or messages, wherein the mobile communication score for each of the consumers is determined based additionally on the number of unique parties.

8. The server according to any one of claims 1 to 7, the set of behavioral data further associated with current ages of the consumers, the set of behavioral data for each of the consumers comprising an age score, the scoring module further configured for determining the age scores from the identification data of the consumers.

9. The server according to claim 8, the scoring module further configured for:

determining the current age of each of the consumers based on the identification data thereof; and

determining the age score for each of the consumers based on the current age.

10. The server according to any one of claims 1 to 9, the set of behavioral data further associated with utilities settlement promptness of the consumers, the set of behavioral data for each of the consumers comprising an aggregated utilities score, the scoring module further configured for determining the aggregated utilities scores from utility bills and utility transactions of the consumers.

11. The server according to claim 10, further comprising:

a utilities communication module configured for:

receiving, from one or more utility servers, utility bill data of the utility bills issued to the consumers, the utility bills data comprising issuance dates of the utility bills;

the transaction module further configured for:

retrieving, from the transaction database, utility transaction data of the utility transactions made by the consumers using their digital wallets for settlement of the utility bills, the utility transaction data comprising transaction dates of the utility transactions; and

the scoring module further configured for:

determining a time duration between the issuance date of each of the utility bills and the transaction date of the corresponding utility transaction; and

scoring each of the utility bills based on the time duration; and

determining the aggregated utilities score for each of the consumers by aggregating the utility bill scores.

12. The server according to any one of claims 1 to 11, wherein the consumers are underbanked consumers pre-identified by the wallet servers based on absence of pre-existing credit profiles, such that said credit profiling is performed for the underbanked consumers.

13. A computerized method for facilitating credit profiling of consumers, the method performed by a payment network server and comprising:

receiving, from one or more wallet servers, digital wallet data of digital wallets of the consumers, the digital wallet data comprising identification data of the consumers;

retrieving, from a transaction database, merchant transaction data of merchant transactions made by the consumers using their digital wallets;

obtaining a set of behavioral data for each of the consumers, the behavioral data associated with the merchant transactions;

determining a cumulative score for each of the consumers based on the set of behavioral data;

generating a set of compiled data comprising the cumulative scores and identification data of each of the consumers; and

distributing the set of compiled data to institutions for said credit profiling of the consumers.

14. The method according to claim 13, the set of behavioral data comprising an aggregated transaction score for each of the consumers, the method further comprising:

identifying a merchant category code of each of the merchant transactions;

scoring each of the merchant transactions based on the merchant category code; and

determining the aggregated transaction score for each of the consumers by aggregating the merchant transaction scores.

15. The method according to claim 13 or 14, the set of behavioral data comprising a mobile communication score for each of the consumers, the method further comprising:

receiving, from the wallet servers, mobile communication data collected by the wallet servers from electronic devices of the consumers operating the digital wallets;

determining, from the mobile communication data and for each of the consumers, a number of calls communicated and/or number of messages communicated; and

determining the mobile communication score for each of the consumers based on the number of calls and/or number of messages.

16. The method according to any one of claims 13 to 15, the set of behavioral data comprising an age score for each of the consumers, the method further comprising:

determining a current age of each of the consumers based on the identification data thereof; and

determining the age score for each of the consumers based on the current age.

17. The method according to any one of claims 13 to 16, the set of behavioral data comprising an aggregated utilities score for each of the consumers, the method further comprising:

receiving, from one or more utility servers, utility bill data of utility bills issued to the consumers, the utility bill data comprising issuance dates of the utility bills;

retrieving, from the transaction database, utility transaction data of utility transactions made by the consumers using their digital wallets for settlement of the utility bills, the utility transaction data comprising transaction dates of the utility transactions;

determining a time duration between the issuance date of each of the utility bills and the transaction date of the corresponding utility transaction;

scoring each of the utility bills based on the time duration; and

determining the aggregated utilities score for each of the consumers by aggregating the utility bill scores.

18. The method according to any one of claims 3 to 17, the method being iteratively performed at predefined intervals, wherein the set of behavioral data is associated with a predefined period before each of the predefined intervals.

19. A computerized method for facilitating credit profiling consumers, the method performed by a wallet server and comprising:

identifying the consumers from a wallet database, each of the consumers having identification data;

identifying, from the wallet database, digital wallets of the consumers based on the identification data thereof,

retrieving, from the wallet database, merchant transaction data of merchant transactions made by the consumers using their digital wallets;

obtaining a set of behavioral data for each of the consumers, the behavioral data associated with the merchant transactions;

determining a cumulative score for each of the consumers based on the set of behavioral data;

generating a set of compiled data comprising the cumulative scores and identification data of each of the consumers; and

distributing the set of compiled data to institutions for said credit profiling of the consumers.

20. The method according to claim 19, further comprising identifying, from among the consumers, underbanked consumers based on absence of pre-existing credit profiles, wherein said credit profiling is performed for the underbanked consumers.