IBM Predictive Customer Intelligence
Version 1.x

Personalized Customer Experience for Mobile Banking Customers 1.0

IBM

Product Information

This document applies to IBM Predictive Customer Intelligence Version 1.0.1 and may also apply to subsequent releases.

Contents

Introduction

IBM® Predictive Customer Intelligence gives you the information and insight that you need to provide proactive service to your customers. The information can help you to develop a consistent customer contact strategy and improve your relationship with your customers.

IBM Predictive Customer Intelligence brings together, in a single solution, the ability to do the following tasks:

- Determine the best offer for a customer.
- Retain customers that are likely to churn.
- Segment your customers, for example, by family status and salary.
- Identify the most appropriate channel to deliver an offer, for example, by email, telephone call, or application.

This solution ensures that all interactions with customers are coordinated and optimized. IBM Predictive Customer Intelligence gives you the ability to sift quickly through millions of customers and know who to contact, when, and with what action.

The following steps define the process:

1. Understand the customer. Predictive modeling helps you to understand what market segments each customer falls into, what products they are interested in, and what offers they are most likely to respond to.
2. Define possible actions and the rules and models that determine which customers are eligible for which offers.
3. After the best action is identified, deliver the recommendation to the customer.

Audience

This guide is intended to provide users with an understanding of how the IBM Predictive Customer Intelligence solution works. It is designed to help people who are planning to implement IBM Predictive Customer Intelligence know what tasks are involved.

Finding information

To find product documentation on the web, including all translated documentation, access IBM Knowledge Center (www.ibm.com/support/knowledgecenter/SSCJHT_1.1.1).

PDF versions of the documents are available from the Predictive Customer Intelligence version 1.1.1 product documentation page (www.ibm.com/support/docview.wss?uid=swg27048306).

Accessibility features

Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products. Some of the components included in the IBM Predictive Customer Intelligence have accessibility features.

IBM Predictive Customer Intelligence HTML documentation has accessibility features. PDF documents are supplemental and, as such, include no added accessibility features.

Forward-looking statements

This documentation describes the current functionality of the product. References to items that are not currently available may be included. No implication of any future availability should be inferred. Any such references are not a commitment, promise, or legal obligation to deliver any material, code, or functionality. The development, release, and timing of features or functionality remain at the sole discretion of IBM.

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Chapter 1. Personalized Customer Experience for Mobile Banking Customers

Personalized Customer Experience for Mobile Banking Customers shows how IBM Predictive Customer Intelligence can be used in the banking industry.

This case study uses the IBM Enterprise Marketing Management suite along with IBM Predictive Customer Intelligence and a mobile banking application. IBM Interact is used to provide personalized offers.

This case study demonstrates how to perform the following actions:

Target the right promotional offers to the right customer
Using IBM Campaign, the marketing manager determines which offers customers will receive based on their customer profile data and their real-time interaction data.

Predict churn, category affinity, and the likelihood of defaulting on credit card debt   Using IBM SPSS® Modeler, a data modeler creates predictive models to predict the following factors:

- A customer's propensity to churn.
- What product or service the customer will be most interested in.
- Whether or not a customer will default on credit card debt.

The results from these models can be used to generate scores in the IBM SPSS scoring service, which are then used by IBM Interact to determine which offers are presented to customers.

Target promotional offers to the right customer

Personalized Customer Experience for Mobile Banking Customers shows how IBM Predictive Customer Intelligence can be used to target promotional offers to the right mobile banking customer. It demonstrates how IBM Predictive Customer Intelligence can be used to ensure that customers are contacted at the right time, and with the best possible actions.

The mobile banking application connects directly to IBM Enterprise Marketing Management by using the IBM Interact API.

The banking customer

The banking customer is in an airport departure lounge and wants to review her recent account activity before shopping in a duty free store. She logs in to her mobile banking application to display her recent transactions. The customer's recent account activity shows two purchases of online airline tickets. The amounts indicate that these tickets might be for international flights.

IBM Predictive Customer Intelligence offers the customer a discount on travel insurance directly to her phone. The discount is based on the recent purchases of airline tickets.

The customer accepts the offer, and an interactive form appears on her smartphone screen, allowing the customer to enter her details. The customer accepts the offer.

IBM Predictive Customer Intelligence incorporates this new activity from the customer in real time and offers the customer activation of her credit card for international use. The customer decides not to accept the offer. When she rejects the offer, the promotion disappears from the screen of her phone.

Mobile banking workflow

The following steps illustrate how IBM Predictive Customer Intelligence determines which offers are to be presented to the customer.

1. The customer logs in to her mobile banking application through her smartphone to display her recent transactions.
2. The customer's smartphone number and location are passed to IBM Interact (part of the IBM Enterprise Marketing Management suite). IBM Interact, which provides personalized offers and customer profile information in real time, retrieves the customer profile from the IBM Predictive Customer Intelligence database by using the customer ID.
3. An IBM Interact connector, the External Callout connector, calls the IBM SPSS scoring service, passing the customer profile and location data. The IBM SPSS scoring service provides real-time predictive scores or values such as a customer segment name or propensity score.
4. The scoring service sends the score back to IBM Interact, overwriting the Marketer's score to generate an offer that is targeted specifically to the customer.
5. IBM Interact delivers the offer to the customer's smartphone.
6. The customer response from the smartphone is logged in the IBM Interact database along with the offer that was made.

The number of offers that are shown to the customer can be defined by using IBM Interact.

Web service calls are used to connect a mobile banking application with IBM Interact and IBM Predictive Customer Intelligence.

Define the offers that banking customers can receive

Monica is a marketing manager who is responsible for defining her company's marketing strategy. She determines which offers individual customers can receive based on their customer profile data and their real-time interaction data.

Customer profile data and real-time data

The customer profile data can include the following data: financial status, customer behavioral data, call, and text volume, products that are owned, contract details, predictive model scores, prior transactions, and campaign responses.

Real-time data can be the current location, such as an airport departure lounge, and the action that the customer is taking, such as buying an airline ticket.

The campaign

Monica creates a campaign that is named Mobile Banking Campaign by using IBM Campaign, part of the IBM Enterprise Marketing Management (EMM) suite. The objective of this campaign is to present the right offer to the right customer.

In IBM Campaign, you define offers, and you define which customer segments are presented with which offer, when a series of conditions are met. For example, are the customers in the affluent segment, and do the customers have a churn score below a certain level?

The marketer's score determines the order in which an offer is presented to the customer. This score can be overwritten by an external callout to the IBM SPSS Scoring service, and this enables you to tailor the offer to the customer's situation.

Build predictive models for a banking customer

David, the data scientist, builds predictive models by using IBM SPSS Modeler.

These models are used to perform the following actions:
- Predict what product or service the customer will be most interested in.
- Predict whether the customer is likely to default on their credit card debt.
- Profile customers into groups with similar demand characteristics, such as young educated and middle income, or affluent and middle aged.

This information is used to determine the most appropriate offers to make to the banking customers, and is used with IBM Enterprise Marketing Management.

For more information about the predictive models that are used, see "Predictive models in the Personalized Customer Experience for Mobile Banking Customers industry accelerator" on page 11.

Industry accelerator artifacts

The IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator includes the following artifacts.

Predictive model

PCI_Banking_Mobility_CDS_Archive.pes

The individual stream files that are contained in the pes file are available in the Streams folder.

The following predictive models are included:
- Category Affinity.str
- Churn.str
- Credit Card Default.str
- Customer Segmentation.str
- Sequence Analysis.str

The Predictive Models are described in "Predictive models in the Personalized Customer Experience for Mobile Banking Customers industry accelerator" on page 11.

IBM DB2® database
PCI_Banking_Mobility_Data.zip

Extend the accelerator with the IBM Predictive Customer Intelligence Usage Report

Optionally, you can monitor the effectiveness of your solution by using the IBM Predictive Customer Intelligence Usage Report. The IBM Predictive Customer Intelligence Usage Report displays the number of offers that are presented to customers and can be configured to show the number of offers that are accepted and rejected.

You can download the IBM Predictive Customer Intelligence Usage Report from IBM developerWorks (http://www.ibm.com/developerworks).

For access to the IBM Predictive Customer Intelligence accelerator, see Accessing IBM Predictive Customer Intelligence accelerators (www.ibm.com/support/docview.wss?uid=swg21985953).

Chapter 2. Industry accelerator installation

The Personalized Customer Experience for Mobile Banking Customers industry accelerator is for use with IBM Predictive Customer Intelligence.

The industry accelerator package contains the following parts:

- IBM DB2 databases.
- IBM SPSS project streams, models, and rules.

To install the industry accelerator, you must perform the following steps:

1. Download the industry accelerator from IBM developerWorks (http://www.ibm.com/developerworks).

   For access to the IBM Predictive Customer Intelligence accelerators, see Accessing IBM Predictive Customer Intelligence accelerators (www.ibm.com/support/docview.wss?uid=swg21985953).

2. Create the sample databases on the data node computer.
3. Import the SPSS project streams, models, and rules on the Predictive Analytics node.
4. Configure the data view for SPSS models on the Predictive Analytics node.

Industry accelerator prerequisites

Before you install the industry accelerator, you must have a fully configured environment.

You must have administration rights and have the ability to copy files between computers.

Download the industry accelerator

Accelerators are available to help you apply your IBM Predictive Customer Intelligence solution to your business needs. You must download the accelerators from IBM developerWorks (http://www.ibm.com/developerworks).

For access to the IBM Predictive Customer Intelligence accelerators, see Accessing IBM Predictive Customer Intelligence accelerators (www.ibm.com/support/docview.wss?uid=swg21985953).

Information about installing an accelerator is provided in a separate document. Each document is available on IBM Knowledge Center (www.ibm.com/support/knowledgecenter/SSCJHT_1.1.1), under the Create and Author section.

Creating the database

To use the IBM Predictive Customer Intelligence industry accelerator, you must create a database.

You run one script to create the database, and then run another script to populate the database.

Procedure

1. Copy the industry accelerator database content file from the computer where you downloaded them to the data node computer:

   The Personalized Customer Experience for Mobile Banking Customers industry accelerator database file is `PCI_1.0_Banking_Mobility\Database\PCI_Banking_Mobility_Data.zip`. A database that is named BANKING is created.

2. On the data node computer, decompress the file.

3. On Microsoft Windows operating systems, do the following steps:

   a. Log on to the data node computer as the DB2 instance owner user.

   b. Go to the folder where you decompressed the industry accelerator content files.

   c. In the uncompressed folder, double-click `Install_DB.bat`.

   d. Double-click `Load_Data.bat`.

4. On Linux operating systems, do the following steps:

   a. Log on to the data node computer as **root** user.

   b. Open a terminal window, and go to the directory where you decompressed the industry accelerator content files.

      Note: If you copied the content files to the home directory for the **root** user, you might have to move the files to another directory that is not in the **root** home directory so that you can run the scripts.

   c. Type the following command to change the permissions for the files:

      `chmod -R 755 *sh`

   d. Change to the database instance owner. For example, `su db2inst1`

   e. In the uncompressed folder, run `sh ./Install_DB.sh`.

   f. Run `sh ./Load_Data.sh`.

What to do next

Verify that the tables are created and the data is successfully loaded into the input tables by checking the `out.log` file.

On Microsoft Windows operating systems, the log file is in the industry accelerator name folder. On Linux operating systems, the log file is in the `db2inst1` home folder.

Search for "rows were rejected" in the log file. The value should be zero, if it is not, there are data load issues.

Importing IBM SPSS project streams, models, and rules

IBM SPSS project streams, models, rules, and other artifacts are contained in a repository export file (.pes) for the IBM Predictive Customer Intelligence industry accelerator. If you want to modify or view these artifacts, you must copy the export file to the computer where IBM SPSS Collaboration and Deployment Services Deployment Manager is installed, and open the file.

Procedure

1. From the computer where you downloaded the industry accelerator, copy the `.pes` file to the computer where IBM SPSS Collaboration and Deployment Services Deployment Manager is installed.

The Personalized Customer Experience for Mobile Banking Customers industry accelerator file is `PCI_1.0_Banking_Mobility\Analytics\ PCI_Banking_Mobility_CDS_Archive.pes`.

2. In IBM SPSS Collaboration and Deployment Service Deployment Manager, right-click **Content Repository**, and click **Import**.
3. Browse to the `.pes` file.
4. Select the following options:
   - **Resolve conflicts globally**
   - **Add new version of target item or rename source item, Use labels from source**.
   - **Continue import even if some objects cannot be imported due to locking conflicts**.
   - **Resolve Invalid Version Conflicts, Import**.
   - **Resource Definitions, Recommended - Import if there are no Duplicate ID conflicts or Duplicate Name conflicts**.
5. Click **OK**.

Results

Content folders and resource definitions are added to the repository alongside any existing content.

Configuring the data view for IBM SPSS models

To configure the data view, IBM SPSS Modeler must be connected to the IBM Predictive Customer Intelligence industry accelerator database through an ODBC data source connection.

If your IBM Predictive Customer Intelligence environment uses the IBM SPSS Modeler client logged in to a Modeler server, perform the steps on the Predictive Analytics node computer (where IBM SPSS Modeler Server is installed).

If your IBM Predictive Customer Intelligence environment uses the IBM SPSS Modeler Client in a stand-alone environment, perform the steps on the client computer where IBM SPSS Modeler client is installed.

Procedure

1. Catalog the database on the client computer.
   a. Click **Start** > **IBM DB2** > **DB2COPY1 (Default)** > **DB2 Command Window - Administrator**.
   b. Enter the following command to catalog the database node:
      `db2 catalog tcpip node NODE_NAME remote data_node_name server PORT_NUMBER`
      `NODE_NAME` can be any value. `PORT_NUMBER` is 50000 by default.
   c. Enter the following command to catalog the PCI database:
      `db2 catalog database BANKING at node NODE_NAME authentication server`
      You must use the same `node_name` that you used in the **db2 catalog database** command.
2. Create an ODBC DSN to point to the industry accelerator database. The database account that is provided in the ODBC connection must be the same user that was used for creating the tables.

> **Tip:** On Microsoft Windows operating systems, in the Windows Control Panel, select **Administrative Tools** and click **Data Sources**. Click the **System DSN** tab.

Configuring ODBC for IBM SPSS Modeler Server on Linux operating systems

To use an ODBC data source with IBM SPSS Modeler Server on a Linux operating system, you must configure the environment.

Procedure

1. Stop the IBM SPSS Modeler Server.
2. Go to the /root/SDAP71 directory.

   The driver files are installed as part of the IBM Predictive Customer Intelligence Server deployment.
3. Run the setodbcpath.sh script to update the ODBC path in the scripts.
4. Edit the odbc.sh script to add the definition for ODBCINI to the bottom of the script. For example:

   ```
   ODBCINI=/usr/spss/odbc/odbc.ini; export ODBCINI
   ```

   ODBCINI must point to the full file path of the odbc.ini file for IBM SPSS Modeler. The odbc.ini file lists the ODBC data sources that you want to connect to. A default odbc.ini file is installed with the drivers.
5. In the odbc.ini file, add the data source and specify the driver in the [ODBC Data Sources] section of the file.

   For example, add the data source as:

   ```
   [ODBC Data Sources]
   BANKING=IBM DB2 ODBC Driver
   ```
6. In the odbc.ini file, create an ODBC data source connection for the industry accelerator database.

   For example, include the following content:

   ```
   [BANKING]
   Driver=/opt/ibm/db2/V10.1/lib64/libdb2o.so
   DriverUnicodeType=1
   Description=IBM DB2 ODBC Driver
   ApplicationUsingThreads=1
   AuthenticationMethod=0
   BulkBinaryThreshold=32
   BulkCharacterThreshold=-1
   BulkLoadBatchSize=1024
   CharsetFor65535=0
   #Database applies to DB2 UDB only
   Database=BANKING
   DefaultIsolationLevel=1
   DynamicSections=200
   EnableBulkLoad=0
   EncryptionMethod=0
   FailoverGranularity=0
   FailoverMode=0
   FailoverPreconnect=0
   GrantAuthid=PUBLIC
   GrantExecute=1
   GSSClient=native
   HostNameInCertificate=
   IpAddress=IP_Address_of_DB_server
   KeyPassword=
   KeyStore=
   KeyStorePassword=
   LoadBalanceTimeout=0
   LoadBalancing=0
   ```

```
LogonID=db2inst1
MaxPoolSize=100
MinPoolSize=0
Password=password
PackageCollection=NULLID
PackageNamePrefix=DD
PackageOwner=
Pooling=0
ProgramID=
QueryTimeout=0
ReportCodePageConversionErrors=0
TcpPort=50000
TrustStore=
TrustStorePassword=
UseCurrentSchema=0
ValidateServerCertificate=1
WithHold=1
XMLDescribeType=-10
```

Note: You must use the driver library `libdb2o.so` with IBM SPSS Modeler.

Ensure that you set `DriverUnicodeType=1` to avoid buffer overflow errors when you connect to the database.

7. If you are using the 64-bit version of IBM SPSS Modeler Server, define and export `LD_LIBRARY_PATH_64` in the `odbc.sh` script:

```
if [ "$LD_LIBRARY_PATH_64" = "" ]; then
LD_LIBRARY_PATH_64=<library_path>
else
LD_LIBRARY_PATH_64=<library_path>:$LD_LIBRARY_PATH_64
fi
export LD_LIBRARY_PATH_64
```

Where `<library_path>` is the same as for the LD_LIBRARY_PATH definition in the script that was initialized with the installation path. For example, `/usr/spss/odbc/lib`.

Tip: You can copy the `if` and `export` statements for `LD_LIBRARY_PATH` in the `odbc.sh` file, append them to the end of the file. Then, replace the `LD_LIBRARY_PATH` strings in the newly appended `if` and `export` statements with `LD_LIBRARY_PATH_64`. Here is an example of the `odbc.sh` file for a 64-bit IBM SPSS Modeler Server installation:

```
if [ "$LD_LIBRARY_PATH" = "" ]; then
  LD_LIBRARY_PATH=/usr/spss/odbc/lib
else
  LD_LIBRARY_PATH=/usr/spss/odbc/lib:$LD_LIBRARY_PATH
fi
export LD_LIBRARY_PATH
if [ "$LD_LIBRARY_PATH_64" = "" ]; then
  LD_LIBRARY_PATH_64=/usr/spss/odbc/lib
else
  LD_LIBRARY_PATH_64=/usr/spss/odbc/lib:$LD_LIBRARY_PATH_64
fi
export LD_LIBRARY_PATH_64
ODBCINI=/usr/spss/odbc/odbc.ini; export ODBCINI
```

Ensure that you export `LD_LIBRARY_PATH_64`, and define it with the `if` loop.

8. Configure IBM SPSS Modeler Server to use the driver. Edit `modelersrv.sh` and add the following line immediately below the line that defines SCLEMDNAME:

```
. <odbc.sh_path>
```

Where `odbc.sh_path` is the full path to the `odbc.sh` file.

For example: `. /usr/spss/odbc/odbc.sh`

Ensure that you leave a space between the first period and the file path.

9. Save `modelersrv.sh`.

10. Configure the IBM SPSS Modeler Server to use the ODBC wrapper named `libspssodbc_datadirect.so`.

    a. Go to the `/usr/IBM/SPSS/ModelerServer/16.0/bin` directory.

    b. Remove the existing `libspssodbc.so` soft link by using the following command:

    ```
    rm –fr libspssodbc.so
    ```

    c. Link the new wrapper to `libspssodbc.so` by using the following command:

    ```
    ln –s libspssodbc_datadirect_utf16.so libspssodbc.so
    ```

11. Configure the db2cli.ini file in *<db2 instance home>*`/sqllib/cfg/db2cli.ini` to add the sections for each database.

    ```
    [BANKING]
    Database=BANKING
    Protocol=TCPIP
    DriverUnicodeType=1
    Port=50000
    Hostname=ip or hostname
    UID=username
    PWD=password
    ```

12. Save `odbc.ini`.

What to do next

To test the connection, do the following steps:

1. Restart IBM SPSS Modeler Server.
2. Connect to IBM SPSS Modeler Server from a client.
3. Add a database source node to the canvas.
4. Open the node and verify that you can see the data source names that you defined in the `odbc.ini` file.

For additional information and troubleshooting tips for connecting to data sources, see the SPSS Modeler documentation (www.ibm.com/support/knowledgecenter/SS3RA7_16.0.0)

Copying the industry accelerator license files to each computer

After you install the industry accelerator, you must copy the `license` folder to each computer on which you use the IBM Predictive Customer Intelligence industry accelerator.

Important: Do not rename the folders or files.

Procedure

Copy the `license` folder from the folder where you decompressed the industry accelerator to each computer on which an IBM Predictive Customer Intelligence component is installed. For example, copy the folder and contents so that you have a `C:\IBM\PCI_IndustryAccelerators\1.0\license` folder on Microsoft Windows operating systems or an `/opt/IBM/PCI_IndustryAccelerators/1.0/license` folder on Linux operating systems on each node computer.
The folder contains the license files. The folder should exist on each server and client node computer.

Chapter 3. Predictive models

Use IBM Predictive Customer Intelligence models to predict what is likely to happen in the future, based on patterns from past data.

For example, models can predict the following situations:
- How likely it is that a customer will churn in the next quarter.
- Whether a customer will be a promoter of a service, or a detractor
- How valuable the customer is in terms of future revenue

Models can be used in the same way as business rules. However, while rules might be based on corporate policies, business logic, or other assumptions, models are built on actual observations of past results, and can discover patterns that might not otherwise be apparent. While business rules bring common business logic to applications, models lend insight and predictive power. The ability to combine models and rules is a powerful feature.

Predictive models in the Personalized Customer Experience for Mobile Banking Customers industry accelerator

A number of predictive models are used in the IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator.

The following models form the basis of the predictive models in the industry accelerator:

Category affinity
> `Category Affinity.str` predicts what product or service the customer will be most interested in.

Churn `Churn.str` predicts whether customers are likely to renew their home insurance policy.

Credit card default
> `Credit Card Default.str` predicts whether customers are likely to default on their credit card debt.

Customer segmentation
> `Customer Segmentation.str` segments customers into groups with similar demand characteristics, such as young educated and middle income, affluent and middle aged.

Sequence analysis
> `Sequence Analysis.str` predicts the kind of recommendation to make to each customer, based on what they have purchased. For example, a customer who obtains a mortgage is likely to want to purchase home insurance. Or, a customer who has purchased travel insurance might want to activate a credit card for international use.

Determine category affinity in banking

You can determine customer affinity towards product lines by understanding the customer demographic information, purchase information, and browsing information.

The IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator Category Affinity model uses customer transaction data as input (transaction date, merchant, category, and price) and predicts the customer's category affinity. It uses a logistic regression model. Logistic regression classifies records based on values of input fields.

The example stream for determining customer affinity towards product lines is named `Category Affinity.str`. The output is a predictive score that determines the probability that the customer will buy a product.

Predict churn in the banking industry

The churn model in the industry accelerator predicts whether the customer is likely to renew their home insurance policy.

The example stream for predicting churn in the IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator is named `Churn.str`.

The churn model takes in several variables into account. For example, the customer's monthly premium, the number of months since the policy was started, the number of claims that are denied, the number of months for renewal, marital status, income, and age. It uses the CHAID algorithm.

Predict whether customers will default on credit card debt

The Credit Card Default model predicts whether customers are likely to default on credit card debt.

In the IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator, the example stream for predicting whether a customer will default on credit card debt is named `Credit Card Default.str`.

The model uses customer information, such as age, education, employment, income, address, credit card debt, other debt, and whether the customer has defaulted in the past. The model uses a Bayesian Network algorithm.

Define customer segments in the banking industry

When you define customer segments, you profile the customers into groups that have similar demand characteristics.

The example stream for defining customer segments in the IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator is named `Customer_Segmentation.str`.

The inputs into the model are customer information such as age, education, employment, address, income, and debt to income ratio. The model uses clustering from the TwoStep model to divide the customers into various segments, such as young educated and middle income, or affluent and middle aged. The TwoStep clustering method is used because it can handle mixed field types and is able to handle large data sets efficiently.

Sequence analysis

Sequence analysis predicts the kind of recommendation to make to each customer, based on what the customer has purchased. For example, a customer who obtains

a mortgage is likely to want to purchase home insurance. A customer who has purchased travel insurance might want to activate a credit card for international use.

IBM Predictive Customer Intelligence Personalized Customer Experience for Mobile Banking Customers industry accelerator sequence analysis uses a Sequence model, which discovers patterns in sequential or time-oriented data. The model detects frequent sequences and creates a generated model node that can be used to make predictions.

The example stream for sequence analysis is named `Sequence Analysis.str`.

Training predictive models

Predictive models must be trained to determine which data is useful and which data is not needed. When a model gives you accurate predictions, you are ready to use the predictive model for real-time scoring.

You use a training data set to build the predictive model and a test set of data to validate the model that was created with the training set.

Models must be retrained periodically with new data sets to adjust for changing behavior patterns. For information about using IBM SPSS Modeler, see IBM SPSS Modeler Help (www.ibm.com/support/knowledgecenter/SS3RA7_16.0.0/com.ibm.spss.modeler.help/clementine/entities/clem_family_overview.htm?lang=en).

Scoring a model

To score a model means to apply it to some data in order to obtain a result or prediction that can be used as input to decisions.

Depending on the application, the scoring results can be written to a database table or flat file, or used as inputs to the segment, selection, and allocation rules that drive decisions in an application.

For more information, see IBM SPSS Collaboration and Deployment Services Deployment Manager User's Guide (www.ibm.com/support/knowledgecenter/SS69YH_6.0.0/com.spss.mgmt.content.help/model_management/thick/scoring_configuration_overview.html).

Deploy an application

You can deploy the IBM Predictive Customer Intelligence application to a testing environment or to a production environment, such as a call center or a website. You can also deploy it to contribute to batch processing.

You can deploy a stream in the IBM SPSS Modeler repository. A deployed stream can be accessed by multiple users throughout the enterprise and can be automatically scored and refreshed. For example, a model can be automatically updated at regularly scheduled intervals as new data becomes available.

For more information, see IBM SPSS Collaboration and Deployment Services (www.ibm.com/support/knowledgecenter/SS69YH_6.0.0/com.spss.mgmt.content.help/model_management/_entities/whatsnew_overview_thick.html?cp=SS69YH_6.0.0%2F5).

Appendix. Troubleshooting a problem

Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and how to resolve the problem.

Review the following table to help you or customer support resolve a problem.

Table 1. Troubleshooting actions and descriptions

Actions	Description
A product fix might be available to resolve your problem.	Apply all known fix packs, or service levels, or program temporary fixes (PTF).
Look up error messages by selecting the product from the IBM Support Portal, and then typing the error message code into the **Search support** box (www.ibm.com/support/entry/portal/).	Error messages give important information to help you identify the component that is causing the problem.
Reproduce the problem to ensure that it is not just a simple error.	If samples are available with the product, you might try to reproduce the problem by using the sample data.
Ensure that the installation successfully finished.	The installation location must contain the appropriate file structure and the file permissions. For example, if the product requires write access to log files, ensure that the directory has the correct permission.
Review all relevant documentation, including release notes, technotes, and proven practices documentation.	Search the IBM Knowledge Center to determine whether your problem is known, has a workaround, or if it is already resolved and documented.
Review recent changes in your computing environment.	Sometimes installing new software might cause compatibility issues.

If the items in the table did not guide you to a resolution, you might need to collect diagnostic data. This data is necessary for an IBM technical-support representative to effectively troubleshoot and assist you in resolving the problem. You can also collect diagnostic data and analyze it yourself.

Troubleshooting resources

Troubleshooting resources are sources of information that can help you resolve a problem that you are having with an IBM product.

Support Portal

The IBM Support Portal is a unified, centralized view of all technical support tools and information for all IBM systems, software, and services.

The IBM Support Portal lets you access all the IBM support resources from one place. You can tailor the pages to focus on the information and resources that you need for problem prevention and faster problem resolution. Familiarize yourself

with the IBM Support Portal by viewing the demo videos (https://www.ibm.com/blogs/SPNA/entry/the_ibm_support_portal_videos).

Find the content that you need by selecting your products from the IBM Support Portal (www.ibm.com/support/entry/portal).

Before contacting IBM Support, you will need to collect diagnostic data (system information, symptoms, log files, traces, and so on) that is required to resolve a problem. Gathering this information will help to familiarize you with the troubleshooting process and save you time.

Service request

Service requests are also known as Problem Management Reports (PMRs). Several methods exist to submit diagnostic information to IBM Software Technical Support.

To open a PMR or to exchange information with technical support, view the IBM Software Support Exchanging information with Technical Support page (www.ibm.com/software/support/exchangeinfo.html).

Fix Central

Fix Central provides fixes and updates for your system's software, hardware, and operating system.

Use the pull-down menu to navigate to your product fixes on Fix Central (www.ibm.com/systems/support/fixes/en/fixcentral/help/getstarted.html). You may also want to view Fix Central help.

IBM developerWorks

IBM developerWorks® provides verified technical information in specific technology environments.

As a troubleshooting resource, developerWorks provides easy access to the most popular practices, in addition to videos and other information: developerWorks (www.ibm.com/developerworks).

IBM Redbooks

IBM Redbooks® are developed and published by the IBM International Technical Support Organization, the ITSO.

IBM Redbooks (www.redbooks.ibm.com) provide in-depth guidance about such topics as installation and configuration and solution implementation.

Software support and RSS feeds

IBM Software Support RSS feeds are a quick, easy, and lightweight format for monitoring new content added to websites.

After you download an RSS reader or browser plug-in, you can subscribe to IBM product feeds at IBM Software Support RSS feeds (https://www.ibm.com/software/support/rss).

Log files

Log files can help you troubleshoot problems by recording the activities that take place when you work with a product.

Error messages

The first indication of a problem is often an error message. Error messages contain information that can be helpful in determining the cause of a problem.

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