

IBM Predictive Customer Intelligence
Version 1.x

*Telecommunications Customer
Management with Mobile Service
Insights 1.0*

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 27.

Product Information

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

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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. Telecommunications Customer Management with Mobile Service Insights

The IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator allows you to understand your customers' mobile phone activity and to use the activity data to predict such things as the potential for a customer to churn, to accept certain offers, or contact a call center.

Using this industry accelerator, you can

- Create more specialized market segments
- Improve churn predictions
- Detect subscribers who will contact a call center and why
- Diagnose network issues by using customer experience
- Increase the customer's value with appropriate offers

Mobile phone activity data consists of elements such as subscriber, direction (inbound or outbound), activity type (text, voice, data), duration, success, and date. Using these elements, meaningful customer segments and statistics can be derived.

For example, mobile phone activity can be sorted into different time groups. Using predefined rules, the time group, the location, and the duration and type of activity can be used to derive different lifestyle segments, such as homebodies, daily grinders, and frequent travelers. The duration and type of activity can also be used to determine usage patterns by voice, data, and text message. And, using the type of activity, success of the activity, and duration, information about the quality of service can be obtained. Combining these elements with a history of churning, you can predict which customers are likely to churn.

You can use mobility analytics to model quality of service data where each subscriber's experience with the network is captured and compared to the subscriber's usage patterns. This analysis creates an individualized quality of service profile for the subscriber. For example, a subscriber that is a heavy data user might not be as concerned about voice quality as a heavy voice user.

To add to the understanding of the customer, you can examine the response to previous marketing campaigns. Based on customer segments, quality of service, and historical response to offers, you can predict the propensity to accept an offer. If you examine the propensity to accept an offer with the profitability of such a campaign, a picture emerges of how best to direct future dollars in marketing campaigns towards certain market segments. If a valuable market segment is at high risk of churn and has been responsive to certain types of offers in the past, then there is evidence that you should target them again with similar offers. With an understanding of their demographic, you can retain them as a customer.

Industry accelerator artifacts

The IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator includes the following artifacts.

IBM Cognos® Business Intelligence reports

PCI_Telco_Mobility_CognosContent.zip

PCI_Telco_Mobility_FMPProject.zip

PCI_Images.zip

The following reports are included:

- IBM PCI Telco Mobility Dashboard
- IBM PCI Telco Mobility Workspace
- Most Likely to Churn Subscriber List
- Subscriber List
- Subscriber Offer

The reports are described in Chapter 4, “Industry accelerator reports,” on page 19.

Predictive models

PCI_Telco_Mobility_CDS_Archive.pes

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

The following streams are included:

- Call Center Prediction.str
- Churn Prediction.str
- Offer Acceptance Propensity.str
- Phase Four Tower Reports.str
- Phase One Dwell Model Data Builder.str
- Phase One Lifestyle Model Data Builder.str
- Phase One QoS Model Data Builder.str
- Phase One Usage Model Data Builder.str
- Phase Three Event Summary.str
- Phase Three Location Affinity Analysis.str
- Phase Three Merge Subscriber Data.str
- Phase Two Buddy Model Data Builder.str
- Phase Two Location Affinity Data Builder.str
- Phase Two Usage Model.str

The Predictive Models are described in “Telecommunications Customer Management with Mobile Service Insights predictive models” on page 13.

IBM DB2® database

PCI_Telco_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 AnalyticsZone (www.ibm.com/analyticszone).

Chapter 2. Industry accelerator installation

The Telecommunications Customer Management with Mobile Service Insights 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.
- IBM Cognos Business Intelligence reports and Framework Manager models and packages.

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

1. Download the industry accelerator from IBM AnalyticsZone (www.ibm.com/analyticszone).
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.
5. Install the IBM Cognos Content on the Cognos 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

You must download the IBM Predictive Customer Intelligence accelerators from IBM AnalyticsZone.

Procedure

1. Go to IBM AnalyticsZone (www.ibm.com/analyticszone).
2. Click **Downloads**, and under **Predictive Customer Intelligence Accelerators**, click **View all PCI downloads**.
3. Click **More details** for the accelerator that you want to download.
4. If you are not signed in, click **Sign In to Download**. You must enter your IBM ID. If you do not have an IBM ID, you must register to create one.
5. Click **Download**.
6. Go to the directory where you downloaded the industry accelerator.
7. Decompress the file.

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 Telecommunications Customer Management with Mobile Service Insights industry accelerator database file is PCI_1.0_Telco_Mobility\Database\PCI_Telco_Mobility_Data.zip. A database that is named MOBILITY 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.

Tuning the database

For better performance for IBM SPSS Modeler processing for the IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator, you can modify settings in your IBM DB2 database.

Procedure

1. On Linux operating systems, open a terminal window, and change to the database instance owner user. For example, `su - db2inst1`.

2. On Microsoft Windows operating systems, log on to the data node computer as the DB2 instance owner user and click **Start > IBM DB2 > DB2COPY1 (Default) > DB2 Command Window - Administrator**.
3. Enter the following commands, and press the Enter key after each line:


```
db2 connect to mobility
db2 update database config using CHNGPGS_THRESH 10 IMMEDIATE
db2 update database config using LOGBUFSZ 3000 IMMEDIATE
```

Note: This value must be less than or equal to the Heap Size value.

```
db2 update database config using NUM_IOCLEANERS 10 IMMEDIATE
db2 connect reset
db2 deactivate database mobility
db2 activate database mobility
```

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 Telecommunications Customer Management with Mobile Service Insights industry accelerator file is PCI_1.0_Telco_Mobility\Analytics\PCI_Telco_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 MOBILITY 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]
MOBILITY=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:

```
[MOBILITY]
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=MOBILITY
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>/sql1lib/cfg/db2cli.ini to add the sections for each database.

```

[MOBILITY]
Database=MOBILITY
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)

Deploy the IBM Cognos content

For IBM Cognos Business Intelligence, you must catalog the database, create a data source connection, and then deploy the content files for the IBM Predictive Customer Intelligence industry accelerator.

Moving the IBM Cognos content

You must copy the IBM Cognos content for the IBM Predictive Customer Intelligence industry accelerator to the appropriate locations in your IBM Cognos installation to be able to deploy the content.

Procedure

1. Copy the IBM Cognos content from the computer where you downloaded the industry accelerator to the `Cognos_Install_location\Deployment` folder on the Cognos Analytics node computer.

The Telecommunications Customer Management with Mobile Service Insights industry accelerator IBM Cognos content file is `PCI_1.0_Telco_Mobility\BI\PCI_Telco_Mobility_CognosContent.zip`.

2. Decompress the IBM Cognos report image file where you downloaded the industry accelerator.

The report images file is `PCI_1.0_Telco_Mobility\BI\PCI_Images.zip`.

Note: If you are installing more than one accelerator, you do not have to replace the images. The `PCI_Images.zip` files contains all of the images that are used in all of the accelerator reports.

3. Copy the `PCI_Images` folder to the `Cognos_Install_location\webcontent\bi\PCI_Images` folder that contains report images files on the Cognos Analytics node computer.

4. Copy the IBM Cognos Framework Manager model files from the computer where you downloaded the industry accelerator to the computer where you installed IBM Cognos Framework Manager, and decompress the file.

The Telecommunications Mobility industry accelerator Framework Manager file is compressed in `PCI_1.0_Telco_Mobility\BI\PCI_Telco_Mobility_FMPProject.zip`.


5. If you want to edit the Framework Manager models, you must catalog the industry accelerator database on the computer where you installed Framework Manager.

- 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 MOBILITY at node NODE_NAME authentication server`
 You must use the same *node_name* that you used in the **db2 catalog database** command.

Creating a data source connection to the industry accelerator database

You must create a data source connection to the IBM Predictive Customer Intelligence industry accelerator database.

Procedure

1. Open a web browser.
2. Go to the IBM Cognos BI portal URL. For example, go to `http://bi_node_name/ibmcognos/`.
3. On the **Welcome** page, click **Administer IBM Cognos Content**.
4. Click the **Configuration** tab, and click **Data Source Connections**.
5. Click the **New Data Source** button .
6. In the **Name** box, type **MOBILITY**, and then click **Next**.
7. In the connection page, select **IBM DB2**, ensure that **Configure JDBC connection** is selected, and click **Next**.
8. In the **DB2 database name** field, type **MOBILITY**.
9. Leave **DB2 connect string** blank.
10. Under **Signons**, select both **Password** and **Create a signon that the Everyone group can use**, and then type the user ID and password for the DB2 instance owner user that you used to create the database, and click **Next**.

Tip: To test whether the parameters are correct, click **Test the connection**. After you test the connection, click **OK** to return to the connection page.

11. In the **Server name** box, enter the name or IP address of your data node computer.
12. In the **Port number** box, enter the DB2 port number. The default is 50000.
13. In **Database name**, type **MOBILITY**.

Tip: To test whether the parameters are correct, click **Test the connection**. After you test the connection, click **OK** to return to the connection page.

14. Click **Finish**.

Deploy the IBM Cognos reports

You must deploy the IBM Predictive Customer Intelligence industry accelerator reports using IBM Cognos Administration.

Procedure

1. Open a web browser.

2. Go to the IBM Cognos BI portal URL. For example, go to `http://bi_node_name/ibmcognos/`.
3. On the **Welcome** page, click **Administer IBM Cognos Content**.
4. On the **Configuration** tab, click **Content Administration**.
5. On the toolbar, click the **New Import** button.
6. In the **Deployment Archive** pane, select deployment archive, and click **Next**.
The deployment archive is named `PCI_Telco_Mobility_CognosContent`.
7. In the **Specify a name and description** pane, accept the default or enter a new name, and click **Next**.
8. In the **Select the public folders and directory content** pane, select all of the packages in the table, leave the **Options** as default, and click **Next**.

Note: Ensure that the **Disable after import** option is cleared.

9. In the **Specify the general options** pane, accept the defaults, and click **Next**.
10. On the **Review the summary** page, click **Next**.
11. On the **Select an action** page, select **Save and run once**, and click **Finish**.
12. On the **Run with options** page, accept the defaults, and click **Run**, and then click **OK**.
13. Select **View the details of this import after closing this dialog** and click **OK**.
14. In IBM Cognos Administration, click the **Home** button.

The content is available in **Public Folders > PCI Industry Accelerators 1.0**.

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.

Telecommunications Customer Management with Mobile Service Insights predictive models

A number of predictive models are provided in the IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator.

The following models form the basis of the predictive models in the Telecommunications Customer Management with Mobile Service Insights industry accelerator:

Call Center Prediction model

The Call Center Prediction model (Call Center Prediction.str) uses the net promoter score to determine satisfaction.

Churn model

The Churn model (Churn Prediction.str) is used to predict customers who are likely to churn from the current list of active customers.

Lifestyle model data builder

The Lifestyle model data builder (Phase One Lifestyle Model Data Builder.str) transforms the data and creates Mobility Lifestyle measures.

Dwell model data builder

The Lifestyle model data builder (Phase One Dwell Model Data Builder.str) creates the initial data set for subscriber location.

Quality of service model data builder

The quality of service model data builder (Phase One QoS Model Data Builder.str) creates quality of service data sets.

Usage model data builder

The usage model data builder (Phase One Usage Model Data Builder.str) creates intermediate data sets for usage analysis.

Usage model

The usage model (Phase Two Usage Model.str) creates final usage measures.

Location affinity data builder model

The location affinity data builder model (Phase Two Location Affinity Data Builder.str) creates final data sets for location affinity.

Buddy model data builder

The buddy model data builder (Phase Two Buddy Model Data Builder.str) creates a table that shows who hung out with whom, where, when, and how often.

Location affinity analysis model

The location affinity analysis model (Phase Three Location Affinity Analysis.str) creates a final data set for subscriber location preferences.

Subscriber data merge

The subscriber data merge model (Phase Three Merge Subscriber Data.str) creates a final customer ID level data set for analysis.

Tower report model

The tower report model (Phase Four Tower Reports.str) shows the report for the top 20 towers used by the number of transactions in a latitude and longitude format.

Offer Acceptance Propensity model

The Offer Acceptance Propensity model (Offer Acceptance Propensity.str) predicts the likelihood of each customer accepting various offers based on historical data and customer segment.

Event Summary model

The Event Summary model (Phase Three Event Summary.str) creates the final analysis set for the subscriber event summary; for example, the event type, date, and location.

Aggregation models

The IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator contains several IBM SPSS models that aggregate data in different phases of the modeling process.

The data that is compiled in these phases is then used in more predictive models for churn, acceptance propensity, and call center predictions.

1: Creating initial analytical data sets

This phase transforms the data and creates Mobility Lifestyle measures. The outputs in this phase represent daily customers behavior. Customers are assigned to a lifestyle based on heuristic, rule-based groups that are based on similar characteristics, such as usage time during the weekend and weekdays.

Some examples in this phase include the following models:

- The Phase One Lifestyle Model Data Builder.str model transforms the data and creates mobility lifestyle measures.

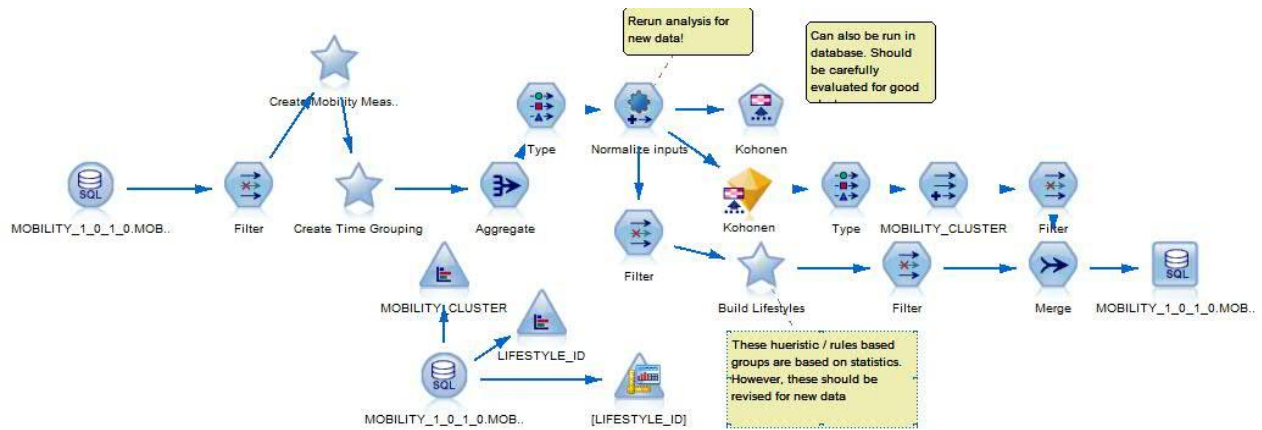


Figure 1. Lifestyle Model Data Builder

- The Phase One Dwell Model Data Builder.str model creates initial data sets for subscriber locations.

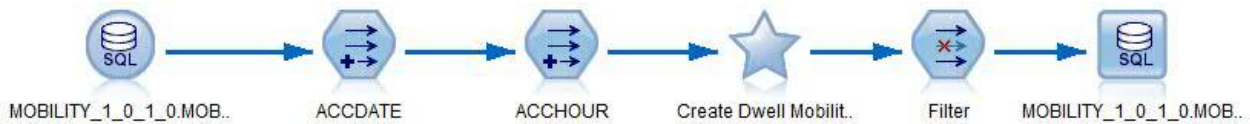


Figure 2. Dwell Model Data Builder

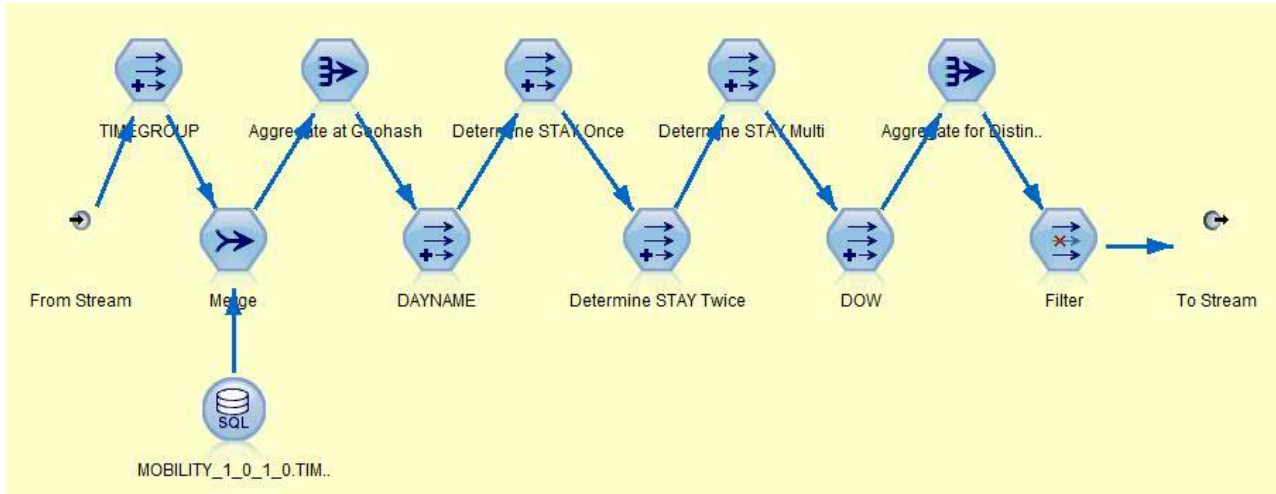


Figure 3. Dwell Model Data Builder

- Phase One QoS Model Data Builder.str builds quality of service data sets.
- Phase One Usage Model Data Builder.str creates intermediate data sets for usage analysis.

2: Enhancing the data sets

The models in this phase are used to finalize the usage measures needed for the analysis.

For example,

- Phase Two Usage Model.str separates the data based on types of usage (data, voice, and text message) and then uses Auto Data Preparation to transform the model to reduce any skewness. Finally, overall data, voice, and text message usage totals are calculated.
- Phase Two Location Affinity Data Builder.str: creates the final sets for location affinity.
- Phase Two Buddy Model Data Builder.str creates a table that shows who hung out with whom, assuming both customers have the same provider, when, where, and how often.

3: Final analytical data sets

The models in this phase create the final data sets.

For example,

- Phase Three Location Affinity Analysis.str creates a final set for subscriber location preferences. For example, the model determines how frequently a subscriber is at each location based on their usage during weekends.
- Phase Three Merge Subscriber Data.str creates the final customer ID level analysis set.
- Phase Three Event Summary.str creates the final analysis set for the subscriber event summary; for example, the event type, date, and location.

4: Reports, maps, and analysis

Phase Four Tower Reports.str shows the report for 20 cellular towers, including the coordinates of each tower.

Predict churn

The IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator shows how existing churn prediction capabilities can be enhanced.

Churn is the measurement of subscribers who ended their contract or services. The objective of the churn prediction model is to predict the customers likely to churn from the current list of active customers.

By understanding the subscriber's personality better and by deriving specific measures for each subscriber, it is possible to understand their future actions better. Mobility analytics creates unique profiles for each subscriber that allows for a detailed understanding of how they use the services and detect changes in usage, lifestyles, or preferences that can signal a likelihood to churn.

Call center prediction

Details of support center contacts and subscriber comments, sentiment and propensity to contact a call center can be determined using the IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator.

The call center contacts can be from various sources such as web interactions, voice response unit interactions, or previous call center interactions. The subscriber comments can be inputted from call center communications, social media, or emails.

The Call Center Prediction.str uses the auto classifier model to determine the best models for analysis. The results provide predictions for whether the customer will contact the call center.

Predict offer acceptance propensity

Offer acceptance propensity in the IBM Predictive Customer Intelligence Telecommunications Customer Management with Mobile Service Insights industry accelerator predicts the likelihood of each customer accepting various offers based on the historical response to offers by various customer segments.

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).

Chapter 4. Industry accelerator reports

An IBM Cognos Business Intelligence report is provided with the IBM Predictive Customer Intelligence industry accelerator.

You can customize the report by using IBM Cognos Report Studio. Report Studio is a report design and authoring tool. Report authors can use Report Studio to create, edit, and distribute a wide range of professional reports. For more information, see IBM Cognos Report Studio User Guide (www.ibm.com/support/knowledgecenter/SSEP7J_10.2.1/com.ibm.swg.ba.cognos.ug_cr_rptstd.10.2.1.doc/c_rs_introduction.html).

The metadata that the report displays comes from the package that is created in and published from IBM Cognos Framework Manager. The example Framework Manager project folder contains the compiled project file (.cpf). When you open the .cpf file, Framework Manager displays the modeled relationships of the data and the package definitions, which are made available to the reporting studios when published. You can modify the metadata for the report by using Framework Manager. For more information, see IBM Cognos Framework Manager User Guide (www.ibm.com/support/knowledgecenter/SSEP7J_10.2.1/com.ibm.swg.ba.cognos.ug_fm.10.2.1.doc/c_ug_fm_introduction.html%23ug_fm_Introduction).

Report dashboards

There are two dashboard reports available from the IBM Cognos Business Intelligence portal.

IBM PCI Telco Mobility Dashboard

This report is a Report Studio active report that creates an output file that contains both the data and layout of the report. The output file uses a file name extension of MHT, and can be viewed on desktop or mobile devices.

1. The **Overview** tab shows charts and statistics that provide a high-level overview of the customer base, including Segments and the Propensity to Churn. There is a Subscriber Count chart, that shows the number of subscribers, and a Churn Propensity chart, that shows the average propensity of the customer base to leave their service provider.

Additionally, the tab provides the following information:

- Treemap Churn Propensity by Lifestyle and Usage Lifestyle
The Relative Churn Propensity is represented by the size and color of the boxes. Each Lifestyle, such as Socialite or Homebody, is a single color and each Lifestyle Usage, such as Voice Caller or High Data, divides the Lifestyle box into smaller boxes.
- Treemap Subscriber Count by Lifestyle and Usage Lifestyle
The Subscriber Count is represented by the size and color of the boxes. Each Lifestyle, such as Socialite or Homebody, is a single color and each Lifestyle Usage, such as Voice Caller or High Data, divides the Lifestyle box into smaller boxes.
- Heatmap Churn Propensity by Lifestyle and Usage Lifestyle

An alternative representation of Churn Propensity at the intersection of Lifestyle and Usage Lifestyle and bears the Churn Propensity value as a label. The color of the intersecting cells is darker when the Churn Propensity is higher.

- **Predictor Importance**

A bar graph that represents the relative importance of the Predictors of Churn. Some predictors are measures and some are dimensions.

- **Two charts that use a slider to control the dimensions and display Subscriber Count or Churn Propensity and Predictors of Churn.**

One bar chart shows either Subscriber Count or Churn Propensity. The dimension on the X-axis can be Lifestyle, Usage Lifestyle, City, Quality Group, or Manufacturer.

The other chart shows the measures that predict churn, as determined by the user selection. The dimension on the X-axis can be Lifestyle, Usage Lifestyle, City, Quality Group, or Manufacturer.

2. The **Campaign** tab contains several charts that show the success of previous campaigns, including the propensity of a customer segment to accept a particular offer and the profit to be made. All charts on this tab are controlled by the slider bar in the center. The slider controls the selection of dimensions that are displayed on the X-axis.

The charts show:

- Overall actual campaign profit versus predicted campaign profit.
- Actual campaign profit and predicted profit on a per capita basis.
- Either actual campaign profit or the offer acceptance rate for each of the top 8 offers that are used in a campaign.

IBM PCI Telco Mobility Workspace

The IBM PCI Telco Mobility Workspace report consists of other reports or widgets. It is intended to be used from a web browser rather than on a mobile device. The report provides more flexibility in the information that is displayed on the report.

1. The **Overview** tab uses various charts and statistics to provides a breakdown of subscribers and predictors of churn. The bar chart on the upper right and the tree map on the bottom are controlled by the selections on the left pane of the workspace. You can select the main dimension and the measure, and, in the case of the tree map, the nested dimension.

The tab includes the following widgets:

- The Keymetrics widget displays Subscriber Count and Churn Propensity.
- The Predictors widget shows the relative importance of predictors of churn. The predictors can be measures or dimensions.
- The Treemap widget uses flexible dimensions where the selected measure is represented by the size and color of the boxes. For instance, if Churn Propensity is selected as the value analyzed on the **Overview** tab, Lifestyle is selected as Category 1, and Usage Lifestyle is selected as Category 2, then each Lifestyle, such as Socialite or Homebody, is a single color. Within each Lifestyle, the Lifestyle Usage, such as Voice Caller or High Data, divides the larger box into smaller boxes whose relative size is determined by the group's Churn Propensity.

- The Bar Chart By Selected Measure Dimension widget shows the selected measure that is graphed against the Category 1 section of a dimension.
2. The **Campaign - Profit** tab gives insight into the effectiveness of a campaign by comparing the actual profit to the predicted profit on an overall and on a per capita basis. The X-axis dimension is controlled by the Category 1 selection from the left side for both of the bar charts on this tab.
 3. The **Campaign - Offer** tab gives insight into what offers are most attractive to which customer segments. The charts show uptake of offers by customer segments, or the Offer Acceptance Rate, and the profitability of offers by customer segments, or actual campaign profit. The X-axis dimension is controlled by the Category 1 selection from the left side for both of the bar charts of this tab.

Additionally, there are three list reports:

1. The Most Likely to Churn Subscriber List report shows a list of the top 1000 subscribers in a particular segment who are likely to churn. It can be run stand-alone or by drilling through from a cell on the Treemap of the Workspace dashboard.
2. The Subscriber Offers report shows a list of offers that a customer has received. It is reached by drilling through from a hyperlink on the Most Likely to Churn Subscriber list.
3. The Subscriber List report is a list of subscribers, in CSV format, with filtering by customer dimensions. This report should be scheduled if there are more than 100,000 subscribers overall.

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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