Abstract

System and Method for Shipping Rate Personalization in E-commerce

A method and logistic system for organization of marketing data flow and shipping rate personalization, that acts interdependently to an e-commerce system. When a user places a logistic quotation on the browser, the e-commerce system will send relevant data (e.g. cart unique id, crm data, profit, cart totals) to the logistic system. In a second step, the e-commerce system will send the cart unique identifiers of the quotations that have been converted in sales to the logistic system. The system organizes these data in a three-dimensional vector with n-dimensional correlations, where each vector position will form a logistic cluster populated with data from a specific strategy of procedures and reiterated statistical tests for each logistic cluster. According to the user profile and while recommendations are made, the next recommended item may have higher profit based on the logistic cost of delivery.

Description

System and Method for Shipping Rate Personalization in E-commerce

FIELD OF THE INVENTION

[001] This present invention relates to a method and system implemented by computer to organize the flow and the disposition of logistics and marketing data and, more particularly, a system and method to provide personalized logistic recommendations to e-commerce customers.

BACKGROUND ART

[002] The e-commerce driven by popularization of the Internet around the globe is a market that moves billions of dollars every year. One of the biggest problems that managers of this business area faces, when related to physical goods, is the management of the required subsidies to take place a sale. Often it is necessary to grant discounts and buy traffic from digital advertising companies, and this can often hamper the full profit potential of business, impacting its long-term operational sustainability.

[003] In this type of business it is possible to track the entire customers experience, from their product search, to the completion of a purchase order. Through this tracking, some useful data are collected such as: conversion rate (percentage of **x**, e.g. visitors, who performs an action, e.g. purchases), average ticket (average of orders values against **x**), profit, cost, shipping rate etc. All these items compose part of metrics used by e-commerce managers in their day-to-day decisions. There is a strong mathematical correlation between these metrics. A good example is: by removing the charged shipping rate to customers, the conversion rate increases, however the average ticket decreases and the delivery logistics cost remains the same; and the converse

is true, if you increase the shipping rate value, the conversion decreases and average ticket increases.

[004] Currently there are major technological efforts for personalization in e-commerce area (for example US8615473B2, US9721225, US6853982) and logistics optimization concepts in academy (for example https://www.scl.gatech.edu/sites/default/files/downloads/gtscl-10_rules_supply_chain_logistics_optimization.pdf).

[005] However, the market currently has few efficient tools or solutions to handle e-commerce shipping rate personalization. In most cases what is used to deal with the problem are predefined sets of rules. For example: an e-commerce system can remove the charged shipping value if the customer buys above **x** or if he/she buys a product known to have a substantial profit like a notebook.

[006] Customizing the shipping rate, in the way it is done nowadays, can create major problems for an e-commerce manager, for example, for a customer who purchases recurrently in his operation (O), he/she may wish grant a larger subsidy as long this “premium” customer remains loyal to the business. For other customers, the manager might prefer to give a smaller subsidy, maximizing the profit of his operation (O). Another example, if the manager wants to execute an incoming marketing strategy in a specific place, the profit could be subsidized by a marketing budget, this would cause a increase in his conversion rate observing the limit of an acceptable profit margin for the defined strategy.

[007] The creation of a flexible information system and method to optimize the relationship of these metrics taking into account the profile data of customers, logistics and business data has the potential to add efficiency to e-commerce operations (O), proposing value both to managers, widening

their profit margins, and to customers, improving the probability of receiving more accurate and relevant discounts.

BRIEF SUMMARY

[008] The present invention seeks to meet the people's needs through a system and method to personalize the shipping rate for e-commerce customers. It presents elements and concepts of marketing, logistics, statistical modeling and machine learning to optimize the n-dimensional relationship between business metrics (KPIs) and charged shipping rate.

[009] The first object presented is an adapted system for shipping rate personalization in e-commerce which comprises the following subsystems or elements:

a) central system (C);
b) server system (SS);
c) frontend system (FS);
d) client system (CS);

wherein:
- the server system (SS) remains as the invention core, being correlated to client system (CS) and optionally correlated to the frontend (FS) and central (C) systems.
- central system (C) is formed by elements which enables and parameterize a set formed by the client (CS) and server (SS) in an e-commerce system or operation (O);
- server system (SS) consists of quotations repository (QR), logistic cluster (LC) and 'n' dimensional generated inputs derived from data crossing between quotations repository (QR) and logistic clusters (LC).

- client system (CS) is minimally formed by two elements: module for quotation dispatch and module for communication of quotations turned in sales;
- frontend system (FS) is composed of a set of interfaces available to e-commerce managers, minimally composed by: logistic cluster (LC) management interface and module for financial reporting about operation (O).

[010] The second object presented in this scope is a method for shipping rate personalization in e-commerce comprising at least the following steps:

a) enabling the client (CS) and server (SS) systems in an e-commerce operation (O);
b) populate data at server system (SS) with management historical data or milestones for model training;
c) creations or parameterizations of logistic clusters (LC);
d) generation of consolidated management data for the logistic cluster (LC) parameterized in f(x);
e) sending related data about quotation from client system (CS) to server system (SS);
f) send a sale report informing sale(s) from client system (CS) to server system (SS);
g) calculation processing through computational mathematical techniques consistent with a commercial strategy;
h) generation of interfaces for e-commerce managers highlighting results achieved in an auditable way.

[011] Aspects of this invention will be immediately recognized by those skilled in the art and by e-commerce managers. The concepts, details and fundamentals for their reproduction are best described and explained in the

Detailed Description bellow.

BRIEF DESCRIPTION OF DRAWINGS

[012] The following figures are presented to better define the operation of the present invention:

[013] FIG. 1 illustrates how each of the subsystems fit into the context of an e-commerce operation (O).

[014] FIG. 2 represents a scalable technological architecture model for the invention to be applied in multiple e-commerce operations (O).

[015] FIGS. 3A and 3B demonstrate examples of usefulness of an eventual automated implementation of the central system (C).

[016] FIG. 4 is a flow of steps that starts when the invention is enabled in an operation (O) and terminates in the first training cycle of the server system (SS).

[017] FIG. 5A is a representation of a logistic cluster (LC) in the form of interface for the e-commerce manager.

[018] FIG. 5B is a flow that illustrates the method for information consolidation or business milestones (BM).

[019] FIG. 6A is a flow of steps that exemplifies the interaction of the customer with the invention through the client (CS) and server (SS) systems.

[020] FIG. 6B is a illustrative flow of the machine learning technique used in the statistical modeling employed. It can happen at any time, not necessarily at execution 614.

[021] FIG. 7 is a graphical representation of the correlation between generation (G) and generation test cases (TC).

[022] FIG. 8 shows the concept of a generational hierarchical tree of tests for a logistic cluster (LC).

[023] FIG. 9A demonstrates the information elements that form the server system (SS) architecture in the context of best result calculation.

[024] FIG. 9B demonstrates a typical operation performed to find the best recommendation.

[025] FIG. 10 represents in the form of an eventual interface the step of generating mathematically auditable reports for the operation manager.

DETAILED DESCRIPTION

[026] The present invention relates to a system and logistic method comprising four semi-independent subsystems, shown in FIG. 1, composed of: central system (C) 100, server system (SS) 101, client system (CS) 103 and frontend system (FS) 104.

[027] The client system (CS) 103 is considered as a module or plugin attached to an e-commerce platform (e.g. Magento, Shopify etc.) of the operation (O). The frontend system (FS) 104 comprises the set of interfaces and reports available to the e-commerce operation manager. The server system (SS) 101 is the core of the present invention being responsible for data organization, flow and applying the logistical personalization method. The central system (C) 100 describes the steps necessary to enable the installation of the other subsystems in some e-commerce operation (O), the central system (C) can be implemented or not by automated method.

[028] Although the subsystems herein described may also be coupled to an operation (O) monolithically, the decoupling, shown in FIG. 2, of these systems integrating them by API or web services, makes these subsystems together performable and technologically scalable, which enables their use in both small and large e-commerce operations (O). Since the large cost of computational power is centralized in the server system (SS) 212, the designed architecture allows isolating these systems in cloud systems (e.g. Aws, Azure etc.) and ensuring the viability of operations (O) 215, 216 and 217.

[029] The method and central system (C) 211 when implemented in its automated form, empowers the holder of the invention to enable the other subsystems together in one or more e-commerce operations (O) easily. FIGs. 3A and 3B illustrate different examples of use cases of a computer automated implementation of the central system (C).

[030] As shown in FIG. 4, once the client (CS), server (SS) and frontend (FS) subsystems are integrated into a system or e-commerce (O) 410 operation, the first step of the method is the first training phase of server system (SS) 411 that occurs with some historic raw data about the e-commerce operation (O).

[031] The first training phase of the server system (SS) can be either by batch (ETL techniques) 412 or by parameterization in server system (SS) to collect data passively 413.

[032] The generation of consolidated management data 414 may occur soon after the parameterization or creation of a logistic cluster (LC) in the server system (SS). Since the e-commerce manager creates or parameterizes a logistic cluster (LC), the server system (SS) organizes this information in a first moment in a three-dimensional vector, being that in each position of the **z** axis is a representation of a logistic cluster (LC).

[033] FIG. 5A represents a possible interface implementation in frontend (FS) to parametrize or create a logistic cluster (LC) 513 on the server (SS). A logistic cluster (LC) is necessarily composed of a set of full customizable boolean rules 512, and not necessarily by name 510 and strategy 511, although these elements also form part of the present invention.

[034] Strategy 511 defines the type of method and statistical modeling that will be used to personalize the best value. Each strategic method 511 guides the server system (SS) to act specifically on the plotted Cartesian graph. For example: for a logistic cluster (LC) of 'premium' customers, the operation manager may prefer to sell at a lower profit margin than losing the valued consumer to one competitor; but for other customers, the manager may prefer to sell with the highest profit possible as good capitalist he is. In other words, he could opt for a "High Revenue" strategy for the first case, and a "High Profit" strategy for second and, eventually, any other commercial strategy customized for his operation (O).

[035] As shown in FIG 5B, once the logistic cluster (LC) 513 and 520 is created, the server system (SS) will consolidate the management data 522 in the form of p(x) specifically for that logistic cluster (LC) 522. Step of data consolidation 522 is important because it guides the correct operation of the server system (SS) in the form of management milestones or others reference parameters about business performance.

[036] The consolidated variables in arithmetic operations 522 required for the model are "quotations conversion rate", "value representing the logistic cost", "value representing the logistic cost charged", "value representing the profit of transaction". Optional variables for the model such as "average ticket", "period", "number of quotations", "number of sales" are also part of the model used in the invention.

[037] Once the logistic cluster(s) (LC) are properly parameterized in the server system (SS), including with the consolidated management data 522, the server system (SS) can relate to client system (CS) in the form of FIG. 6A.

[038] At the moment the electronic retailer customer makes a quotation (identified or not) in browser, the client system (CS) will electronically send relevant data 611 to shipping rate personalization to server system (SS), such as “geographic code”, “profit” (profit is optional if previously parameterized in server system), “unique identifier of cart or quotation”. Other non-mandatory variables used in the model is “e-CRM values” (coupled in client system), customer economic behavioral data such as device, resolution, session time, amount of items in the cart, categories etc.

[039] Once received these data from client system (CS), the server system (SS) will store these data in memory 612 and will classify the quotation according to the logistic cluster (LC) most adhering to it through the boolean filters 512. In the sequence, it will proceed to the decision flow 613 where it will be determined whether or not the quotation will be part of sample statistical tests or not.

[040] If the answer to decision 613 is positive, the server system (SS) will proceed with test method 614, using 'test generations' (G) and 'test cases' (TC) made specially for that logistic cluster (LC).

[041] In FIG. 7 we have the representation of a possible implementation of the method establishing a possible correlation between generations (G) of tests and test cases (TC). While in FIG. 8 illustrates the operation architecture of a generational tree, constantly tested, renewed and reiterated to obtain more accurate tests according the strategy 511 chosen for the logistic cluster (LC) in question.

[042] The driving logic behind the machine learning technique and generational modeling of statistical tests represented in the forms of FIGs. 6B, 7 and 8 is inspired by the concept of natural selection originally proposed by Darwin, where we select the best values adapted to a given condition, eliminating the values not adapted to the same condition, in a recursive and reiterated way. The method used to create a generation (G) always involves a minimum and maximum input values, as soon as the model obtains them, the method proceeds to create test cases (TC) in the form of ranges of values in groups of **x**. For example, suppose that for a given logistic cluster (LC) the maximum shipping rate charged from consumer is **$10**, the server system (SS) could create a generation (G) 810 with a minimum value of **$0** (free shipping) and a maximum of **$10**; and could create **x** groups of test cases (TC) (in the example of FIG. 7, five sets of test cases were created). All this is to statistically measure the correlation and variation between the shipping rate **(x)** and other business metrics **(y)** as illustrated in FIG. 7, therefore **f (x) = y**.

[043] As soon as a generation (G) reach its parameterized sample population, the server system (SS) will observe the strategy 511 adopted for that logistic cluster (LC) and determine the winning test case (TC) consistent with the chosen strategy 511, creating a new generation (G) 813 with more accurate minimum and maximum values, and so on. At the same time that a new generation (G) 813 opens, the server system (SS) can close 811, pause or define any other states for the other generations (G) according to the strategy 511 adopted for the logistic cluster (LC).

[044] If the answer of decision 613 is negative or jump the test method due a specific parameterized bypass, the method will look for the highest result potential recommendation according to parameterized strategy 511 for the logistic cluster (LC).

[045] FIG. 9A puts the choice of best recommendation 916 method in the data architectural context of the server system (SS), where n-dimensional inputs 915 are extracted or generated from both the quotations repository (QR) 910 and the managerial milestones 914 related to the logistic cluster (LC) 911. The FIG. 9B illustrates a typical strategy 511 operation on the collected n-dimensional data.

[046] At the end of the method, the server system (SS) will make available to the frontend system (FS) financial performance reports for the logistic clusters (LC) or for the operation (O) as a whole, informing to the e-commerce manager clearly the potential of results that he has with or without the invention enabled in an auditable and transparent manner. This could be determined statistically through a bypass rate defined in the context of the central system (C), client (CS) or server system (SS). FIG. 10 represents an interface with a possible implementation of this last step herein described.

Claims

1. A system for shipping rate personalization in e-commerce comprising:

   a) a server system (SS) having a quotations repository (QR), logistic clusters (LC) and n-dimensional generated inputs formed by crossing data between quotations repository (QR) and logistic clusters (LC) repository, wherein the server system (SS) is necessarily related to the client system (CS) and optionally related to frontend (FS) and central (C) systems;

   b) client system (CS) having at least a module for communication of quotation and a module for communication of sales;

   c) an optional frontend system (FS) having a set of interfaces available to e-commerce managers, minimally composed by: interface of logistic clusters (LC) management and module for operation (O) financial report;

   d) an optional central system (C) having elements that enable and parameterize a set formed by the client (CS) and server (SS) systems.

2. The system for shipping rate personalization in e-commerce of claim l, wherein the architecture is decentralized and scalable when the elements integration is implemented through APIs or web services.

3. The system for shipping rate personalization in e-commerce of claim l, wherein the logistic cluster (LC) element embodied in server system (SS) necessarily have a set of boolean rules associated to a strategy;

4. The system for shipping rate personalization in e-commerce of claim 3, wherein strategy is a parameter for setting a computer mathematical technique correlated to a commercial strategy;

5. The system for shipping rate personalization in e-commerce of claim 1, wherein server (SS) or client (CS) have a 'bypass' parameter where part of logistics quotations may not be personalized for audit purposes.

6. The system for shipping rate personalization in e-commerce of claim 1, wherein server (SS) or client (CS) have a 'profit margin' parameter wherein makes optional the need of use profit value (are equivalents) in whole system.

7. A method for shipping rate personalization in e-commerce comprising:

a) enabling the client (CS) and server (SS) systems in an e-commerce operation (O), wherein the server (SS) location is setted in client (CS) and the client (CS) is setted as authorized in server (SS);
b) populating data at server system (SS) with management historical data or milestones for model training, wherein can be done through batch insertion (such as ETL techniques) or setting the server (SS) to run in passive or collect data mode;
c) creations or parameterizations of logistic clusters (LC), wherein a computational mathematical technique related to a commercial or marketing strategy is defined along with custom boolean filters;
d) generation of consolidated management data or business milestones (BM) for the logistic cluster (LC) parameterized in f(x);

e) sending related data about quotation from client system (CS) to server system (SS), wherein required data such as cart/quotation unique identifier, transaction value and profit value, transaction profit are informed;

f) send a sale communication from client system (CS) to server system (SS) informing the quotations that turned in sales;

g) recommendation processing through computational mathematical techniques consistent with a marketing strategy;

h) generation of interfaces for e-commerce managers highlighting results achieved in an auditable way.

8. The method for shipping rate personalization in e-commerce of claim 7, wherein the step of sending a sale communication comprises a cart or quotation unique identifier;

9. The method for shipping rate personalization in e-commerce of claim 7, wherein the step of recommendation processing comprises reiterated statistical tests by sample structured in a hierarchical and generational tree with n-dimensional correlations.

10. The method of claim 9, wherein the recommendation processing will determine if the quotation be a part of statistical tests or not.

11. The method of claims 9 and 10, wherein the recommendation processing will use n-dimensional inputs generated by a strategy, a computer implemented method, using data from quotations repository (QR) and logistic cluster (LC) repository in form of data from customer, from business, from quotation and/or from sample statistical tests previously applied in another customers.

12. The method of claims 7 and 11, wherein the step of sending related data of claim 7 can include customer authorized data to identify their economical behavioral profiles, such as device, screen resolution,

session time, e-CRM data etc. for provide more accurate n-dimensional inputs to the model.

13. Method of claim 7, wherein the steps of 'populating data on server system (SS)', 'sending related data about quotation' and 'sending a sale communication' when combined partially or integrally provide more accurate input data for model training system.

14. Method of claim 10, wherein the step of generation of consolidated management data (BM) in f(x) uses combination of values such as average ticket, profit, conversion rate previously filtered through boolean values defined in a logistic cluster (LC).

Drawings

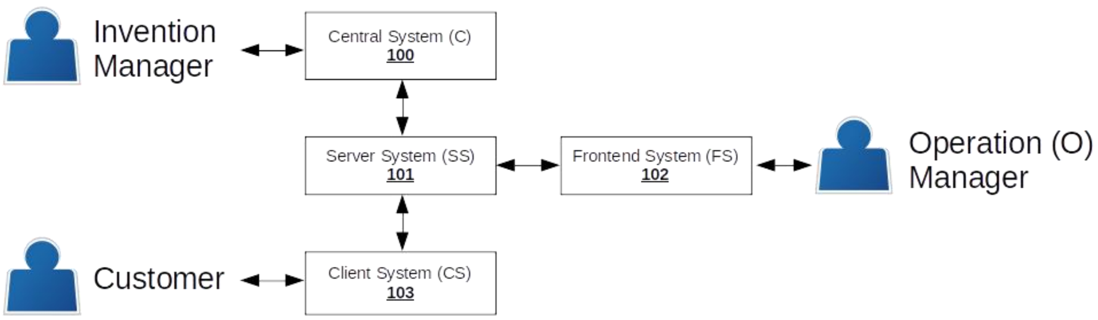

FIG. 1

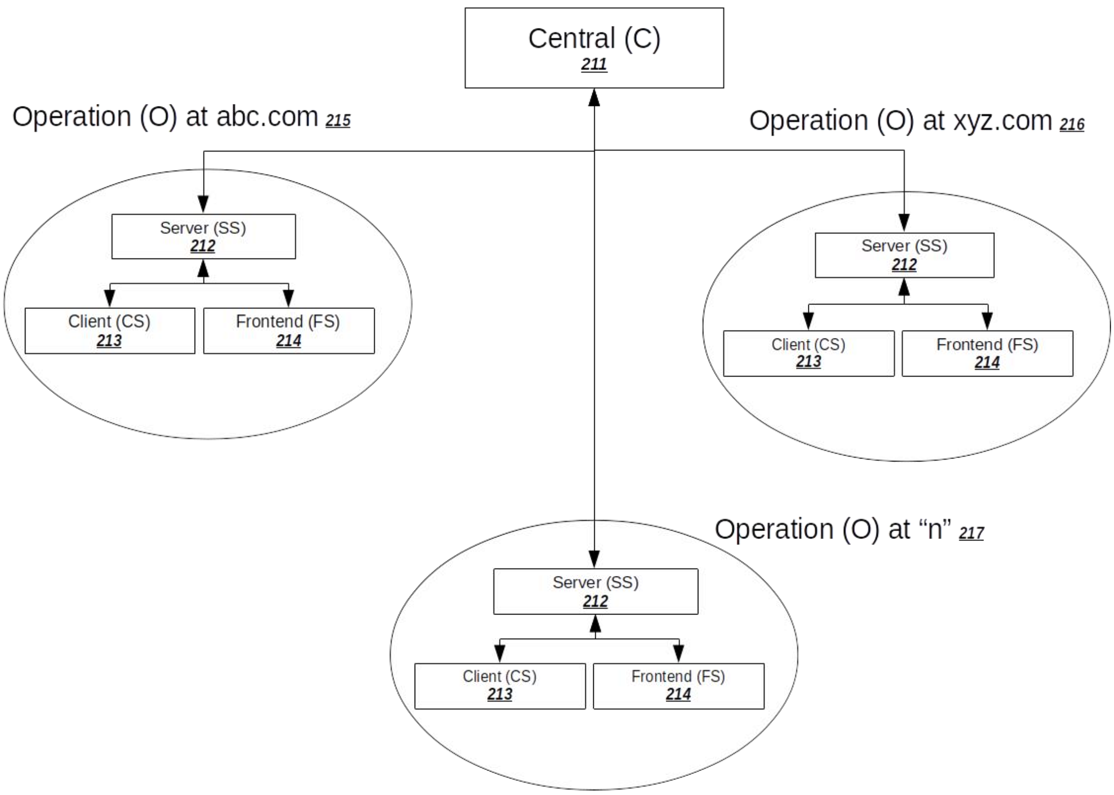

FIG. 2

FIG. 3A

Website: XyzShop.com
Operation: 30-days trial
Operation server: abc
Server location: abc.xyz
Operation frontend: xyz
Frontend location: abc.xyz
Bypass rate: x

Install operation

FIG. 3B

Hello John (XyzShop.com), to buy or try our product, click here.

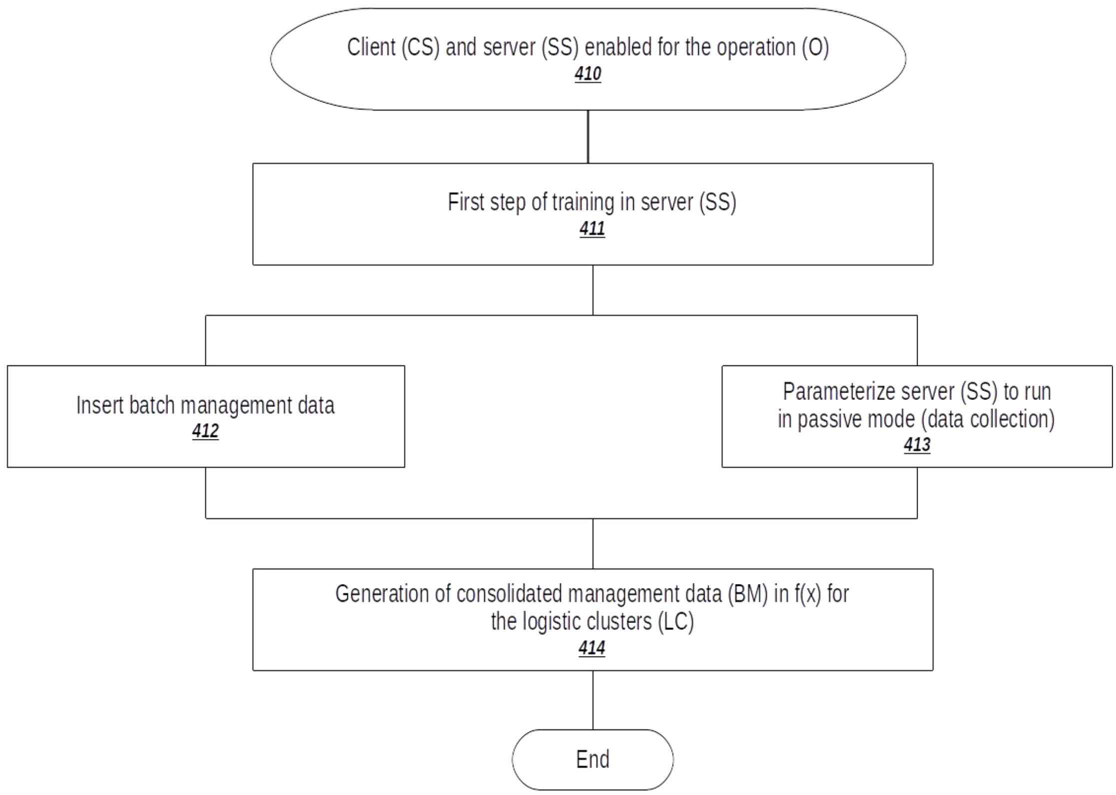
Client (CS) and server (SS) enabled for the operation (O)
410
First step of training in server (SS)
411
Insert batch management data
412
Parameterize server (SS) to run in passive mode (data collection)
413
Generation of consolidated management data (BM) in f(x) for the logistic clusters (LC)
414
End

FIG. 4

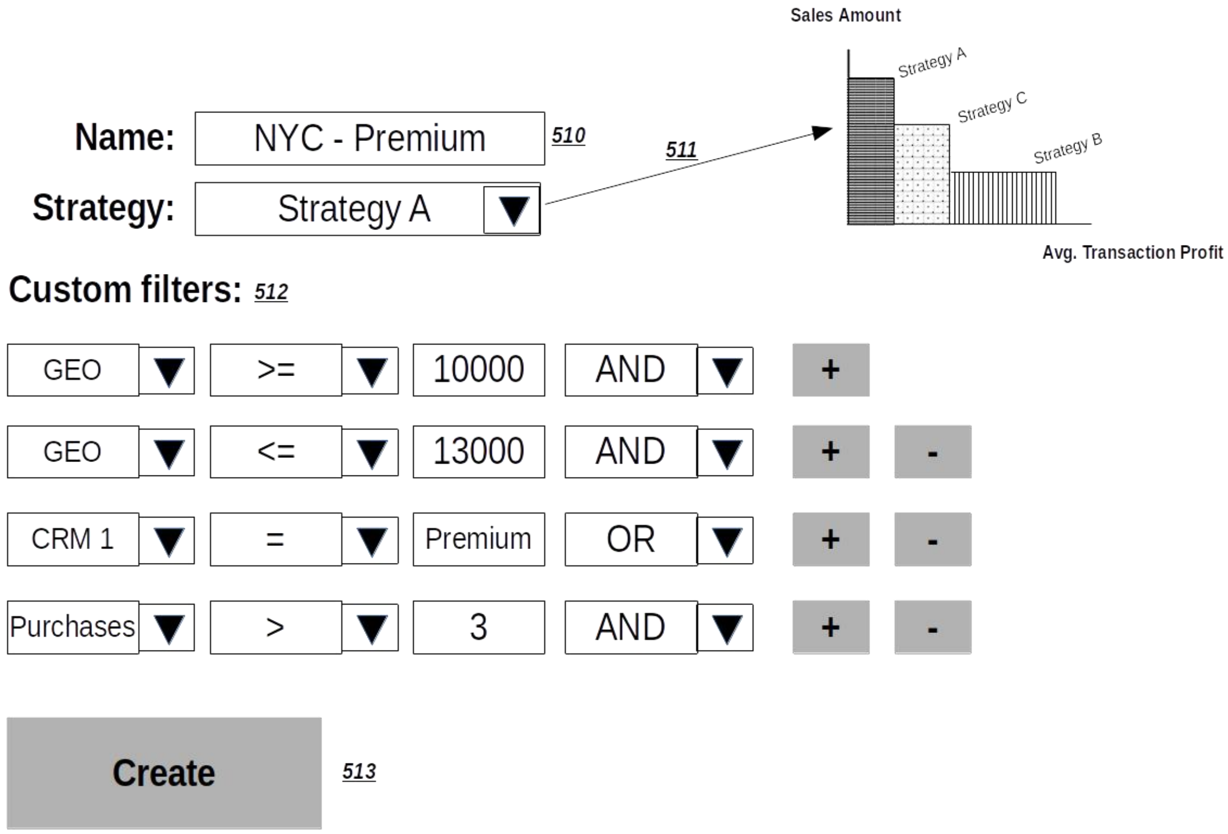
Sales Amount
Strategy A
Strategy C
Strategy B
Avg. Transaction Profit
Name:
NYC - Premium
510
511
Strategy:
Strategy A
Custom filters:
512
GEO
>=
10000
AND
+
GEO
<=
13000
AND
+
-
CRM 1
=
Premium
OR
+
-
Purchases
>
3
AND
+
-
Create
513

FIG. 5A

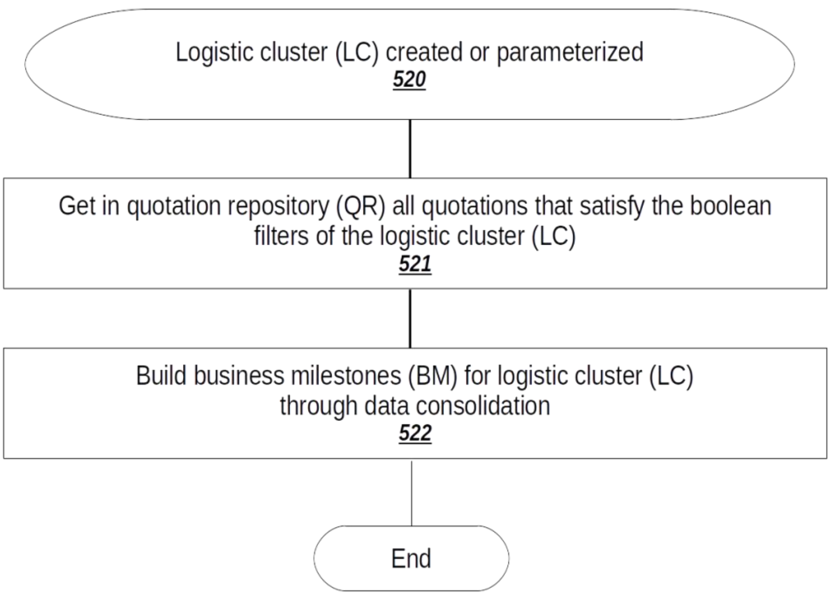
Logistic cluster (LC) created or parameterized
520
Get in quotation repository (QR) all quotations that satisfy the boolean filters of the logistic cluster (LC)
521
Build business milestones (BM) for logistic cluster (LC) through data consolidation
522
End

FIG. 5B

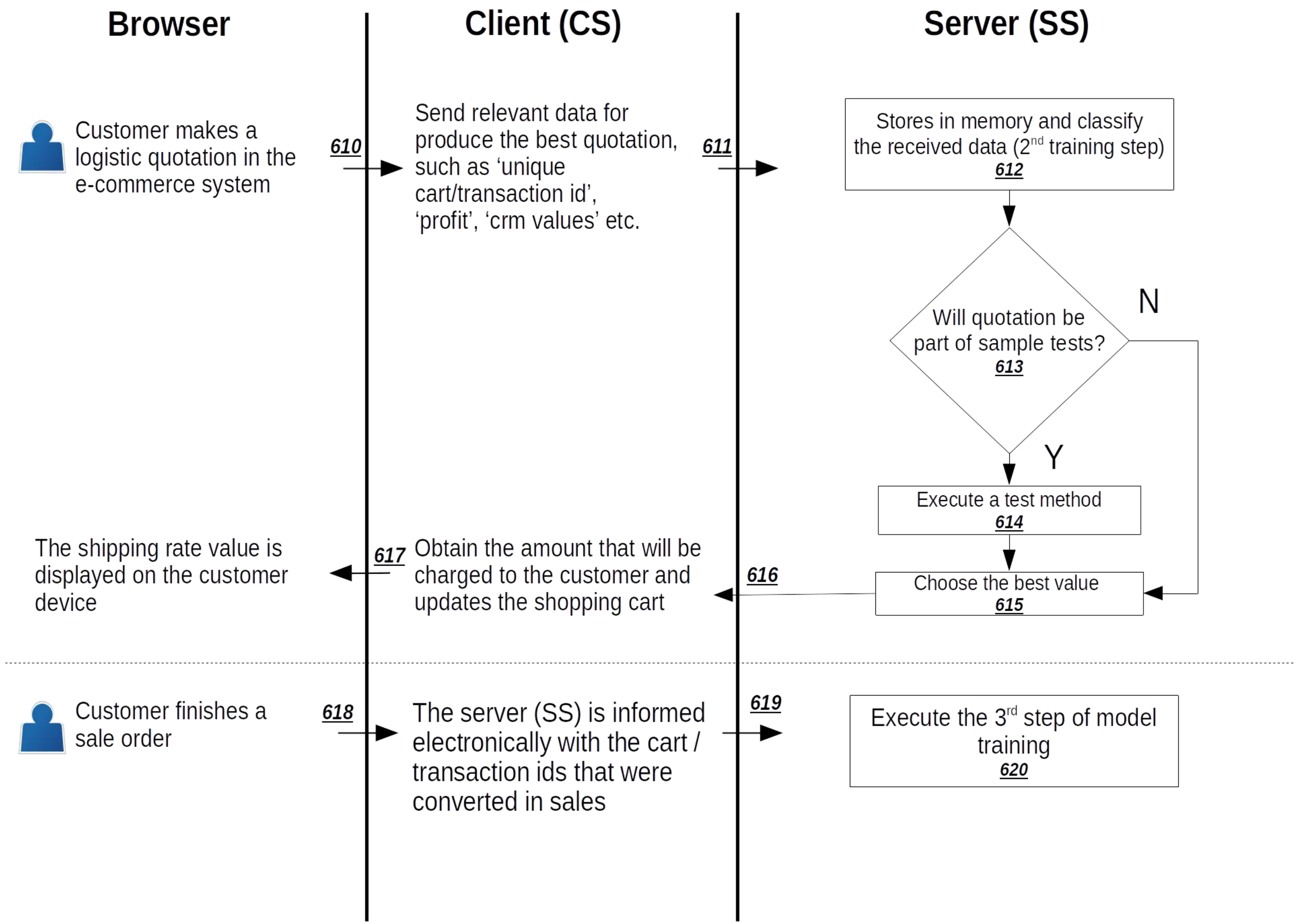
Browser
Client (CS)
Server (SS)
Customer makes a logistic quotation in the e-commerce system
610
Send relevant data for produce the best quotation, such as 'unique cart/transaction id', 'profit', 'crm values' etc.
611
Stores in memory and classify the received data (2nd training step)
612
Will quotation be part of sample tests?
613
N
Y
Execute a test method
614
Choose the best value
615
616
Obtain the amount that will be charged to the customer and updates the shopping cart
617
The shipping rate value is displayed on the customer device
Customer finishes a sale order
618
The server (SS) is informed electronically with the cart / transaction ids that were converted in sales
619
Execute the 3rd step of model training
620

FIG. 6A

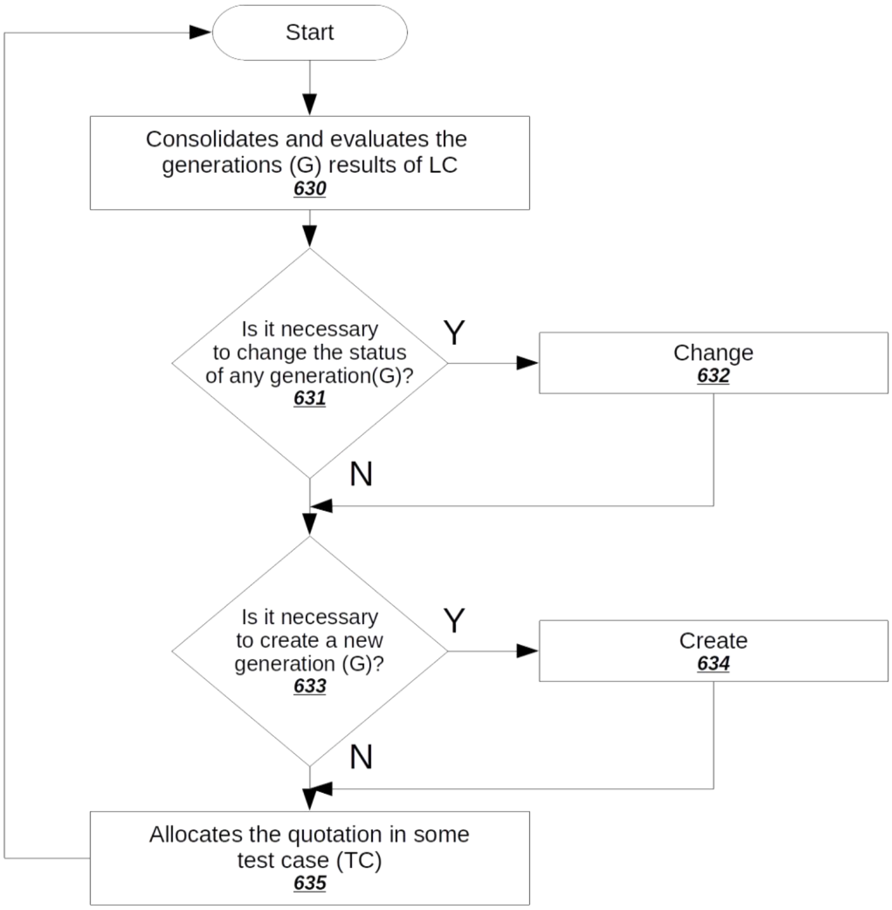
Start
Consolidates and evaluates the generations (G) results of LC
630
Is it necessary to change the status of any generation(G)?
631
Y
Change
632
N
Is it necessary to create a new generation (G)?
633
Y
Create
634
N
Allocates the quotation in some test case (TC)
635

FIG. 6B

Generation (G) N

Cluster ID
Sample Population
Range Start
Range End
Best Value
Best Test Case

Test Cases (TC) for Generation N

Group	Charged Shipping Rate	Conversion	Avg. Ticket	Other data
A	Y1	X1	X2	X3
B	Y2	Z1	Z2	Z3
C	Y3	W1	W2	W3
D	Y4	A1	A2	A3
E	Y5	B1	B2	B3

FIG. 7

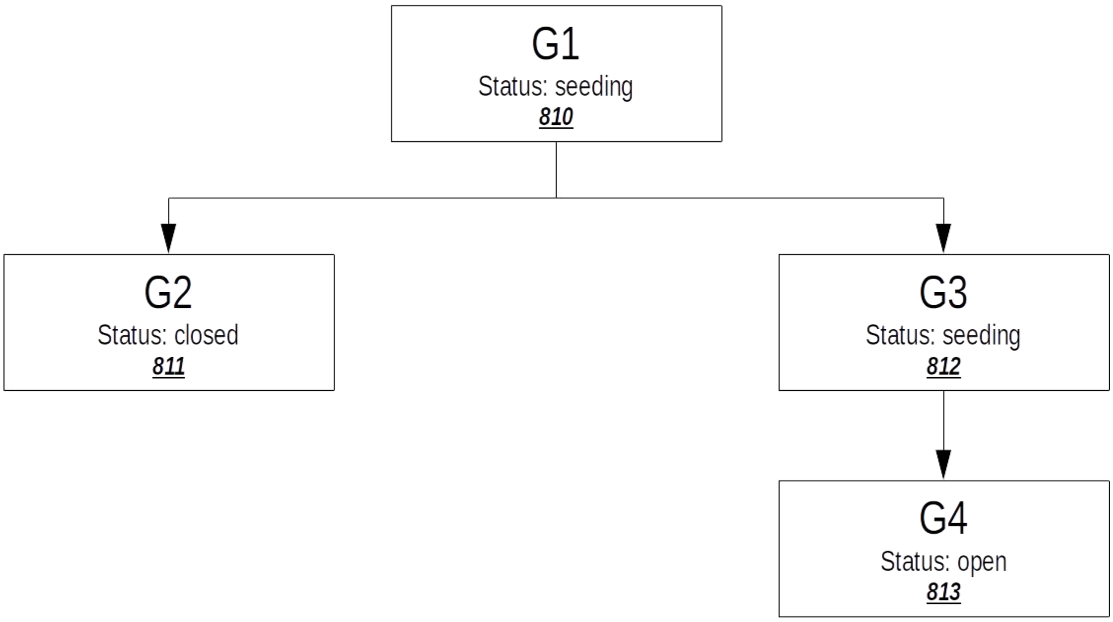

FIG. 8

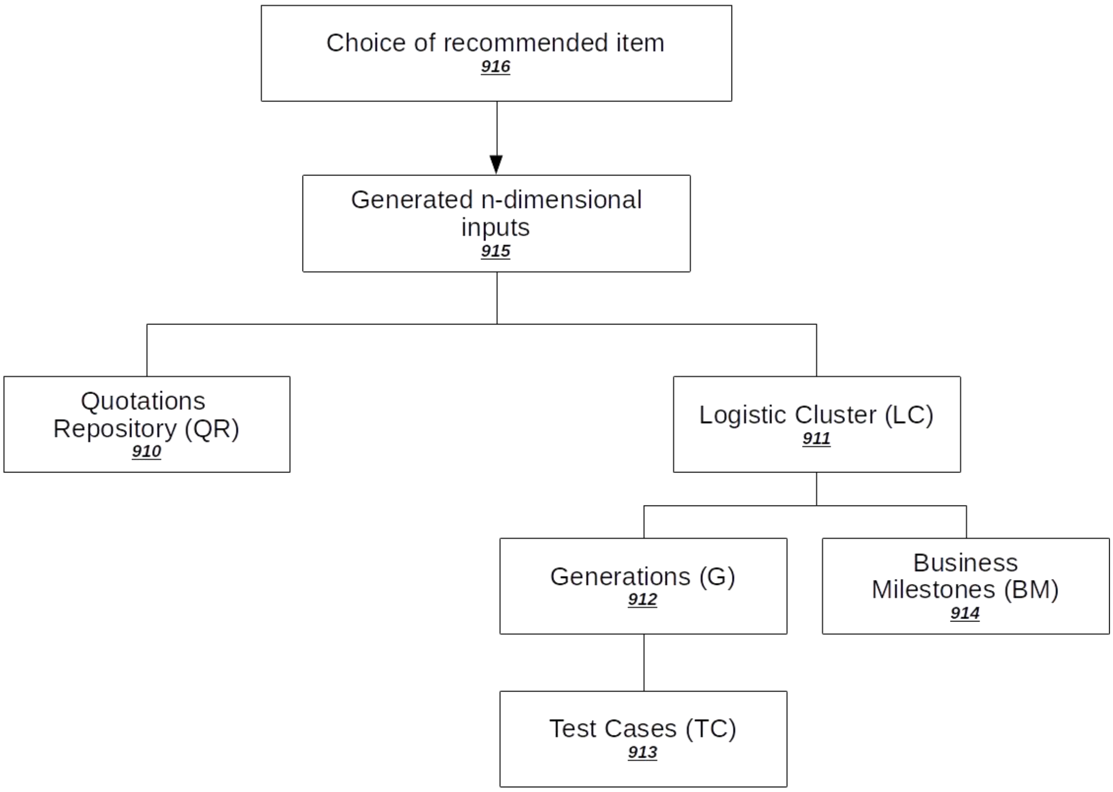
Choice of recommended item
916
Generated n-dimensional inputs
915
Quotations Repository (QR)
910
Logistic Cluster (LC)
911
Generations (G)
912
Business Milestones (BM)
914
Test Cases (TC)
913

FIG. 9A

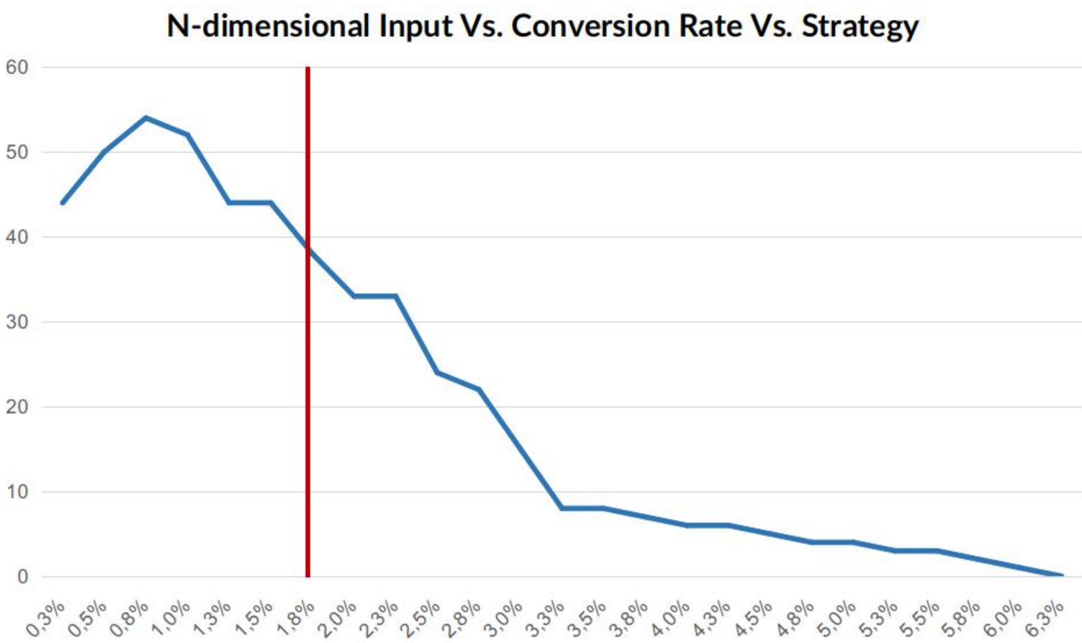
N-dimensional Input Vs. Conversion Rate Vs. Strategy
60
50
40
30
20
10
0
0,3%
0,5%
0,8%
1,0%
1,3%
1,5%
1,8%
2,0%
2,3%
2,5%
2,8%
3,0%
3,3%
3,5%
3,8%
4,0%
4,3%
4,5%
4,8%
5,0%
5,3%
5,5%
5,8%
6,0%
6,3%

FIG. 9B

Check the results of the enabled invention in your operation (O)

	Without invention (X%)	With invention (Y%)
Average Ticket	$ X	$ (X + Y)
Sales Number	X	X+Y
Profit per Sale	$ X	$ (X+Y)
Revenue Potential	$ X	$ (X+Y)
Profit Potential	$ X	$ (X+Y)
Sales Potential	X	X + Y

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FIG. 10