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(19) **United States**
(12) **Reissued Patent**
Bruce et al.

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(54) **METHODS, SYSTEMS, AND ARTICLES OF MANUFACTURE FOR DETERMINING OPTIMAL PARAMETER SETTINGS FOR BUSINESS INITIATIVE TESTING MODELS**

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(73) Assignee: **APPLIED PREDICTIVE TECHNOLOGIES, INC.**, Arlington, VA (US)

(21) Appl. No.: **17/241,771**

(22) Filed: **Apr. 27, 2021**

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **8,571,916**
Issued: **Oct. 29, 2013**
Appl. No.: **11/364,197**
Filed: **Mar. 1, 2006**

U.S. Applications:

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(51) **Int. Cl.**

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G06Q 30/0201	(2023.01)
G06Q 30/0242	(2023.01)

(52) **U.S. Cl.**
CPC ***G06Q 30/0201*** (2013.01); ***G06Q 30/0242*** (2013.01)

(58) **Field of Classification Search**
CPC G06Q 10/00; G06Q 40/00; G06Q 30/0242; G06Q 30/0201
See application file for complete search history.

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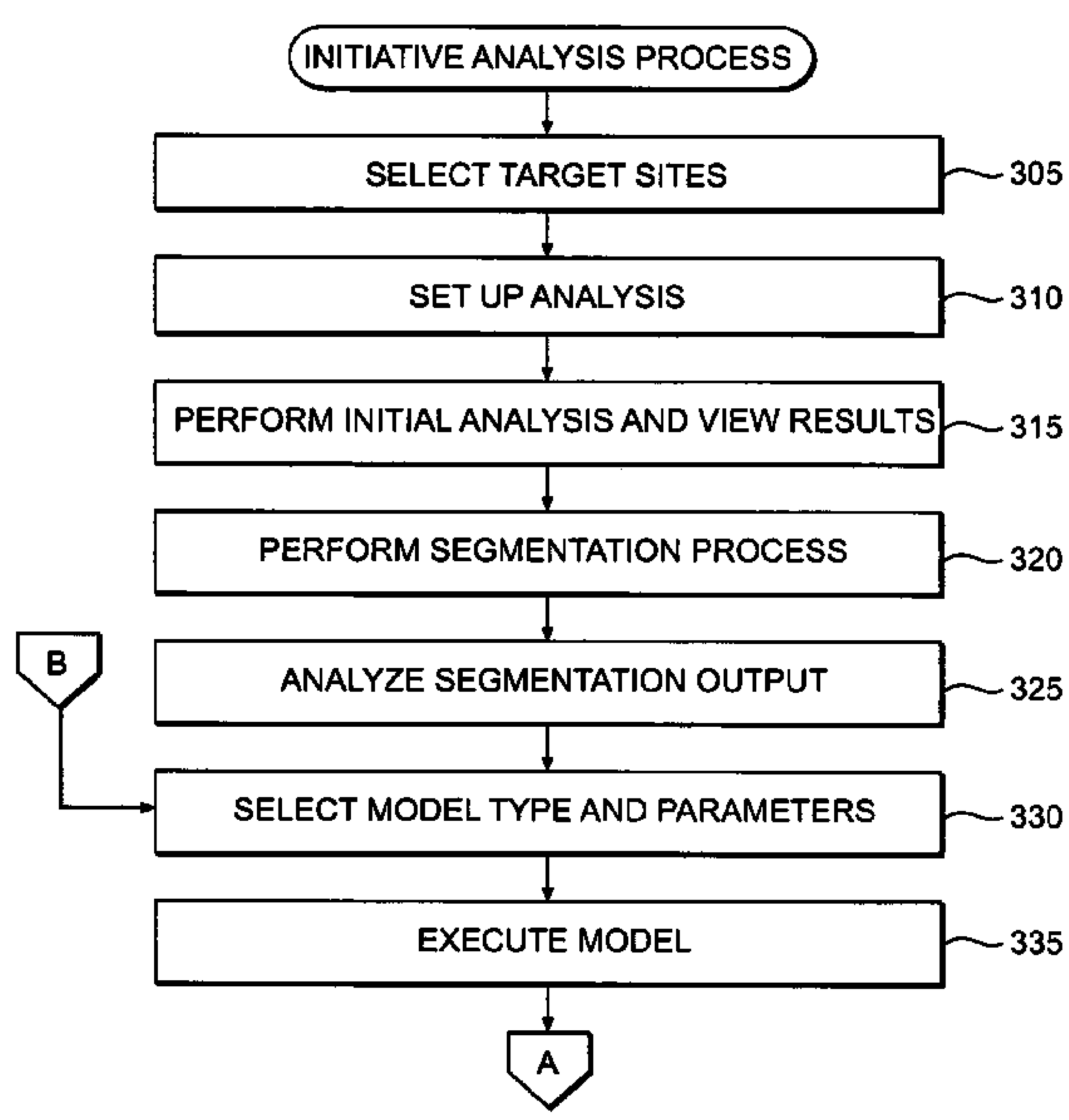
(74) *Attorney, Agent, or Firm* — Foley & Lardner LLP

(57) **ABSTRACT**

A system, method, and article of manufacture is disclosed for determining optimal parameter settings for a business initiative testing model used for testing initiatives for business locations included in a business network. In one aspect, a method is disclosed that includes defining a first test type of a business initiative testing model having a set of parameter settings. Each parameter setting may include a set of one or more parameter setting options. The method may also include performing virtual tests on a set of virtual test sites based on the defined test type. Each virtual test site may reflect a selected business location in the business network. Also, the method may include determining a set of optimal parameter settings for the first test type of the business initiative testing model based on results from the virtual test. Moreover, the method may include configuring the business initiative testing model using the optimal parameter settings from the set for the first test type to test a business initiative to apply to the business network.

34 Claims, 27 Drawing Sheets



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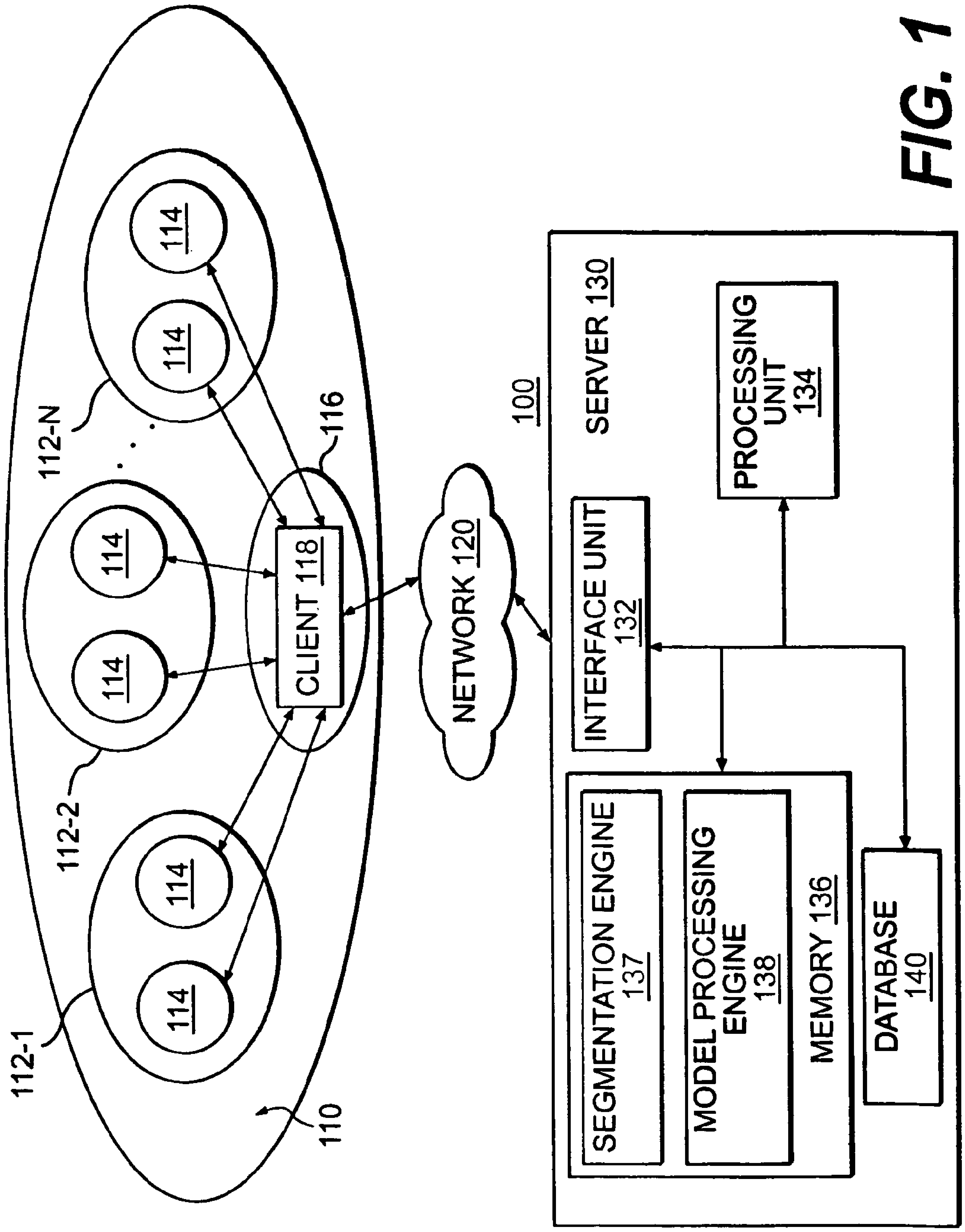
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112-1
112-2
112-N
114
116
CLIENT 118
NETWORK 120
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SERVER 130
INTERFACE UNIT 132
PROCESSING UNIT 134
MEMORY 136
SEGMENTATION ENGINE 137
MODEL PROCESSING ENGINE 138
DATABASE 140

FIG. 1

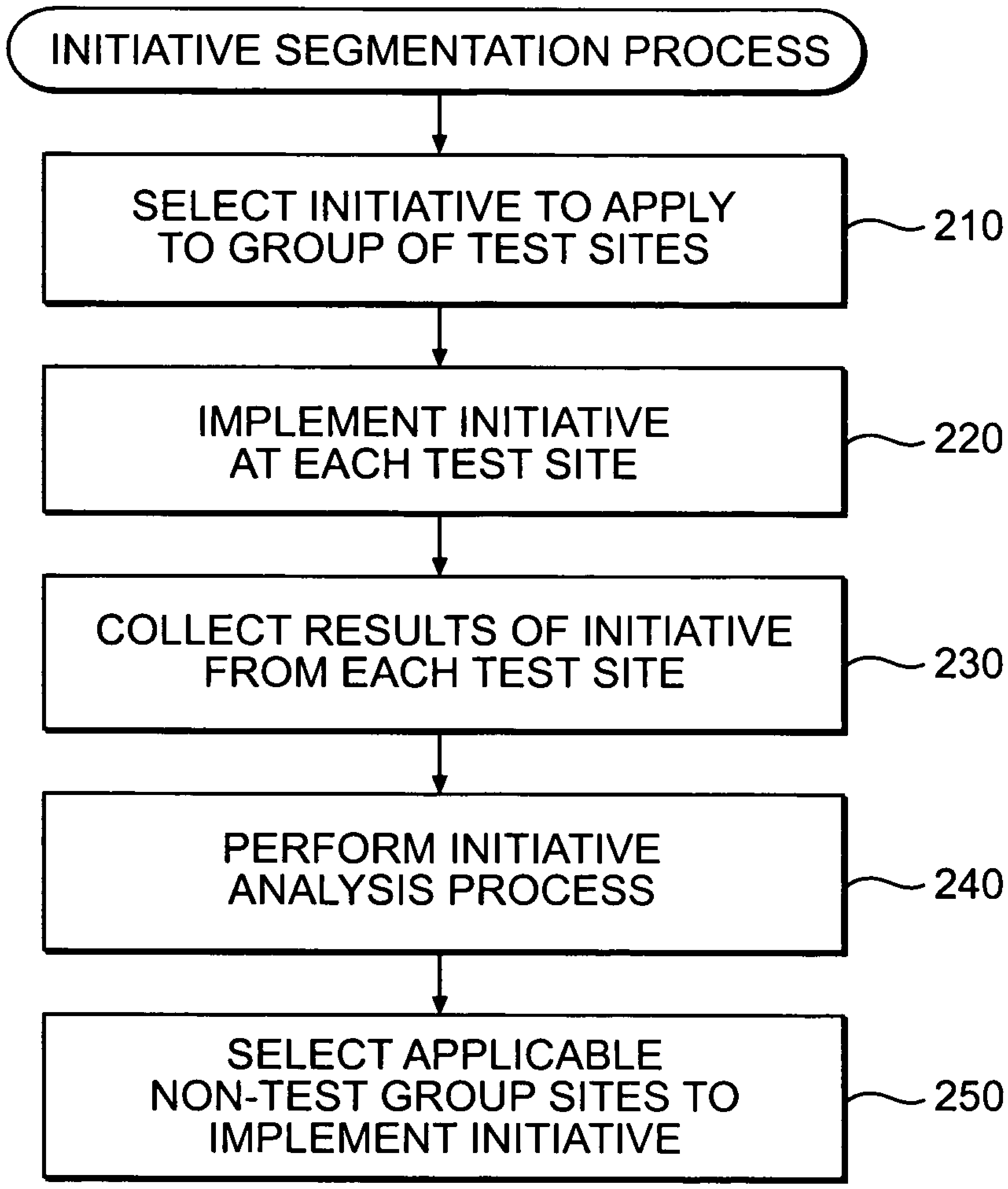

INITIATIVE SEGMENTATION PROCESS
SELECT INITIATIVE TO APPLY TO GROUP OF TEST SITES
210
IMPLEMENT INITIATIVE AT EACH TEST SITE
220
COLLECT RESULTS OF INITIATIVE FROM EACH TEST SITE
230
PERFORM INITIATIVE ANALYSIS PROCESS
240
SELECT APPLICABLE NON-TEST GROUP SITES TO IMPLEMENT INITIATIVE
250

FIG. 2

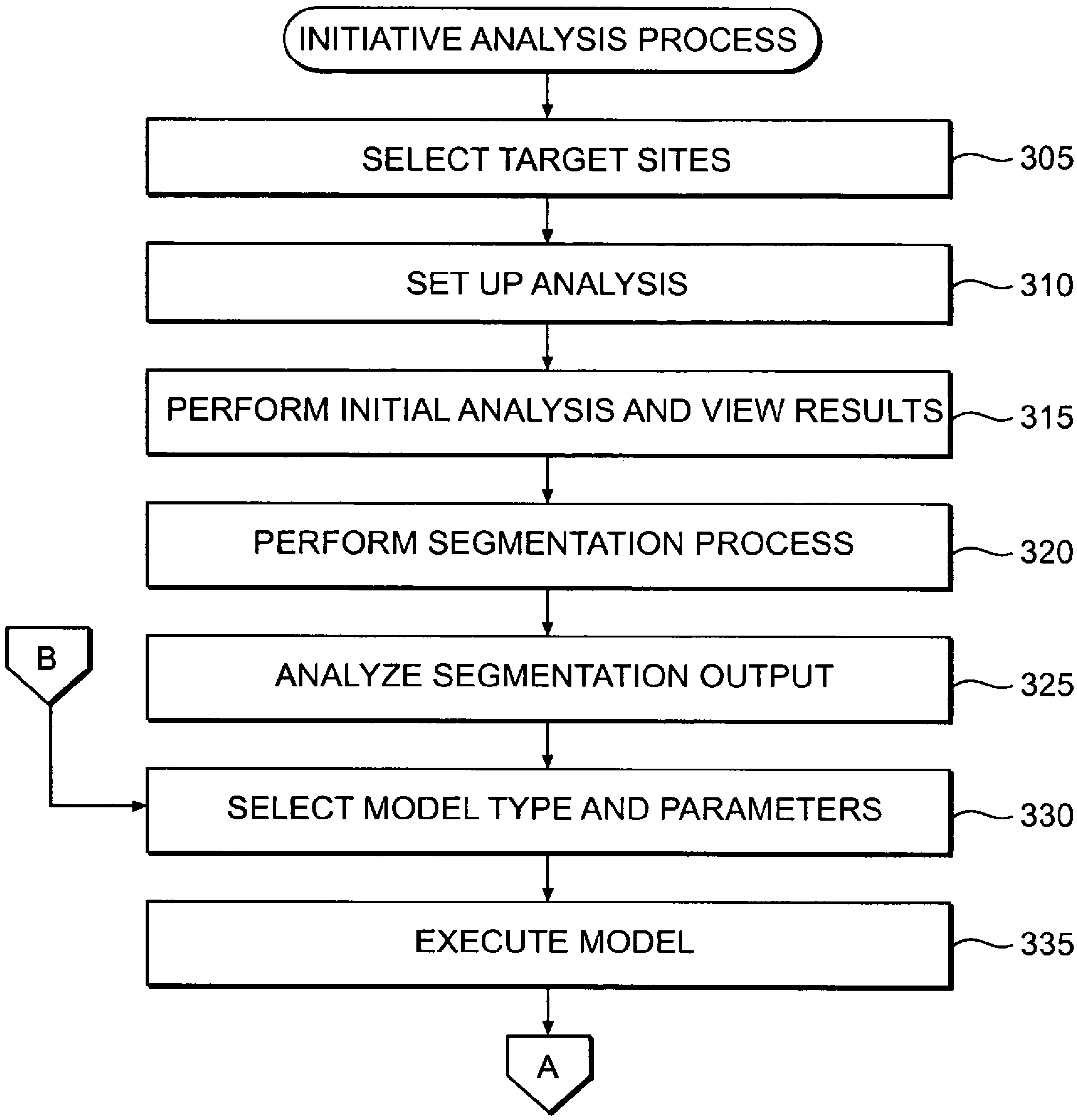

INITIATIVE ANALYSIS PROCESS
SELECT TARGET SITES
305
SET UP ANALYSIS
310
PERFORM INITIAL ANALYSIS AND VIEW RESULTS
315
PERFORM SEGMENTATION PROCESS
320
B
ANALYZE SEGMENTATION OUTPUT
325
SELECT MODEL TYPE AND PARAMETERS
330
EXECUTE MODEL
335
A

FIG. 3A

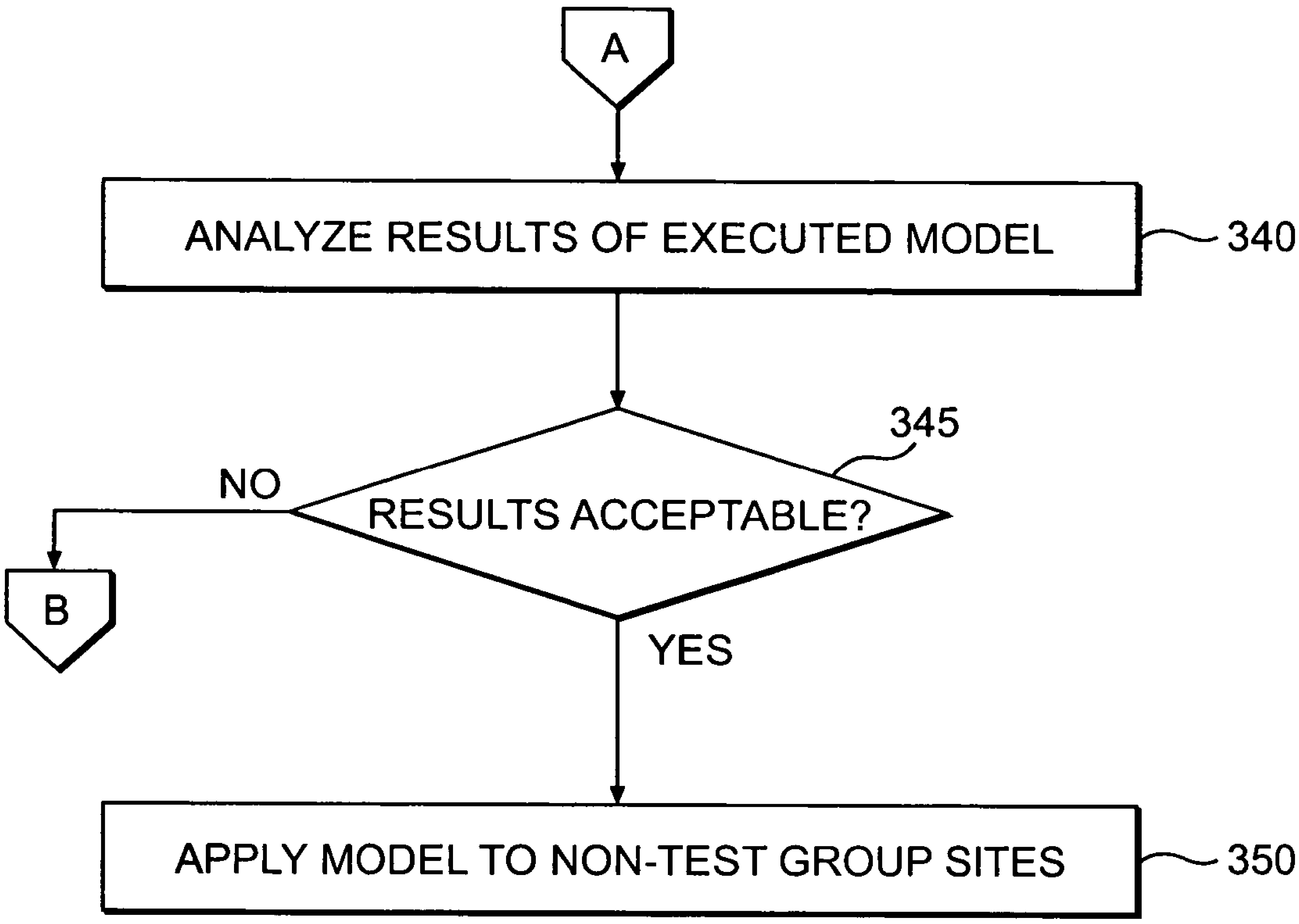
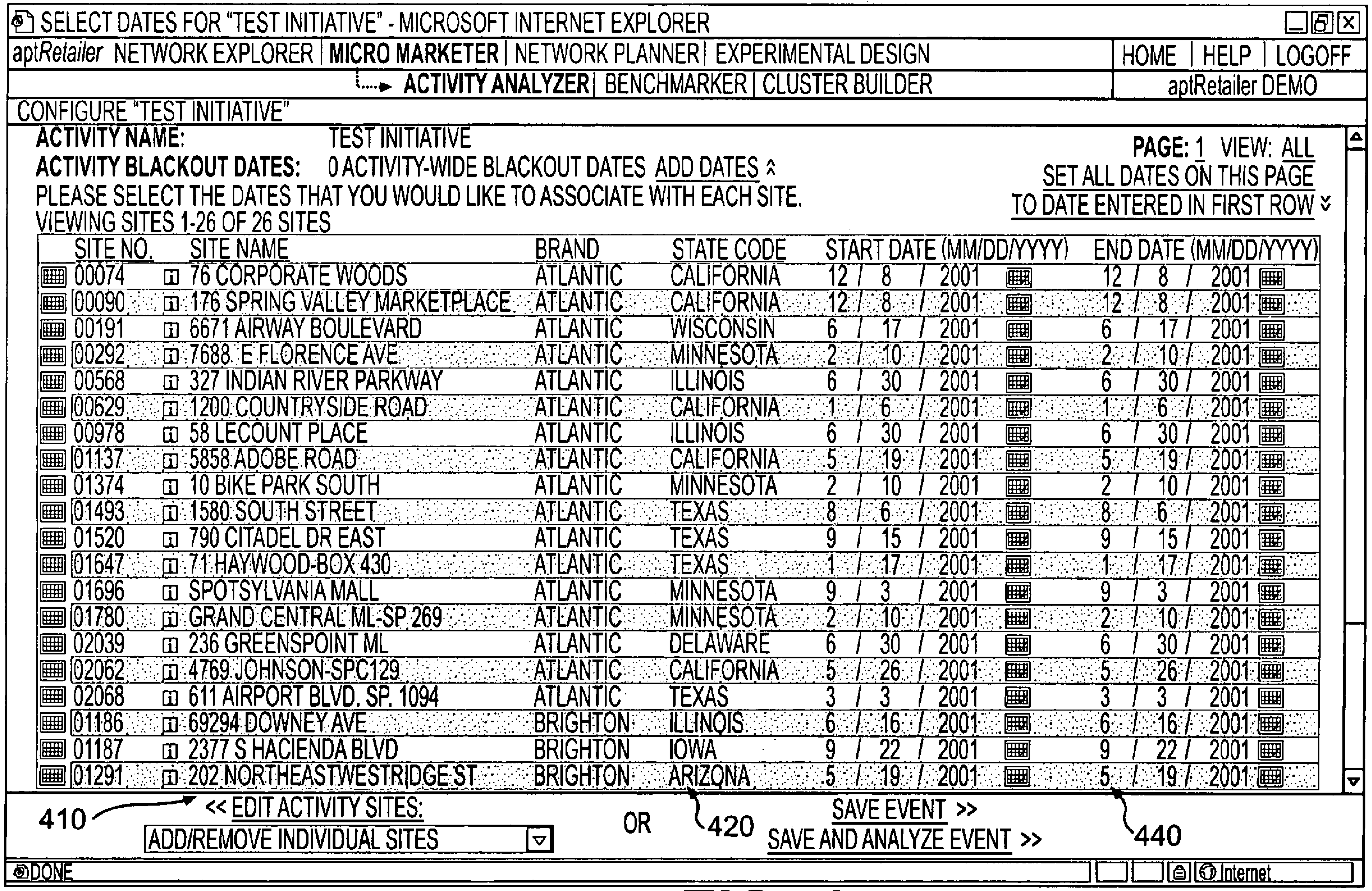

A
ANALYZE RESULTS OF EXECUTED MODEL
340
345
NO
RESULTS ACCEPTABLE?
B
YES
APPLY MODEL TO NON-TEST GROUP SITES
350

FIG. 3B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aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
CONFIGURE "TEST INITIATIVE"
ACTIVITY NAME: TEST INITIATIVE
ACTIVITY BLACKOUT DATES: 0 ACTIVITY-WIDE BLACKOUT DATES ADD DATES
PLEASE SELECT THE DATES THAT YOU WOULD LIKE TO ASSOCIATE WITH EACH SITE.
VIEWING SITES 1-26 OF 26 SITES
PAGE: 1 VIEW: ALL
SET ALL DATES ON THIS PAGE TO DATE ENTERED IN FIRST ROW
SITE NO. SITE NAME BRAND STATE CODE START DATE (MM/DD/YYYY) END DATE (MM/DD/YYYY)
00074 76 CORPORATE WOODS ATLANTIC CALIFORNIA 12 / 8 / 2001 12 / 8 / 2001
00090 176 SPRING VALLEY MARKETPLACE ATLANTIC CALIFORNIA 12 / 8 / 2001 12 / 8 / 2001
00191 6671 AIRWAY BOULEVARD ATLANTIC WISCONSIN 6 / 17 / 2001 6 / 17 / 2001
00292 7688 E FLORENCE AVE ATLANTIC MINNESOTA 2 / 10 / 2001 2 / 10 / 2001
00568 327 INDIAN RIVER PARKWAY ATLANTIC ILLINOIS 6 / 30 / 2001 6 / 30 / 2001
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02068 611 AIRPORT BLVD. SP. 1094 ATLANTIC TEXAS 3 / 3 / 2001 3 / 3 / 2001
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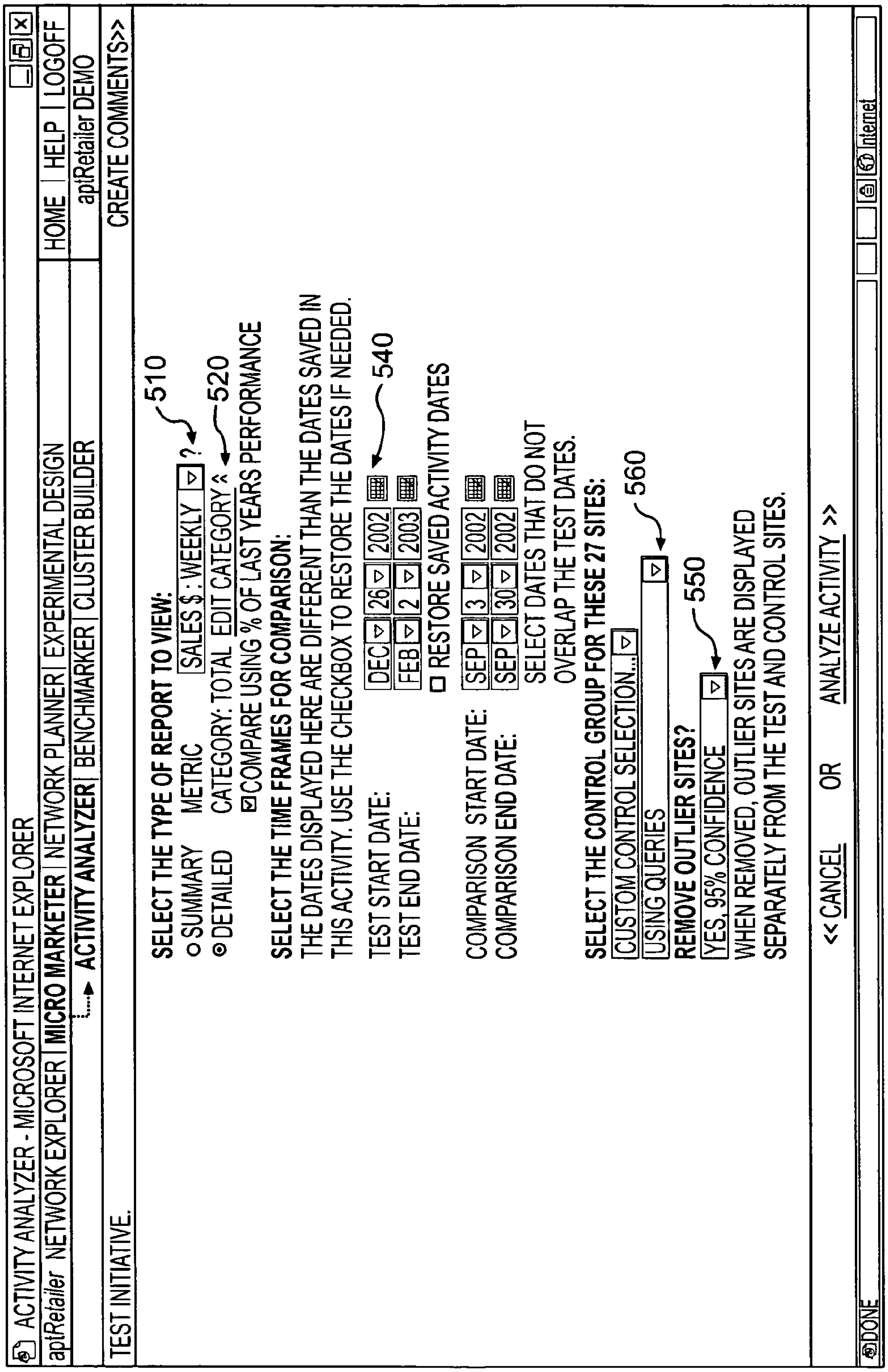
01187 2377 S HACIENDA BLVD BRIGHTON IOWA 9 / 22 / 2001 9 / 22 / 2001
01291 202 NORTHEASTWESTRIDGE ST BRIGHTON ARIZONA 5 / 19 / 2001 5 / 19 / 2001
410
<< EDIT ACTIVITY SITES:
ADD/REMOVE INDIVIDUAL SITES
OR
420
SAVE EVENT >>
SAVE AND ANALYZE EVENT >>
440
DONE
Internet

FIG. 4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aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
TEST INITIATIVE.
CREATE COMMENTS>>
SELECT THE TYPE OF REPORT TO VIEW:
SUMMARY METRIC SALES $: WEEKLY ?
DETAILED CATEGORY: TOTAL EDIT CATEGORY ^
COMPARE USING % OF LAST YEARS PERFORMANCE
510
520
SELECT THE TIME FRAMES FOR COMPARISON:
THE DATES DISPLAYED HERE ARE DIFFERENT THAN THE DATES SAVED IN THIS ACTIVITY. USE THE CHECKBOX TO RESTORE THE DATES IF NEEDED.
TEST START DATE: DEC 26 2002
TEST END DATE: FEB 2 2003
540
RESTORE SAVED ACTIVITY DATES
COMPARISON START DATE: SEP 3 2002
COMPARISON END DATE: SEP 30 2002
SELECT DATES THAT DO NOT OVERLAP THE TEST DATES.
SELECT THE CONTROL GROUP FOR THESE 27 SITES:
CUSTOM CONTROL SELECTION...
USING QUERIES
560
REMOVE OUTLIER SITES?
YES, 95% CONFIDENCE
550
WHEN REMOVED, OUTLIER SITES ARE DISPLAYED SEPARATELY FROM THE TEST AND CONTROL SITES.
<< CANCEL OR ANALYZE ACTIVITY >>
DONE
Internet

FIG. 5

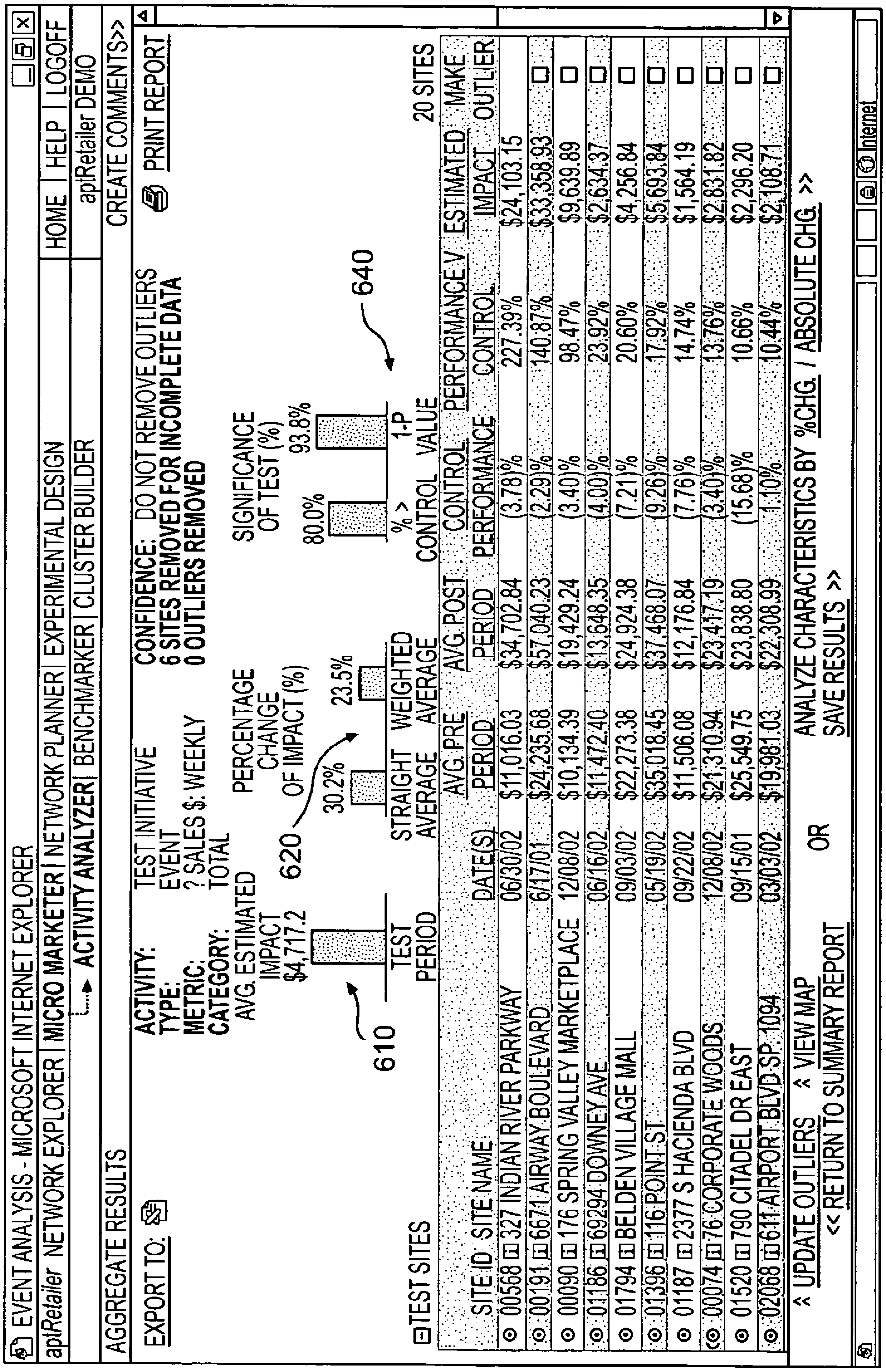

EVENT ANALYSIS - MICROSOFT INTERNET EXPLORER
aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
AGGREGATE RESULTS
CREATE COMMENTS>>
EXPORT TO:
PRINT REPORT
ACTIVITY: TEST INITIATIVE
TYPE: EVENT
METRIC: ? SALES $: WEEKLY
CATEGORY: TOTAL
CONFIDENCE: DO NOT REMOVE OUTLIERS
6 SITES REMOVED FOR INCOMPLETE DATA
0 OUTLIERS REMOVED
AVG. ESTIMATED IMPACT
$4,717.2
TEST PERIOD
610
620
PERCENTAGE CHANGE OF IMPACT (%)
30.2%
23.5%
STRAIGHT AVERAGE
WEIGHTED AVERAGE
SIGNIFICANCE OF TEST (%)
80.0%
93.8%
% > CONTROL
1-P VALUE
640
TEST SITES
20 SITES
SITE ID SITE NAME | DATE(S) | AVG. PRE PERIOD | AVG. POST PERIOD | CONTROL PERFORMANCE | PERFORMANCE V CONTROL | ESTIMATED IMPACT | MAKE OUTLIER
00568 327 INDIAN RIVER PARKWAY | 06/30/02 | $11,016.03 | $34,702.84 | (3.78)% | 227.39% | $24,103.15
00191 6671 AIRWAY BOULEVARD | 6/17/01 | $24,235.68 | $57,040.23 | (2.29)% | 140.87% | $33,358.93
00090 176 SPRING VALLEY MARKETPLACE | 12/08/02 | $10,134.39 | $19,429.24 | (3.40)% | 98.47% | $9,639.89
01186 69294 DOWNEY AVE | 06/16/02 | $11,472.40 | $13,648.35 | (4.00)% | 23.92% | $2,634.37
01794 BELDEN VILLAGE MALL | 09/03/02 | $22,273.38 | $24,924.38 | (7.21)% | 20.60% | $4,256.84
01396 116 POINT ST | 05/19/02 | $35,018.45 | $37,468.07 | (9.26)% | 17.92% | $5,693.84
01187 2377 S HACIENDA BLVD | 09/22/02 | $11,506.08 | $12,176.84 | (7.76)% | 14.74% | $1,564.19
00074 76 CORPORATE WOODS | 12/08/02 | $21,310.94 | $23,417.19 | (3.40)% | 13.76% | $2,831.82
01520 790 CITADEL DR EAST | 09/15/01 | $25,549.75 | $23,838.80 | (15.68)% | 10.66% | $2,296.20
02068 611 AIRPORT BLVD SP. 1094 | 03/03/02 | $19,981.03 | $22,308.99 | 1.10% | 10.44% | $2,108.71
UPDATE OUTLIERS
VIEW MAP
<< RETURN TO SUMMARY REPORT
OR
ANALYZE CHARACTERISTICS BY %CHG. / ABSOLUTE CHG. >>
SAVE RESULTS >>
Internet

FIG. 6

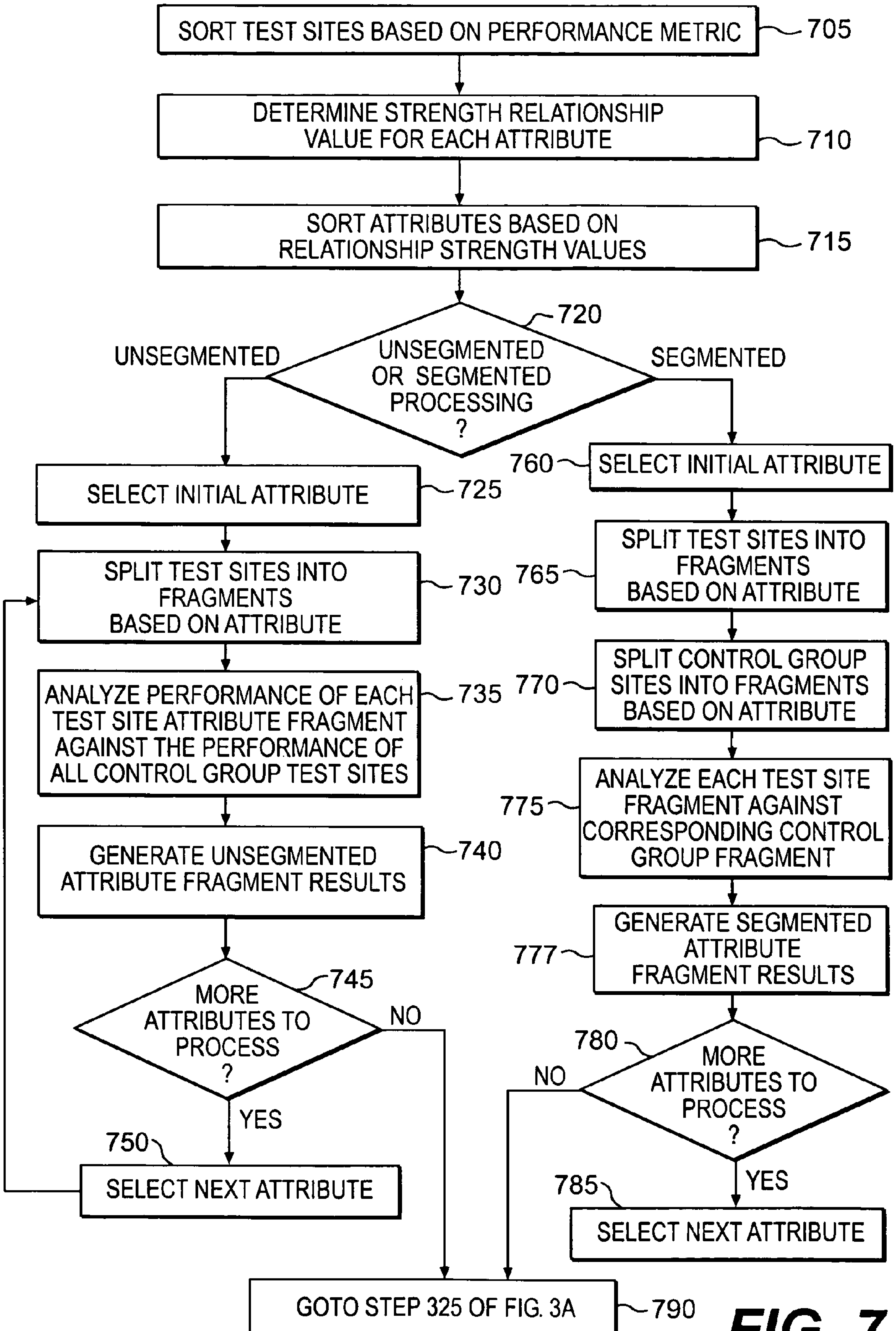

SORT TEST SITES BASED ON PERFORMANCE METRIC
705
DETERMINE STRENGTH RELATIONSHIP VALUE FOR EACH ATTRIBUTE
710
SORT ATTRIBUTES BASED ON RELATIONSHIP STRENGTH VALUES
715
UNSEGMENTED OR SEGMENTED PROCESSING ?
720
UNSEGMENTED
SEGMENTED
SELECT INITIAL ATTRIBUTE
725
SPLIT TEST SITES INTO FRAGMENTS BASED ON ATTRIBUTE
730
ANALYZE PERFORMANCE OF EACH TEST SITE ATTRIBUTE FRAGMENT AGAINST THE PERFORMANCE OF ALL CONTROL GROUP TEST SITES
735
GENERATE UNSEGMENTED ATTRIBUTE FRAGMENT RESULTS
740
MORE ATTRIBUTES TO PROCESS ?
745
NO
YES
750
SELECT NEXT ATTRIBUTE
760
SELECT INITIAL ATTRIBUTE
765
SPLIT TEST SITES INTO FRAGMENTS BASED ON ATTRIBUTE
770
SPLIT CONTROL GROUP SITES INTO FRAGMENTS BASED ON ATTRIBUTE
775
ANALYZE EACH TEST SITE FRAGMENT AGAINST CORRESPONDING CONTROL GROUP FRAGMENT
777
GENERATE SEGMENTED ATTRIBUTE FRAGMENT RESULTS
780
MORE ATTRIBUTES TO PROCESS ?
NO
YES
785
SELECT NEXT ATTRIBUTE
GOTO STEP 325 OF FIG. 3A
790

FIG. 7

801 802 803

TEST SITE	PERFORMANCE METRIC	ATTRIBUTES					
		ATTRIBUTE 1 (NO. OF COMPETITOR STORES WITHIN 10 MILES)	ATTRIBUTE 2 (AVG. DISTANCE TO BUSINESS LOCATION IN NETWORK)	ATTRIBUTE 3 (AVG. MO. RENT)	ATTRIBUTE 4 (% POPULATION 18-24 W/N 5 MILES)	...	ATTRIBUTE T
TS-1	15% (AVG. SALES INCREASE)	.81	12.02	15650	.083	...	1.34
TS-2	10% (AVG. SALES INCREASE)	.96	10.13	12670	.064	...	1.56
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
TS-X	(4%) (AVG. SALES INCREASE)	1.78	8.32	16345	.033	...	2.45

FIG. 8

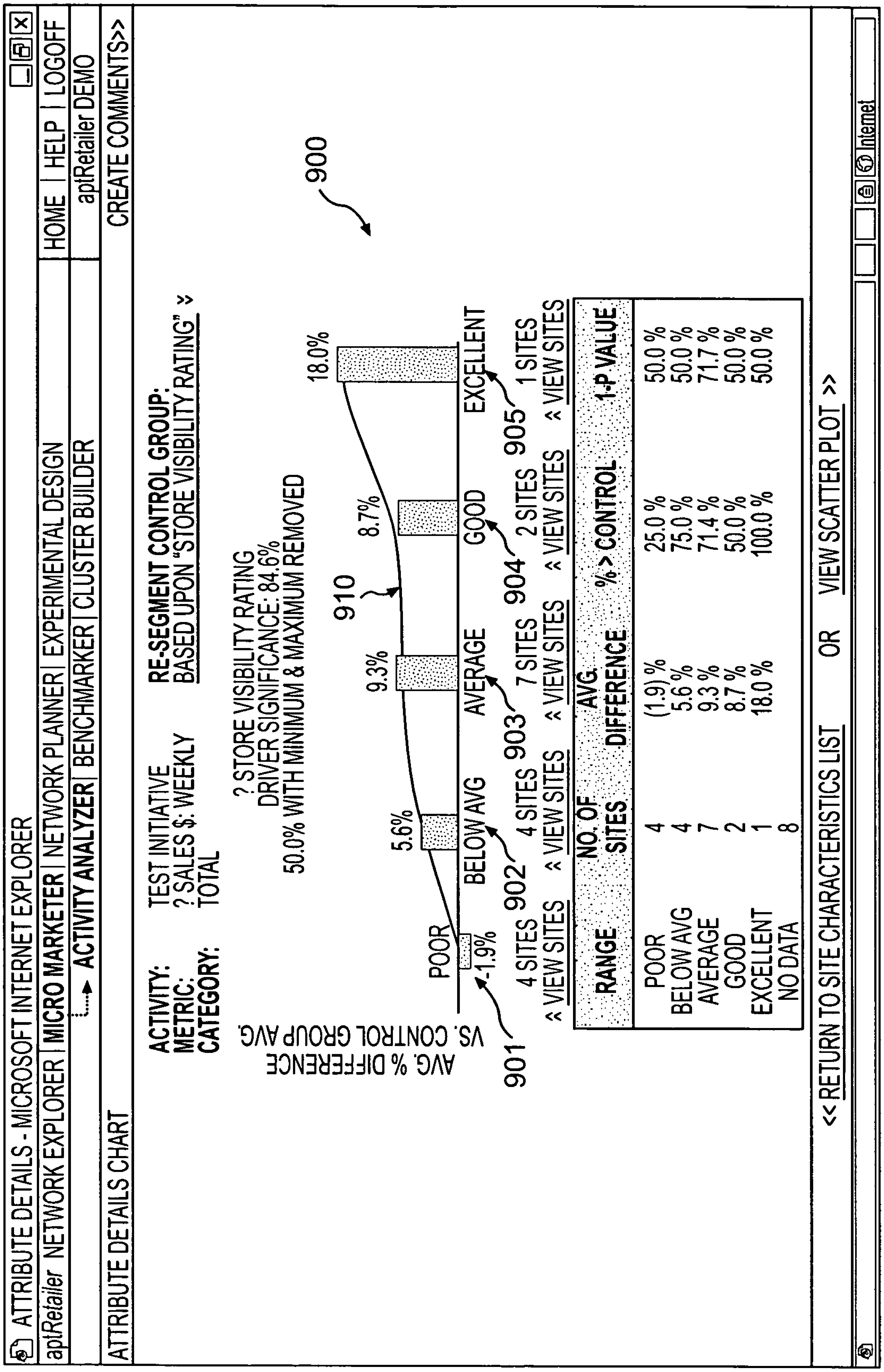

ATTRIBUTE DETAILS - MICROSOFT INTERNET EXPLORER
aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
ATTRIBUTE DETAILS CHART
CREATE COMMENTS>>
ACTIVITY: TEST INITIATIVE
METRIC: ? SALES $: WEEKLY
CATEGORY: TOTAL
RE-SEGMENT CONTROL GROUP:
BASED UPON "STORE VISIBILITY RATING" >>
? STORE VISIBILITY RATING
DRIVER SIGNIFICANCE: 84.6%
50.0% WITH MINIMUM & MAXIMUM REMOVED
900
AVG. % DIFFERENCE VS. CONTROL GROUP AVG.
-1.9%
5.6%
9.3%
8.7%
18.0%
910
POOR
BELOW AVG
AVERAGE
GOOD
EXCELLENT
901
902
903
904
905
4 SITES
4 SITES
7 SITES
2 SITES
1 SITES
^ VIEW SITES
RANGE
NO. OF SITES
AVG. DIFFERENCE
% > CONTROL
1-P VALUE
POOR 4 (1.9) % 25.0 % 50.0 %
BELOW AVG 4 5.6 % 75.0 % 50.0 %
AVERAGE 7 9.3 % 71.4 % 71.7 %
GOOD 2 8.7 % 50.0 % 50.0 %
EXCELLENT 1 18.0 % 100.0 % 50.0 %
NO DATA 8
<< RETURN TO SITE CHARACTERISTICS LIST OR VIEW SCATTER PLOT >>
Internet

FIG. 9

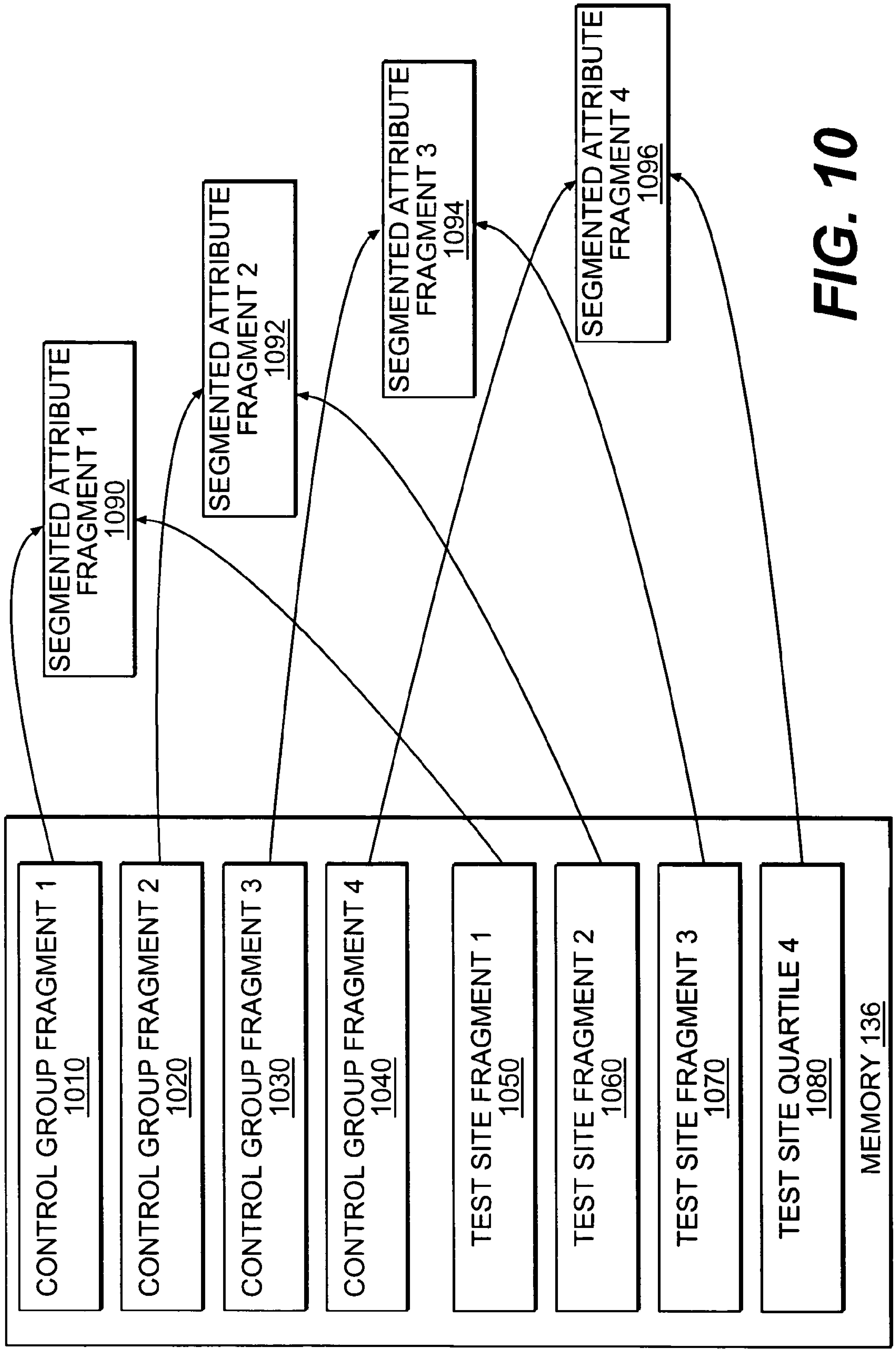

CONTROL GROUP FRAGMENT 1
1010
CONTROL GROUP FRAGMENT 2
1020
CONTROL GROUP FRAGMENT 3
1030
CONTROL GROUP FRAGMENT 4
1040
TEST SITE FRAGMENT 1
1050
TEST SITE FRAGMENT 2
1060
TEST SITE FRAGMENT 3
1070
TEST SITE QUARTILE 4
1080
MEMORY 136
SEGMENTED ATTRIBUTE FRAGMENT 1
1090
SEGMENTED ATTRIBUTE FRAGMENT 2
1092
SEGMENTED ATTRIBUTE FRAGMENT 3
1094
SEGMENTED ATTRIBUTE FRAGMENT 4
1096

FIG. 10

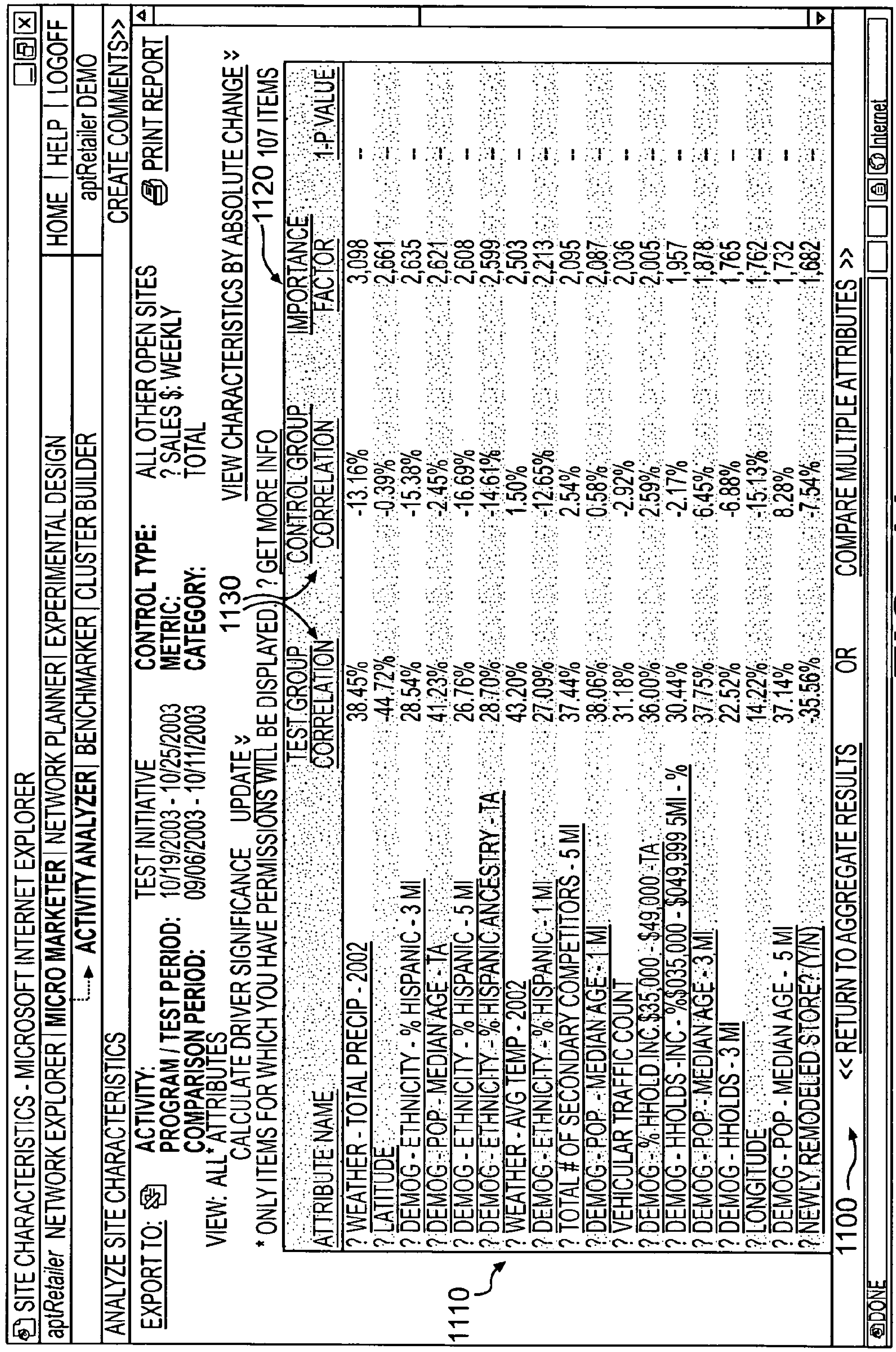

SITE CHARACTERISTICS - MICROSOFT INTERNET EXPLORER
aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
ANALYZE SITE CHARACTERISTICS
CREATE COMMENTS>>
EXPORT TO:
ACTIVITY: TEST INITIATIVE
PROGRAM / TEST PERIOD: 10/19/2003 - 10/25/2003
COMPARISON PERIOD: 09/06/2003 - 10/11/2003
CONTROL TYPE: ALL OTHER OPEN SITES
METRIC: ? SALES $: WEEKLY
CATEGORY: TOTAL
PRINT REPORT
VIEW: ALL* ATTRIBUTES
CALCULATE DRIVER SIGNIFICANCE UPDATE »
VIEW CHARACTERISTICS BY ABSOLUTE CHANGE »
* ONLY ITEMS FOR WHICH YOU HAVE PERMISSIONS WILL BE DISPLAYED
? GET MORE INFO
1130
1120 107 ITEMS
ATTRIBUTE NAME
TEST GROUP CORRELATION
CONTROL GROUP CORRELATION
IMPORTANCE FACTOR
1-P VALUE
? WEATHER - TOTAL PRECIP - 2002 38.45% -13.16% 3,098
? LATITUDE -44.72% -0.39% 2,661
? DEMOG - ETHNICITY - % HISPANIC - 3 MI 28.54% -15.38% 2,635
? DEMOG - POP - MEDIAN AGE - TA 41.23% -2.45% 2,621
? DEMOG - ETHNICITY - % HISPANIC - 5 MI 26.76% -16.69% 2,608
? DEMOG - ETHNICITY - % HISPANIC ANCESTRY - TA 28.70% -14.61% 2,599
? WEATHER - AVG TEMP - 2002 43.20% 1.50% 2,503
? DEMOG - ETHNICITY - % HISPANIC - 1 MI 27.09% -12.65% 2,213
? TOTAL # OF SECONDARY COMPETITORS - 5 MI 37.44% 2.54% 2,095
? DEMOG - POP - MEDIAN AGE - 1 MI 38.06% 0.58% 2,087
? VEHICULAR TRAFFIC COUNT 31.18% -2.92% 2,036
? DEMOG - % HHOLD INC $35,000 - $49,000 - TA 36.00% 2.59% 2,005
? DEMOG - HHOLDS - INC - %$035,000 - $049,999 5MI - % 30.44% -2.17% 1,957
? DEMOG - POP - MEDIAN AGE - 3 MI 37.75% 6.45% 1,878
? DEMOG - HHOLDS - 3 MI 22.52% -6.88% 1,765
? LONGITUDE 14.22% -15.13% 1,762
? DEMOG - POP - MEDIAN AGE - 5 MI 37.14% 8.28% 1,732
? NEWLY REMODELED STORE? (Y/N) -35.56% -7.54% 1,682
1110
1100
<< RETURN TO AGGREGATE RESULTS OR COMPARE MULTIPLE ATTRIBUTES >>
DONE
Internet

FIG. 11

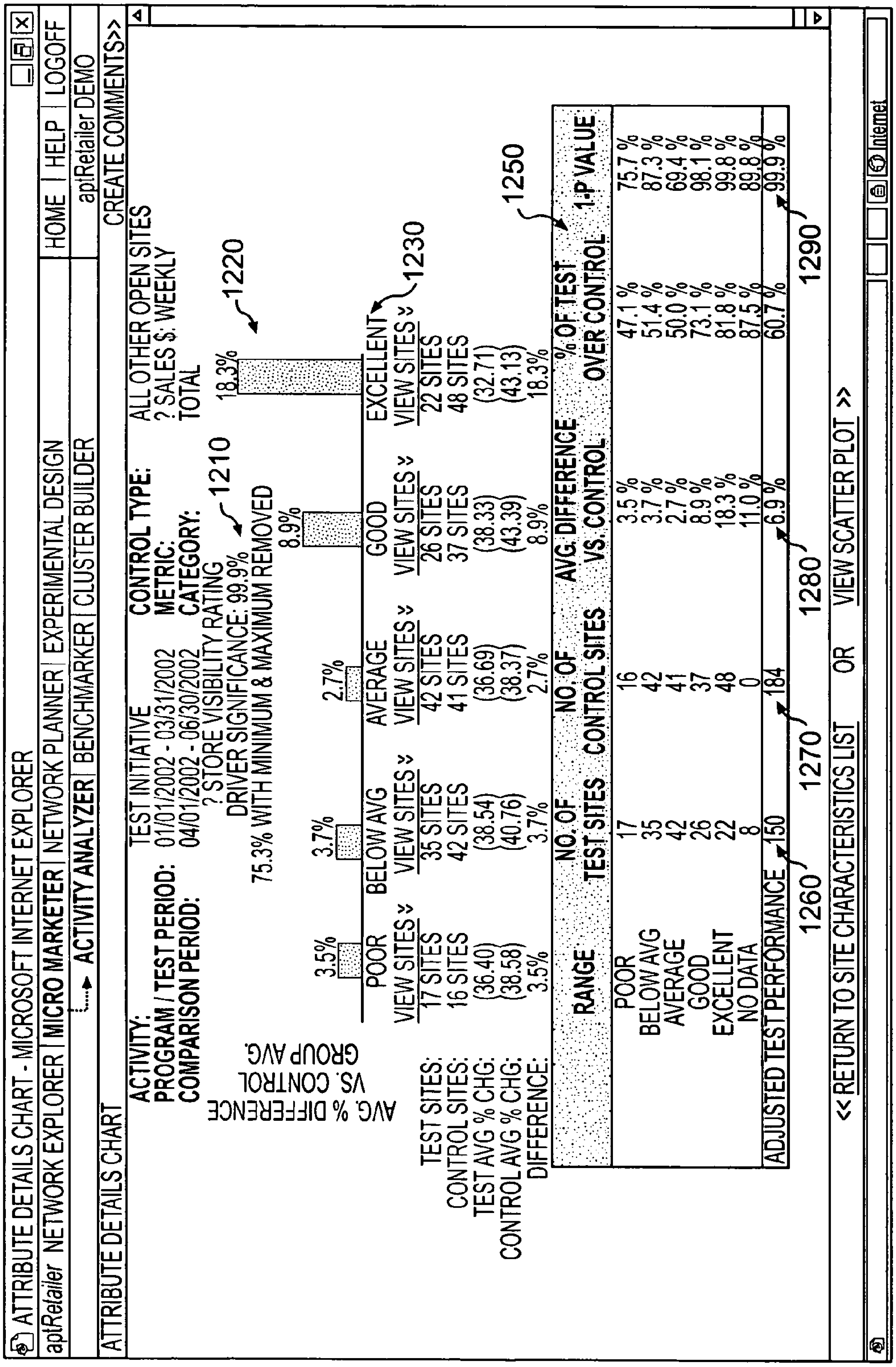

ATTRIBUTE DETAILS CHART - MICROSOFT INTERNET EXPLORER
aptRetailer NETWORK EXPLORER | MICRO MARKETER | NETWORK PLANNER | EXPERIMENTAL DESIGN
HOME | HELP | LOGOFF
ACTIVITY ANALYZER | BENCHMARKER | CLUSTER BUILDER
aptRetailer DEMO
ATTRIBUTE DETAILS CHART
CREATE COMMENTS>>
ACTIVITY: TEST INITIATIVE
PROGRAM / TEST PERIOD: 01/01/2002 - 03/31/2002
COMPARISON PERIOD: 04/01/2002 - 06/30/2002
CONTROL TYPE: ALL OTHER OPEN SITES
METRIC: ? SALES $: WEEKLY
CATEGORY: TOTAL
? STORE VISIBILITY RATING
DRIVER SIGNIFICANCE: 99.9%
75.3% WITH MINIMUM & MAXIMUM REMOVED
AVG. % DIFFERENCE VS. CONTROL GROUP AVG.
3.5%
3.7%
2.7%
8.9%
18.3%
1210
1220
1230
POOR
BELOW AVG
AVERAGE
GOOD
EXCELLENT
VIEW SITES »
TEST SITES: 17 SITES 35 SITES 42 SITES 26 SITES 22 SITES
CONTROL SITES: 16 SITES 42 SITES 41 SITES 37 SITES 48 SITES
TEST AVG % CHG: (36.40) (38.54) (36.69) (38.33) (32.71)
CONTROL AVG % CHG: (38.58) (40.76) (38.37) (43.39) (43.13)
DIFFERENCE: 3.5% 3.7% 2.7% 8.9% 18.3%
1250
RANGE | NO. OF TEST SITES | NO. OF CONTROL SITES | AVG. DIFFERENCE VS. CONTROL | % OF TEST OVER CONTROL | 1-P VALUE
POOR | 17 | 16 | 3.5 % | 47.1 % | 75.7 %
BELOW AVG | 35 | 42 | 3.7 % | 51.4 % | 87.3 %
AVERAGE | 42 | 41 | 2.7 % | 50.0 % | 69.4 %
GOOD | 26 | 37 | 8.9 % | 73.1 % | 98.1 %
EXCELLENT | 22 | 48 | 18.3 % | 81.8 % | 99.8 %
NO DATA | 8 | 0 | 11.0 % | 87.5 % | 89.8 %
ADJUSTED TEST PERFORMANCE | 150 | 184 | 6.9 % | 60.7 % | 99.9 %
1260
1270
1280
1290
<< RETURN TO SITE CHARACTERISTICS LIST OR VIEW SCATTER PLOT >>
Internet

FIG. 12

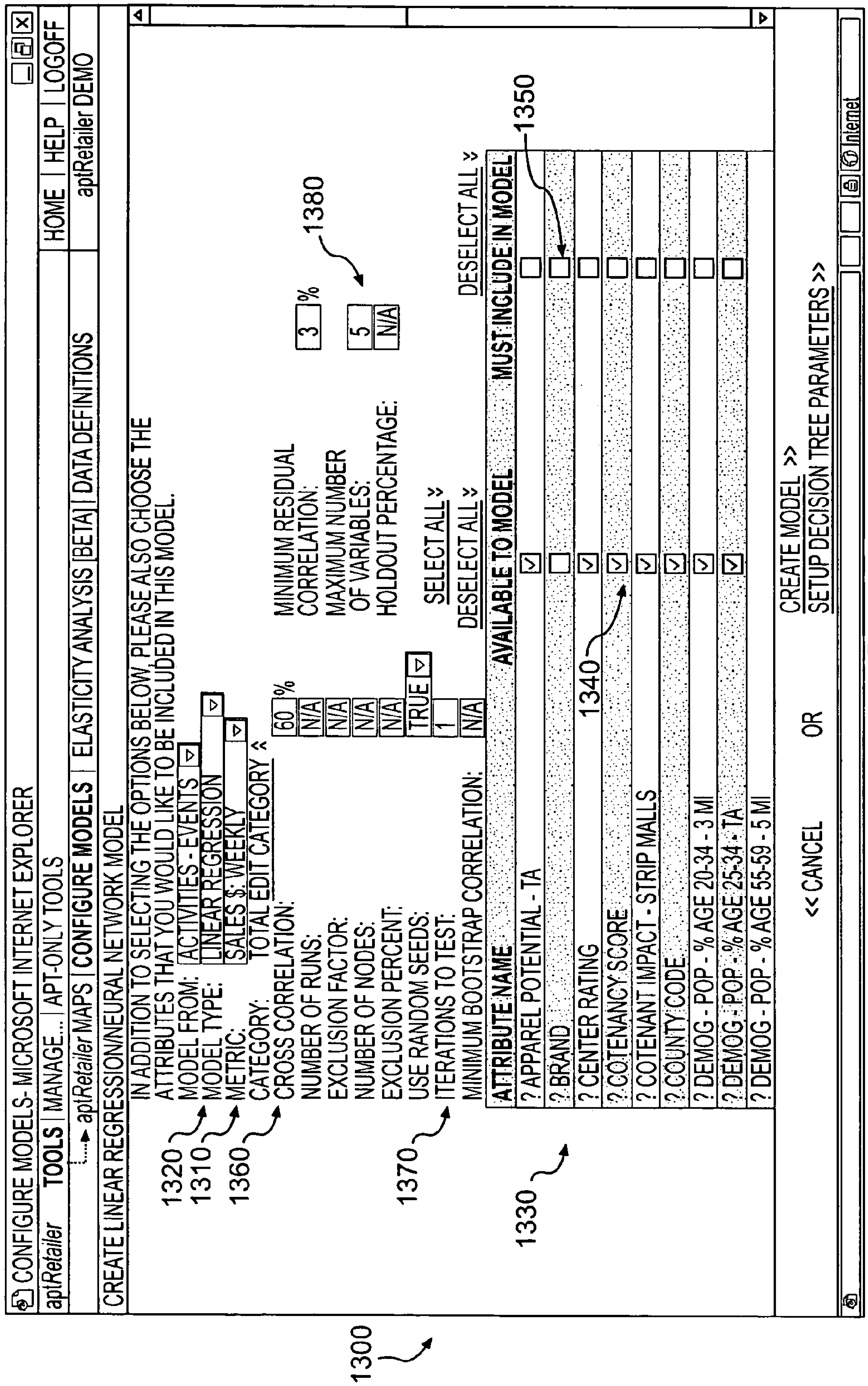

CONFIGURE MODELS- MICROSOFT INTERNET EXPLORER
aptRetailer TOOLS | MANAGE... | APT-ONLY TOOLS
HOME | HELP | LOGOFF
aptRetailer MAPS | CONFIGURE MODELS | ELASTICITY ANALYSIS [BETA] | DATA DEFINITIONS
aptRetailer DEMO
CREATE LINEAR REGRESSION/NEURAL NETWORK MODEL
IN ADDITION TO SELECTING THE OPTIONS BELOW, PLEASE ALSO CHOOSE THE ATTRIBUTES THAT YOU WOULD LIKE TO BE INCLUDED IN THIS MODEL.
MODEL FROM: ACTIVITIES - EVENTS
MODEL TYPE: LINEAR REGRESSION
METRIC: SALES $: WEEKLY
CATEGORY: TOTAL EDIT CATEGORY
CROSS CORRELATION: 60 %
NUMBER OF RUNS: N/A
EXCLUSION FACTOR: N/A
NUMBER OF NODES: N/A
EXCLUSION PERCENT: N/A
USE RANDOM SEEDS: TRUE
ITERATIONS TO TEST: 1
MINIMUM BOOTSTRAP CORRELATION: N/A
MINIMUM RESIDUAL CORRELATION: 3 %
MAXIMUM NUMBER OF VARIABLES: 5
HOLDOUT PERCENTAGE: N/A
SELECT ALL
DESELECT ALL
DESELECT ALL
ATTRIBUTE NAME
AVAILABLE TO MODEL
MUST INCLUDE IN MODEL
? APPAREL POTENTIAL - TA
? BRAND
? CENTER RATING
? COTENANCY SCORE
? COTENANT IMPACT - STRIP MALLS
? COUNTY CODE
? DEMOG - POP - % AGE 20-34 - 3 MI
? DEMOG - POP - % AGE 25-34 - TA
? DEMOG - POP - % AGE 55-59 - 5 MI
<< CANCEL
OR
CREATE MODEL >>
SETUP DECISION TREE PARAMETERS >>
Internet
1300
1310
1320
1330
1340
1350
1360
1370
1380

FIG. 13

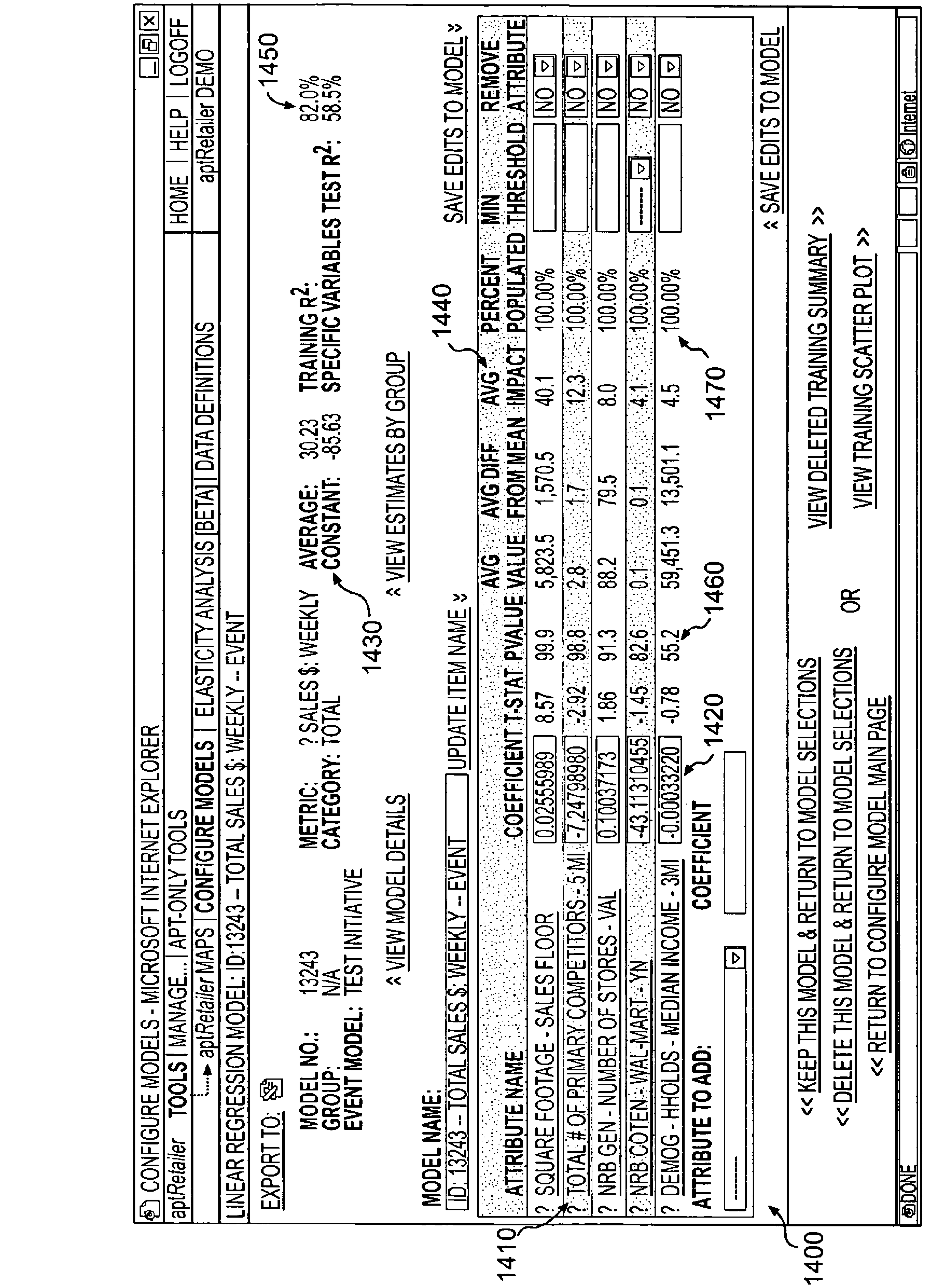

CONFIGURE MODELS - MICROSOFT INTERNET EXPLORER
aptRetailer TOOLS | MANAGE... | APT-ONLY TOOLS
HOME | HELP | LOGOFF
aptRetailer MAPS | CONFIGURE MODELS | ELASTICITY ANALYSIS [BETA] | DATA DEFINITIONS
aptRetailer DEMO
LINEAR REGRESSION MODEL: ID:13243 -- TOTAL SALES $: WEEKLY -- EVENT
EXPORT TO:
MODEL NO.: 13243
GROUP: N/A
EVENT MODEL: TEST INITIATIVE
METRIC: ? SALES $: WEEKLY
CATEGORY: TOTAL
AVERAGE: 30.23
CONSTANT: -85.63
TRAINING R2: 82.0%
SPECIFIC VARIABLES TEST R2: 58.5%
^ VIEW MODEL DETAILS
^ VIEW ESTIMATES BY GROUP
MODEL NAME:
ID: 13243 -- TOTAL SALES $: WEEKLY -- EVENT
UPDATE ITEM NAME »
SAVE EDITS TO MODEL »
ATTRIBUTE NAME
COEFFICIENT
T-STAT
PVALUE
AVG VALUE
AVG DIFF FROM MEAN
AVG IMPACT
PERCENT POPULATED
MIN THRESHOLD
REMOVE ATTRIBUTE
? SQUARE FOOTAGE - SALES FLOOR 0.02555989 8.57 99.9 5,823.5 1,570.5 40.1 100.00% NO
? TOTAL # OF PRIMARY COMPETITORS - 5 MI -7.24798980 -2.92 98.8 2.8 1.7 -12.3 100.00% NO
? NRB GEN - NUMBER OF STORES - VAL 0.10037173 1.86 91.3 88.2 79.5 8.0 100.00% NO
? NRB COTEN - WAL-MART - YN -43.11310455 -1.45 82.6 0.1 0.1 -4.1 100.00% NO
? DEMOG - HHOLDS - MEDIAN INCOME - 3MI -0.00033220 -0.78 55.2 59,451.3 13,501.1 4.5 100.00% NO
ATTRIBUTE TO ADD:
COEFFICIENT
« SAVE EDITS TO MODEL
<< KEEP THIS MODEL & RETURN TO MODEL SELECTIONS
<< DELETE THIS MODEL & RETURN TO MODEL SELECTIONS
OR
<< RETURN TO CONFIGURE MODEL MAIN PAGE
VIEW DELETED TRAINING SUMMARY >>
VIEW TRAINING SCATTER PLOT >>
DONE
Internet
1400
1410
1420
1430
1440
1450
1460
1470

FIG. 14

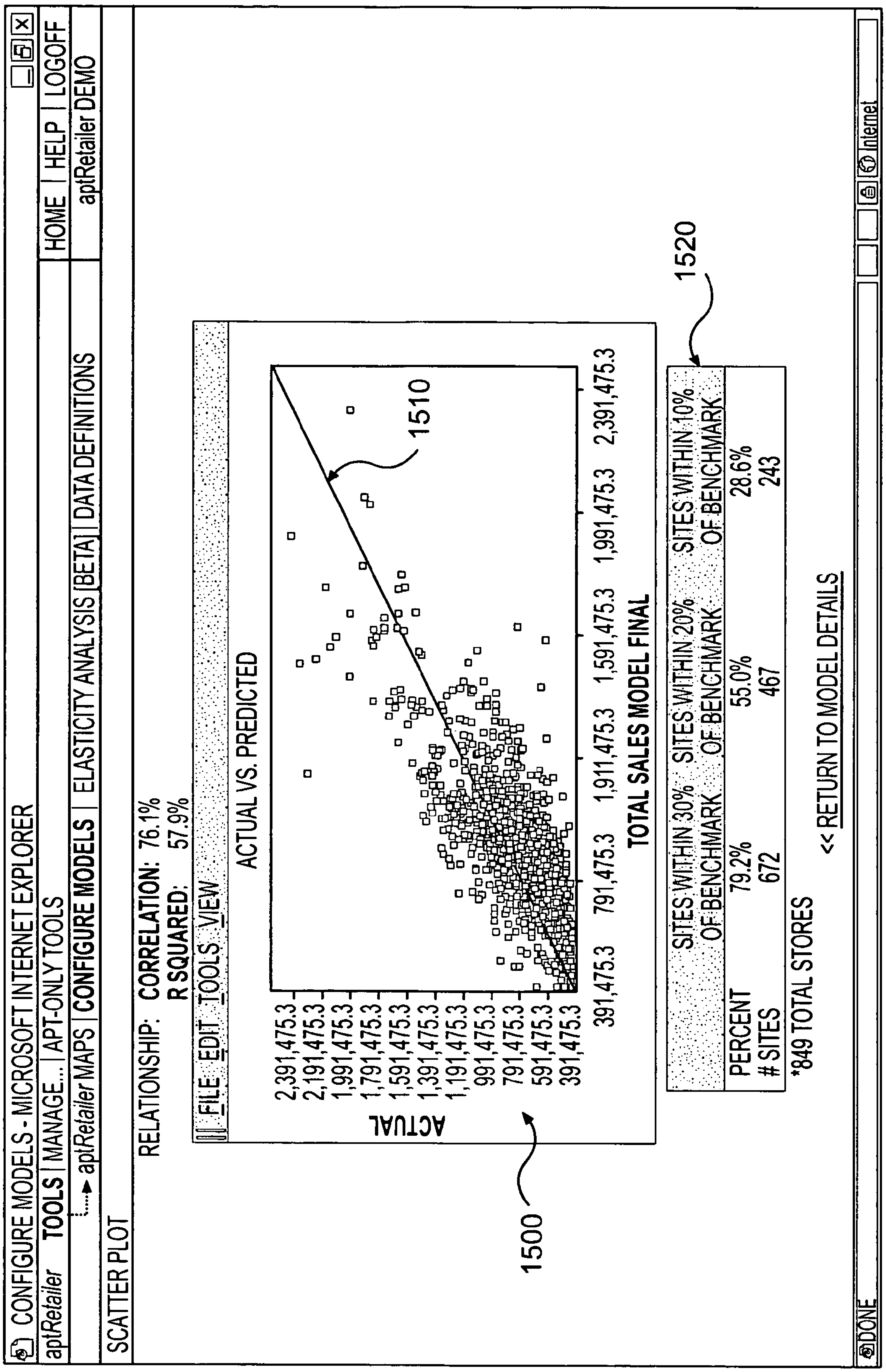
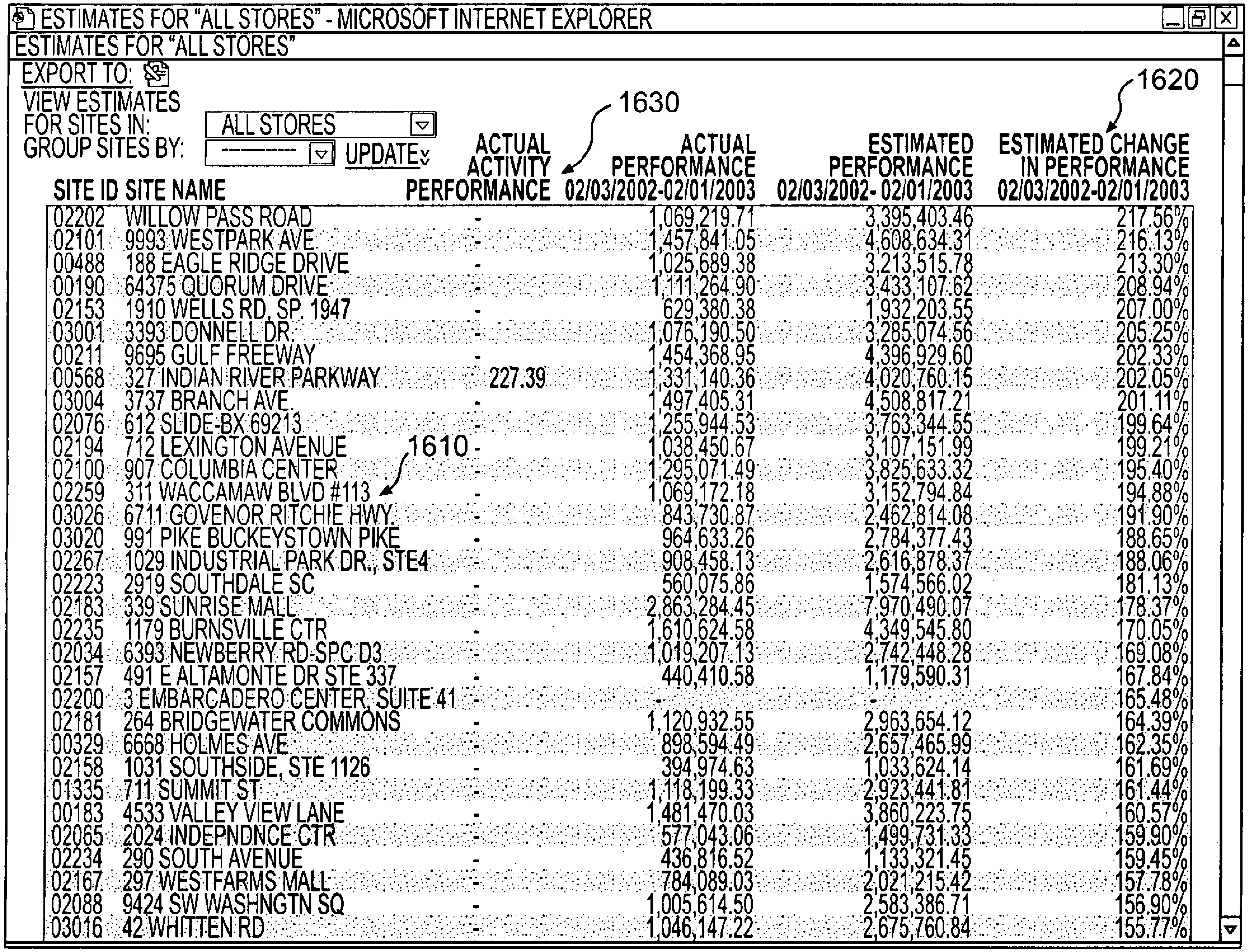
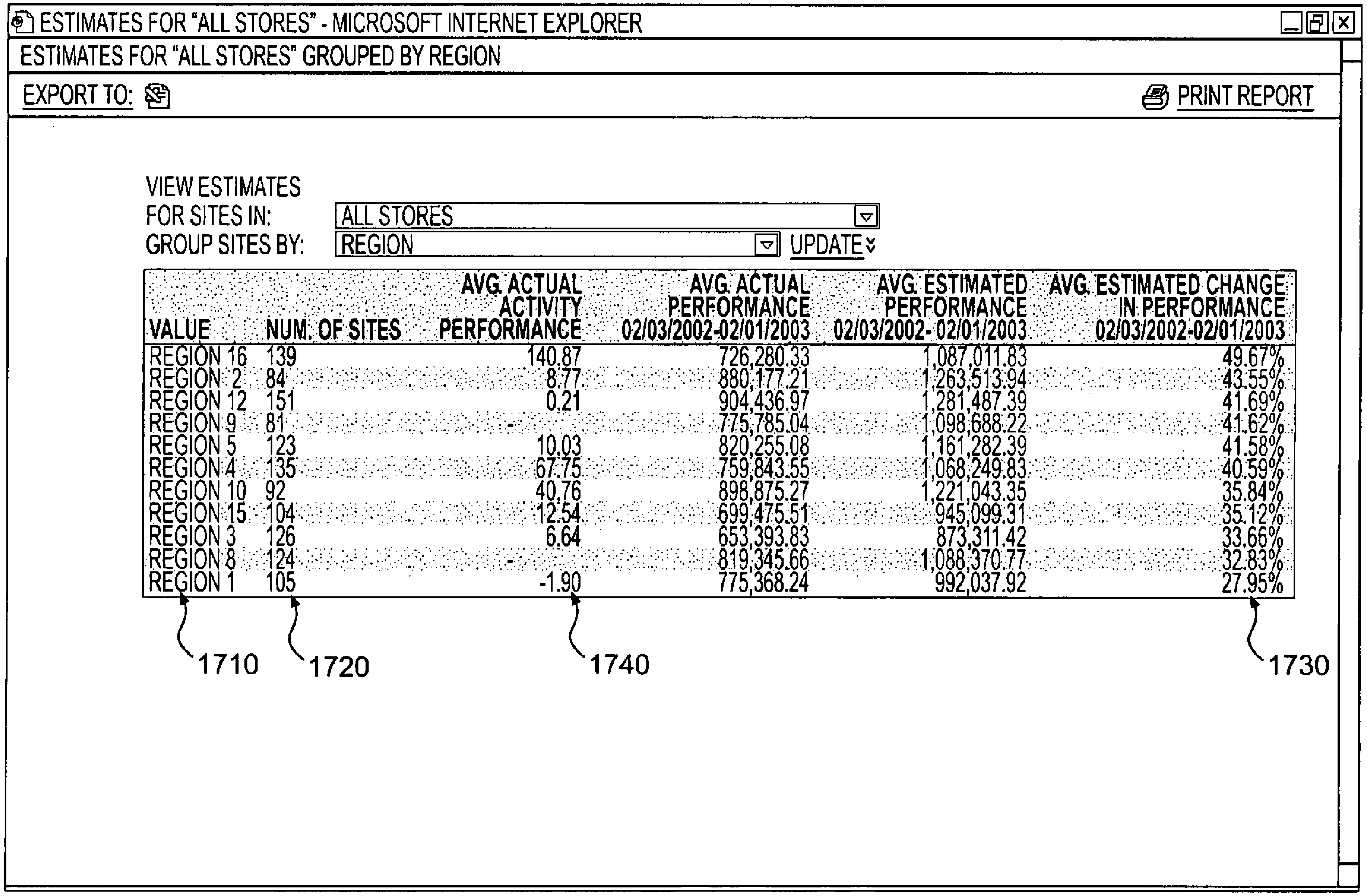

CONFIGURE MODELS - MICROSOFT INTERNET EXPLORER
aptRetailer TOOLS | MANAGE... | APT-ONLY TOOLS
HOME | HELP | LOGOFF
aptRetailer MAPS | CONFIGURE MODELS | ELASTICITY ANALYSIS [BETA] | DATA DEFINITIONS
aptRetailer DEMO
SCATTER PLOT
RELATIONSHIP: CORRELATION: 76.1%
R SQUARED: 57.9%
FILE EDIT TOOLS VIEW
ACTUAL VS. PREDICTED
ACTUAL
2,391,475.3
2,191,475.3
1,991,475.3
1,791,475.3
1,591,475.3
1,391,475.3
1,191,475.3
991,475.3
791,475.3
591,475.3
391,475.3
391,475.3 791,475.3 1,911,475.3 1,591,475.3 1,991,475.3 2,391,475.3
TOTAL SALES MODEL FINAL
1500
1510
1520
SITES WITHIN 30% OF BENCHMARK
SITES WITHIN 20% OF BENCHMARK
SITES WITHIN 10% OF BENCHMARK
PERCENT 79.2% 55.0% 28.6%
SITES 672 467 243
*849 TOTAL STORES
<< RETURN TO MODEL DETAILS
DONE
Internet

FIG. 15



SITE ID	SITE NAME	ACTUAL ACTIVITY PERFORMANCE	ACTUAL PERFORMANCE 02/03/2002-02/01/2003	ESTIMATED PERFORMANCE 02/03/2002- 02/01/2003	ESTIMATED CHANGE IN PERFORMANCE 02/03/2002-02/01/2003
02202	WILLOW PASS ROAD	-	1,069,219.71	3,395,403.46	217.56%
02101	9993 WESTPARK AVE.	-	1,457,841.05	4,608,634.31	216.13%
00488	188 EAGLE RIDGE DRIVE	-	1,025,689.38	3,213,515.78	213.30%
00190	64375 QUORUM DRIVE	-	1,111,264.90	3,433,107.62	208.94%
02153	1910 WELLS RD, SP. 1947	-	629,380.38	1,932,203.55	207.00%
03001	3393 DONNELL DR.	-	1,076,190.50	3,285,074.56	205.25%
00211	9695 GULF FREEWAY	-	1,454,368.95	4,396,929.60	202.33%
00568	327 INDIAN RIVER PARKWAY	227.39	1,331,140.36	4,020,760.15	202.05%
03004	3737 BRANCH AVE.	-	1,497,405.31	4,508,817.21	201.11%
02076	612 SLIDE-BX 69213	-	1,255,944.53	3,763,344.55	199.64%
02194	712 LEXINGTON AVENUE	-	1,038,450.67	3,107,151.99	199.21%
02100	907 COLUMBIA CENTER	-	1,295,071.49	3,825,633.32	195.40%
02259	311 WACCAMAW BLVD #113	-	1,069,172.18	3,152,794.84	194.88%
03026	6711 GOVENOR RITCHIE HWY.	-	843,730.87	2,462,814.08	191.90%
03020	991 PIKE BUCKEYSTOWN PIKE	-	964,633.26	2,784,377.43	188.65%
02267	1029 INDUSTRIAL PARK DR., STE4	-	908,458.13	2,616,878.37	188.06%
02223	2919 SOUTHDALE SC	-	560,075.86	1,574,566.02	181.13%
02183	339 SUNRISE MALL	-	2,863,284.45	7,970,490.07	178.37%
02235	1179 BURNSVILLE CTR	-	1,610,624.58	4,349,545.80	170.05%
02034	6393 NEWBERRY RD-SPC D3	-	1,019,207.13	2,742,448.28	169.08%
02157	491 E ALTAMONTE DR STE 337	-	440,410.58	1,179,590.31	167.84%
02200	3 EMBARCADERO CENTER, SUITE 41	-	-	-	165.48%
02181	264 BRIDGEWATER COMMONS	-	1,120,932.55	2,963,654.12	164.39%
00329	6668 HOLMES AVE	-	898,594.49	2,657,465.99	162.35%
02158	1031 SOUTHSIDE, STE 1126	-	394,974.63	1,033,624.14	161.69%
01335	711 SUMMIT ST	-	1,118,199.33	2,923,441.81	161.44%
00183	4533 VALLEY VIEW LANE	-	1,481,470.03	3,860,223.75	160.57%
02065	2024 INDEPNDNCE CTR	-	577,043.06	1,499,731.33	159.90%
02234	290 SOUTH AVENUE	-	436,816.52	1,133,321.45	159.45%
02167	297 WESTFARMS MALL	-	784,089.03	2,021,215.42	157.78%
02088	9424 SW WASHNGTN SQ	-	1,005,614.50	2,583,386.71	156.90%
03016	42 WHITTEN RD	-	1,046,147.22	2,675,760.84	155.77%

FIG. 16



VALUE	NUM. OF SITES	AVG. ACTUAL ACTIVITY PERFORMANCE	AVG. ACTUAL PERFORMANCE 02/03/2002-02/01/2003	AVG. ESTIMATED PERFORMANCE 02/03/2002- 02/01/2003	AVG. ESTIMATED CHANGE IN PERFORMANCE 02/03/2002-02/01/2003
REGION 16	139	140.87	726,280.33	1,087,011.83	49.67%
REGION 2	84	8.77	880,177.21	1,263,513.94	43.55%
REGION 12	151	0.21	904,436.97	1,281,487.39	41.69%
REGION 9	81	-	775,785.04	1,098,688.22	41.62%
REGION 5	123	10.03	820,255.08	1,161,282.39	41.58%
REGION 4	135	67.75	759,843.55	1,068,249.83	40.59%
REGION 10	92	40.76	898,875.27	1,221,043.35	35.84%
REGION 15	104	12.54	699,475.51	945,099.31	35.12%
REGION 3	126	6.64	653,393.83	873,311.42	33.66%
REGION 8	124	-	819,345.66	1,088,370.77	32.83%
REGION 1	105	-1.90	775,368.24	992,037.92	27.95%

FIG. 17

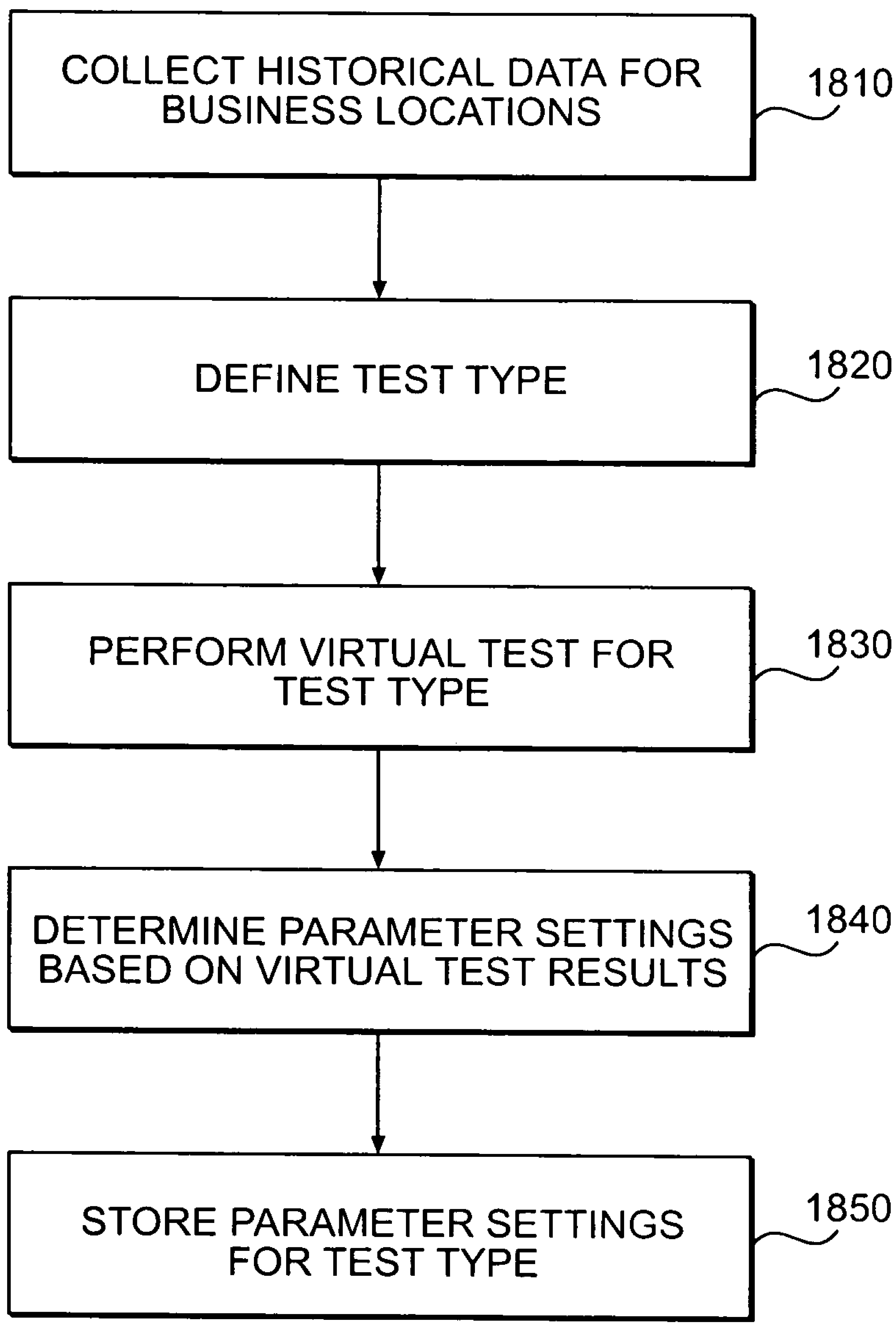

COLLECT HISTORICAL DATA FOR BUSINESS LOCATIONS
1810
DEFINE TEST TYPE
1820
PERFORM VIRTUAL TEST FOR TEST TYPE
1830
DETERMINE PARAMETER SETTINGS BASED ON VIRTUAL TEST RESULTS
1840
STORE PARAMETER SETTINGS FOR TEST TYPE
1850

FIG. 18

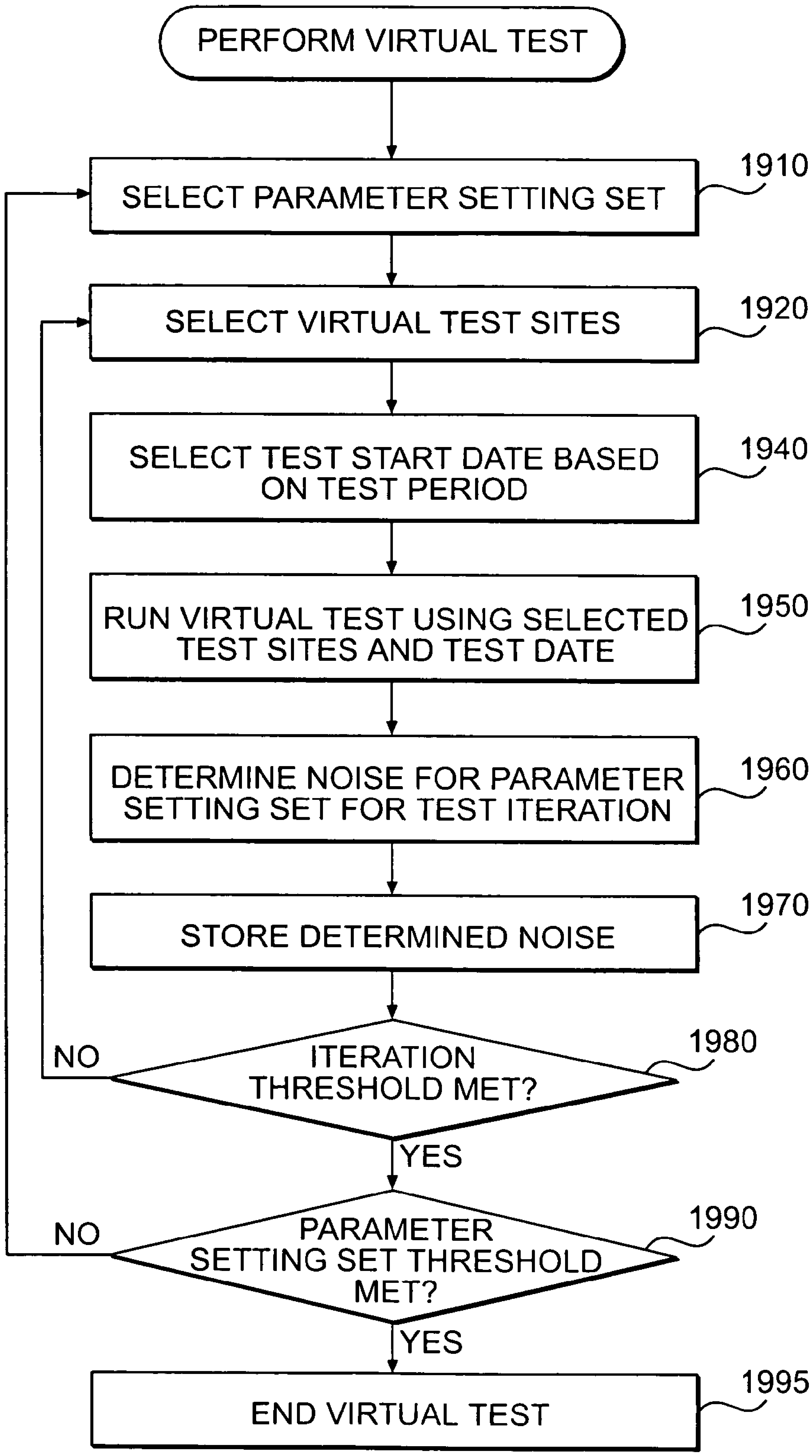

PERFORM VIRTUAL TEST
SELECT PARAMETER SETTING SET
1910
SELECT VIRTUAL TEST SITES
1920
SELECT TEST START DATE BASED ON TEST PERIOD
1940
RUN VIRTUAL TEST USING SELECTED TEST SITES AND TEST DATE
1950
DETERMINE NOISE FOR PARAMETER SETTING SET FOR TEST ITERATION
1960
STORE DETERMINED NOISE
1970
NO
ITERATION THRESHOLD MET?
1980
YES
NO
PARAMETER SETTING SET THRESHOLD MET?
1990
YES
END VIRTUAL TEST
1995

FIG. 19

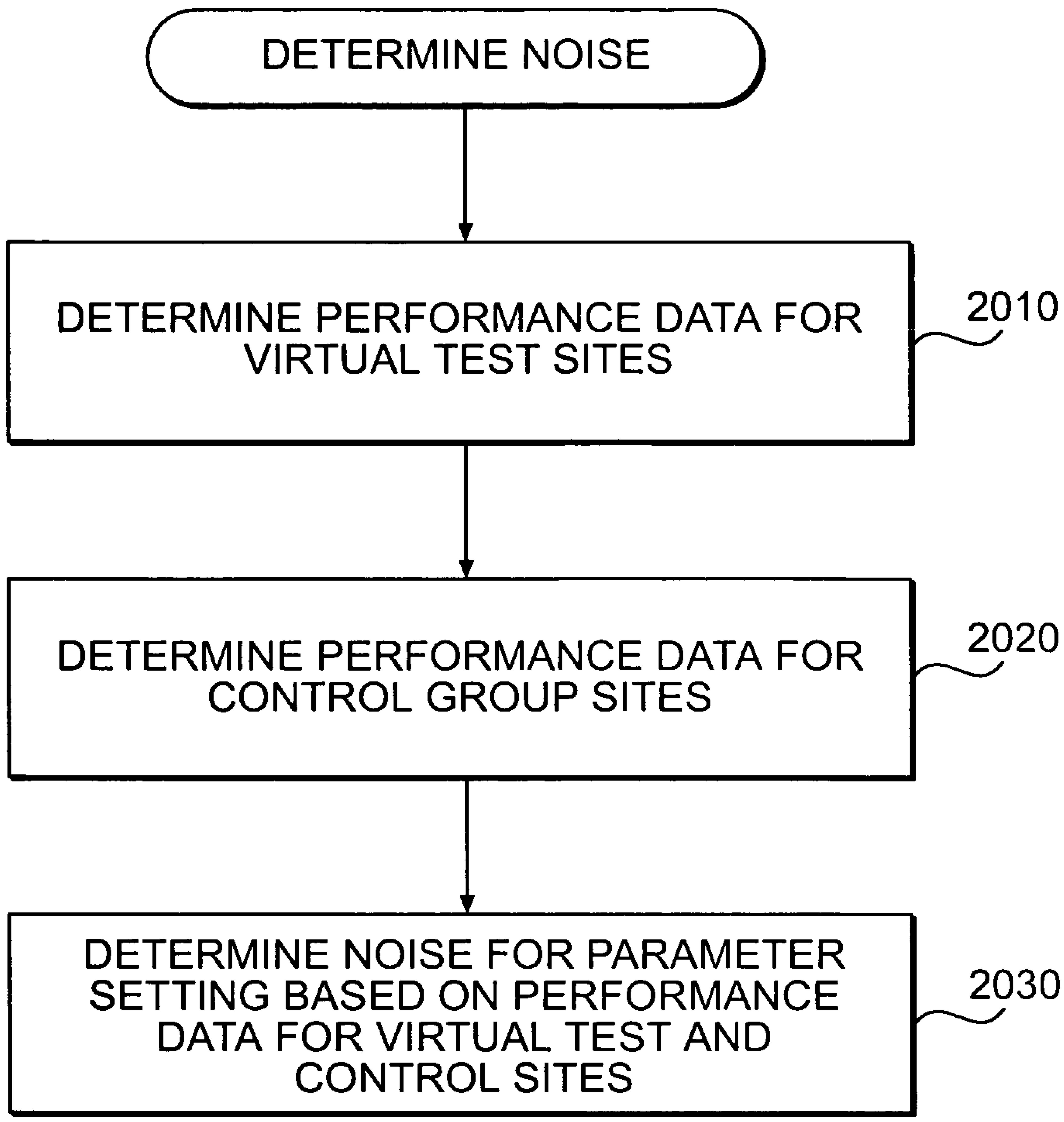

DETERMINE NOISE
DETERMINE PERFORMANCE DATA FOR VIRTUAL TEST SITES
2010
DETERMINE PERFORMANCE DATA FOR CONTROL GROUP SITES
2020
DETERMINE NOISE FOR PARAMETER SETTING BASED ON PERFORMANCE DATA FOR VIRTUAL TEST AND CONTROL SITES
2030

FIG. 20

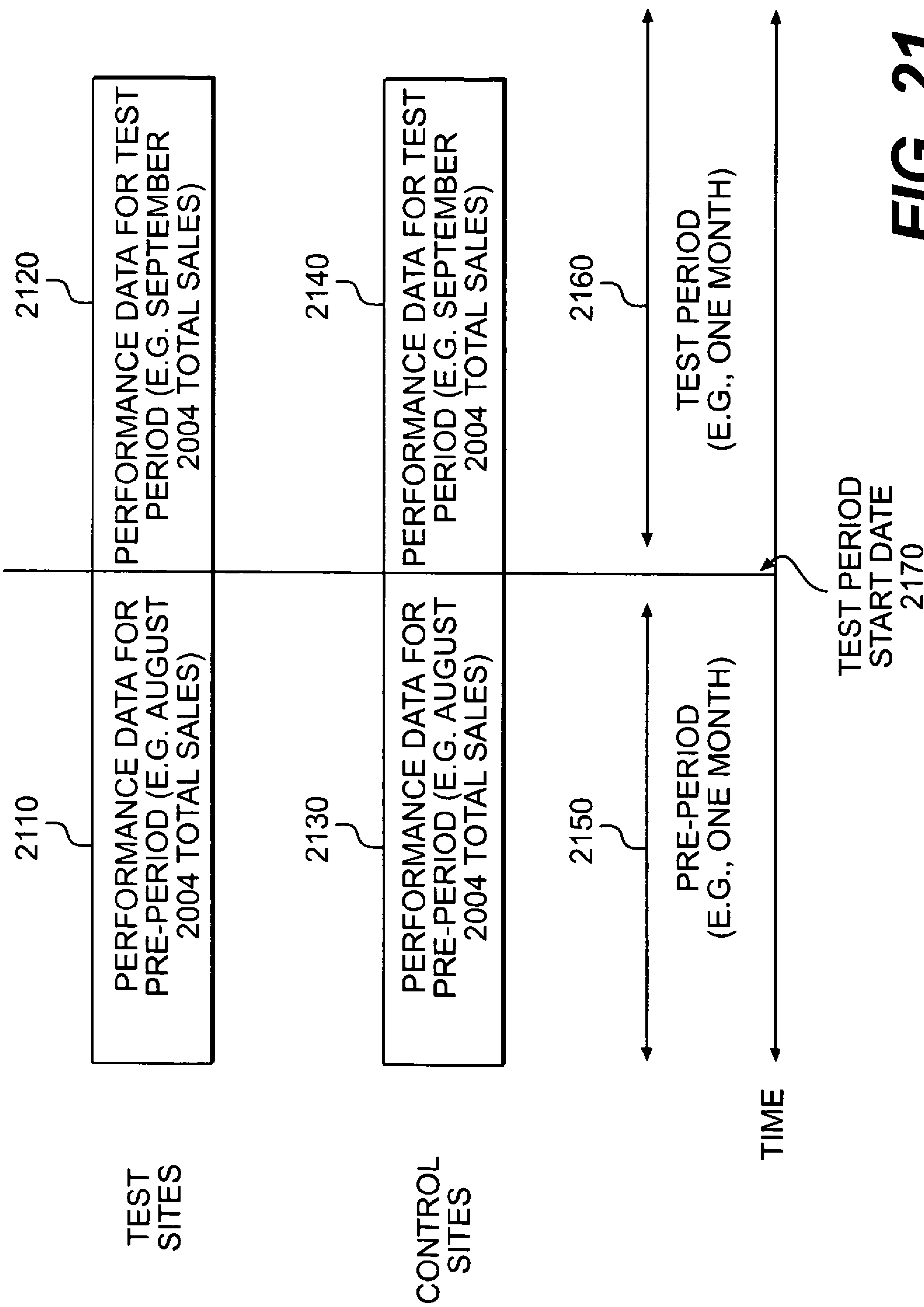

TEST SITES
CONTROL SITES
TIME
2110
PERFORMANCE DATA FOR PRE-PERIOD (E.G. AUGUST 2004 TOTAL SALES)
2120
PERFORMANCE DATA FOR TEST PERIOD (E.G. SEPTEMBER 2004 TOTAL SALES)
2130
PERFORMANCE DATA FOR PRE-PERIOD (E.G. AUGUST 2004 TOTAL SALES)
2140
PERFORMANCE DATA FOR TEST PERIOD (E.G. SEPTEMBER 2004 TOTAL SALES)
2150
PRE-PERIOD (E.G., ONE MONTH)
2160
TEST PERIOD (E.G., ONE MONTH)
TEST PERIOD START DATE 2170

FIG. 21

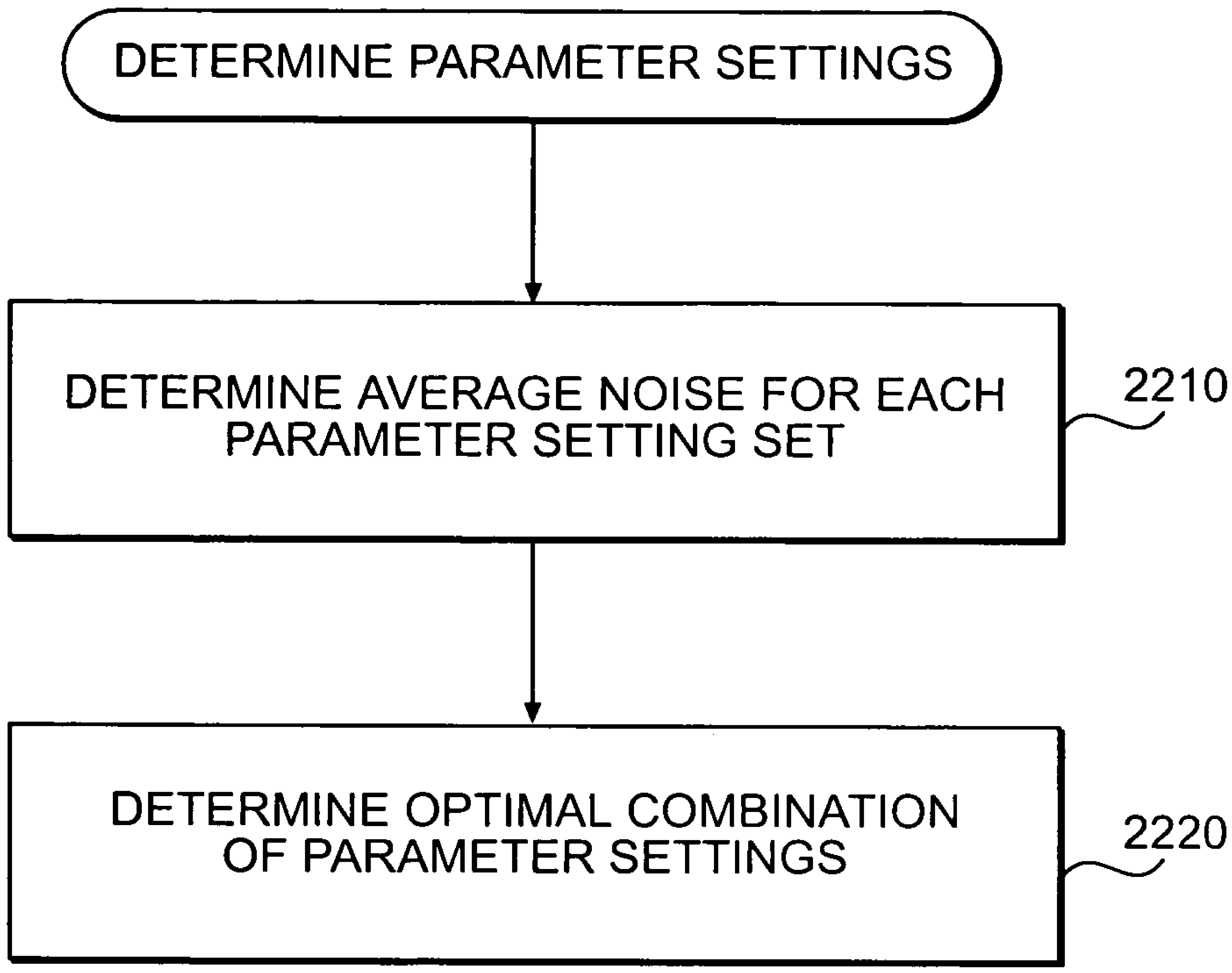

DETERMINE PARAMETER SETTINGS
DETERMINE AVERAGE NOISE FOR EACH PARAMETER SETTING SET
2210
DETERMINE OPTIMAL COMBINATION OF PARAMETER SETTINGS
2220

FIG. 22

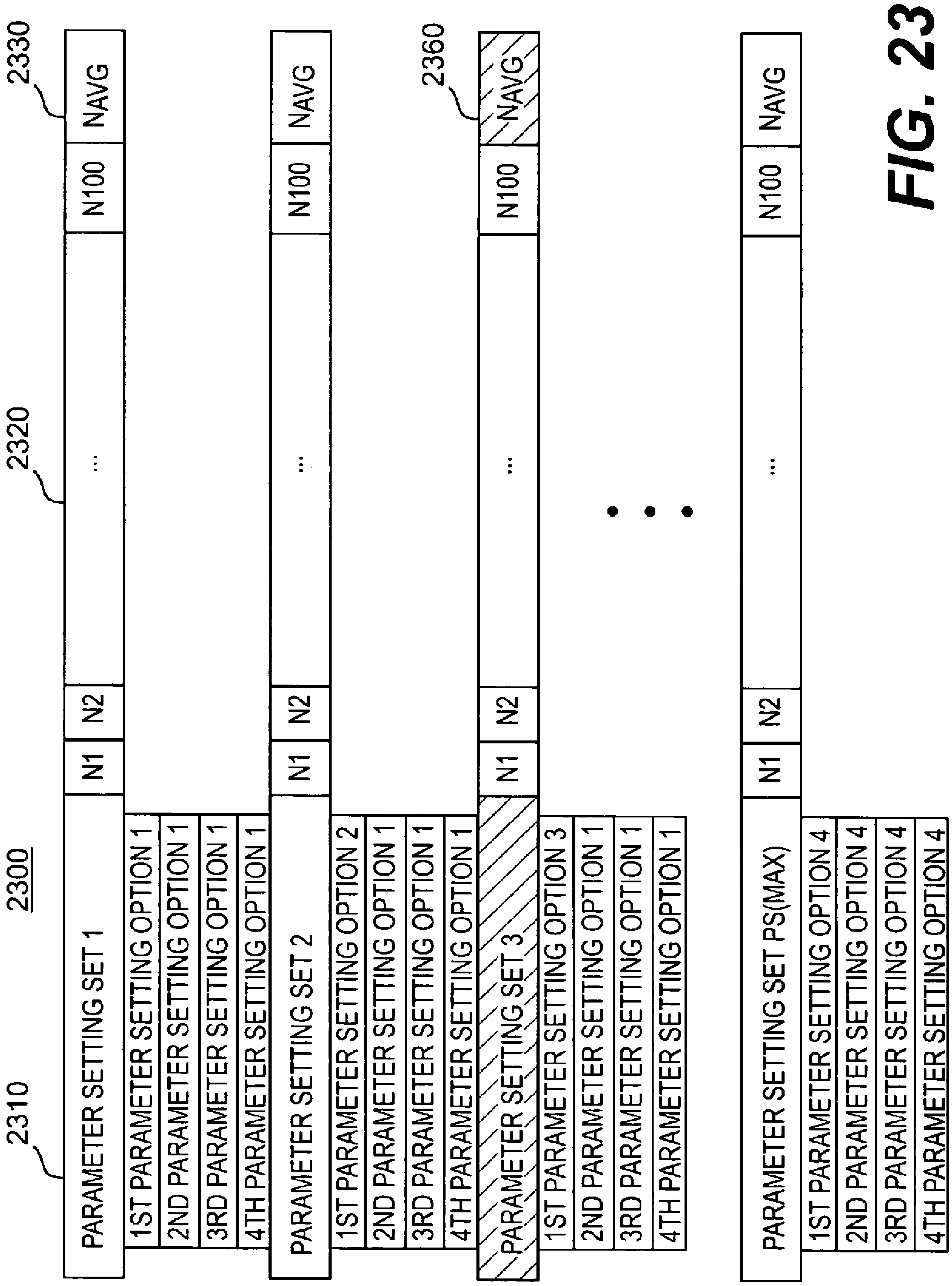

2300
2310
2320
2330
2360
PARAMETER SETTING SET 1
1ST PARAMETER SETTING OPTION 1
2ND PARAMETER SETTING OPTION 1
3RD PARAMETER SETTING OPTION 1
4TH PARAMETER SETTING OPTION 1
N1
N2
...
N100
NAVG
PARAMETER SETTING SET 2
1ST PARAMETER SETTING OPTION 2
2ND PARAMETER SETTING OPTION 1
3RD PARAMETER SETTING OPTION 1
4TH PARAMETER SETTING OPTION 1
N1
N2
...
N100
NAVG
PARAMETER SETTING SET 3
1ST PARAMETER SETTING OPTION 3
2ND PARAMETER SETTING OPTION 1
3RD PARAMETER SETTING OPTION 1
4TH PARAMETER SETTING OPTION 1
N1
N2
...
N100
NAVG
PARAMETER SETTING SET PS(MAX)
1ST PARAMETER SETTING OPTION 4
2ND PARAMETER SETTING OPTION 4
3RD PARAMETER SETTING OPTION 4
4TH PARAMETER SETTING OPTION 4
N1
N2
...
N100
NAVG

FIG. 23

2400

	2450			2460		2470
2410 FIRST PARAMETER SETTING	PARAMETER SETTING OPTION 1	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 2	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 3	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 4	N1	N2	...	N100	NAVG
2420 SECOND PARAMETER SETTING	PARAMETER SETTING OPTION 1	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 2	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 3	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 4	N1	N2	...	N100	NAVG
2430 THIRD PARAMETER SETTING	PARAMETER SETTING OPTION 1	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 2	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 3	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 4	N1	N2	...	N100	NAVG
2440 FOURTH PARAMETER SETTING	PARAMETER SETTING OPTION 1	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 2	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 3	N1	N2	...	N100	NAVG
	PARAMETER SETTING OPTION 4	N1	N2	...	N100	NAVG

FIG. 24

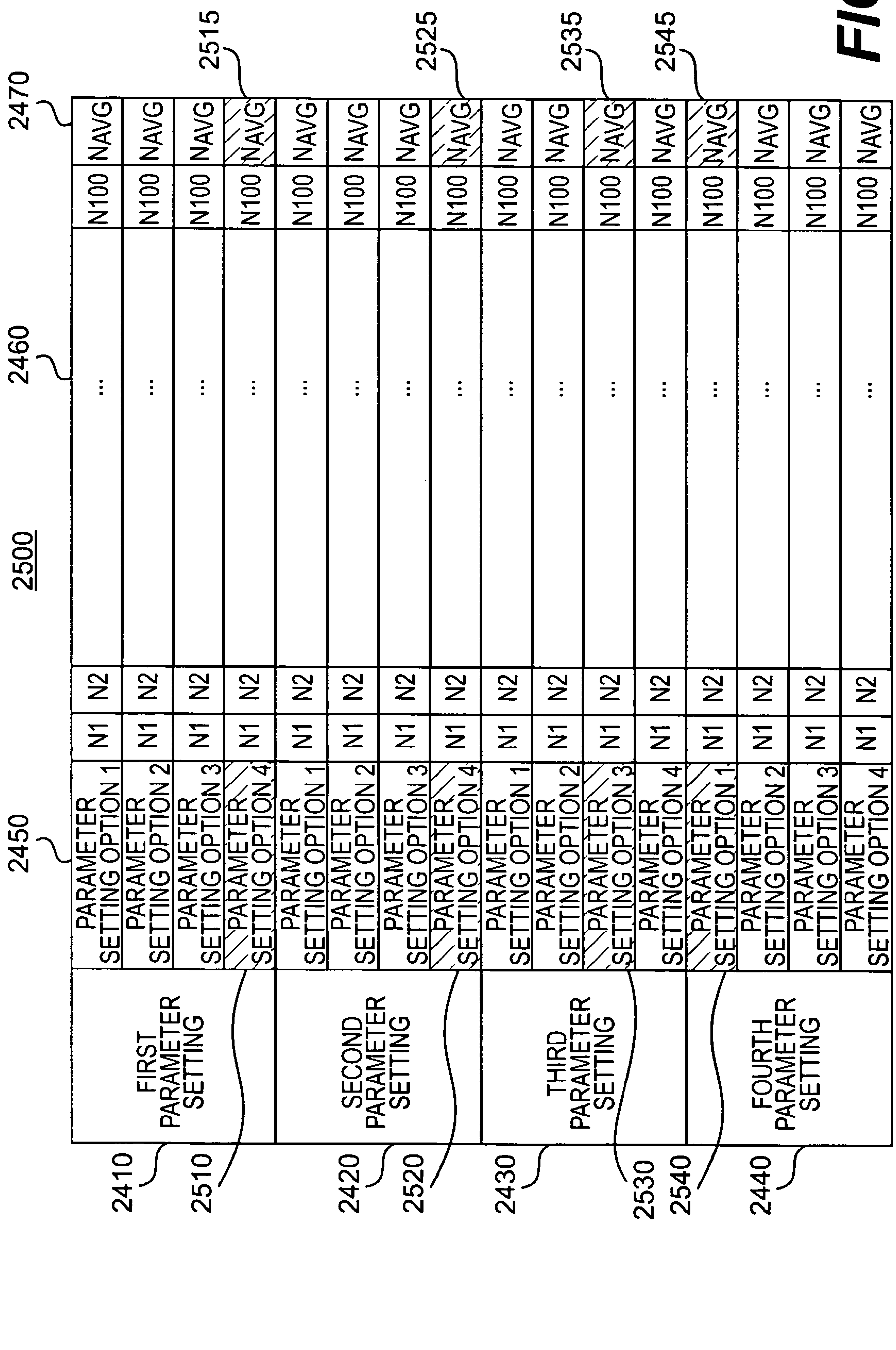

2500
2410
2420
2430
2440
2450
2460
2470
2510
2520
2530
2540
2515
2525
2535
2545
FIRST PARAMETER SETTING
SECOND PARAMETER SETTING
THIRD PARAMETER SETTING
FOURTH PARAMETER SETTING
PARAMETER SETTING OPTION 1
PARAMETER SETTING OPTION 2
PARAMETER SETTING OPTION 3
PARAMETER SETTING OPTION 4
N1
N2
...
N100
NAVG

FIG. 25

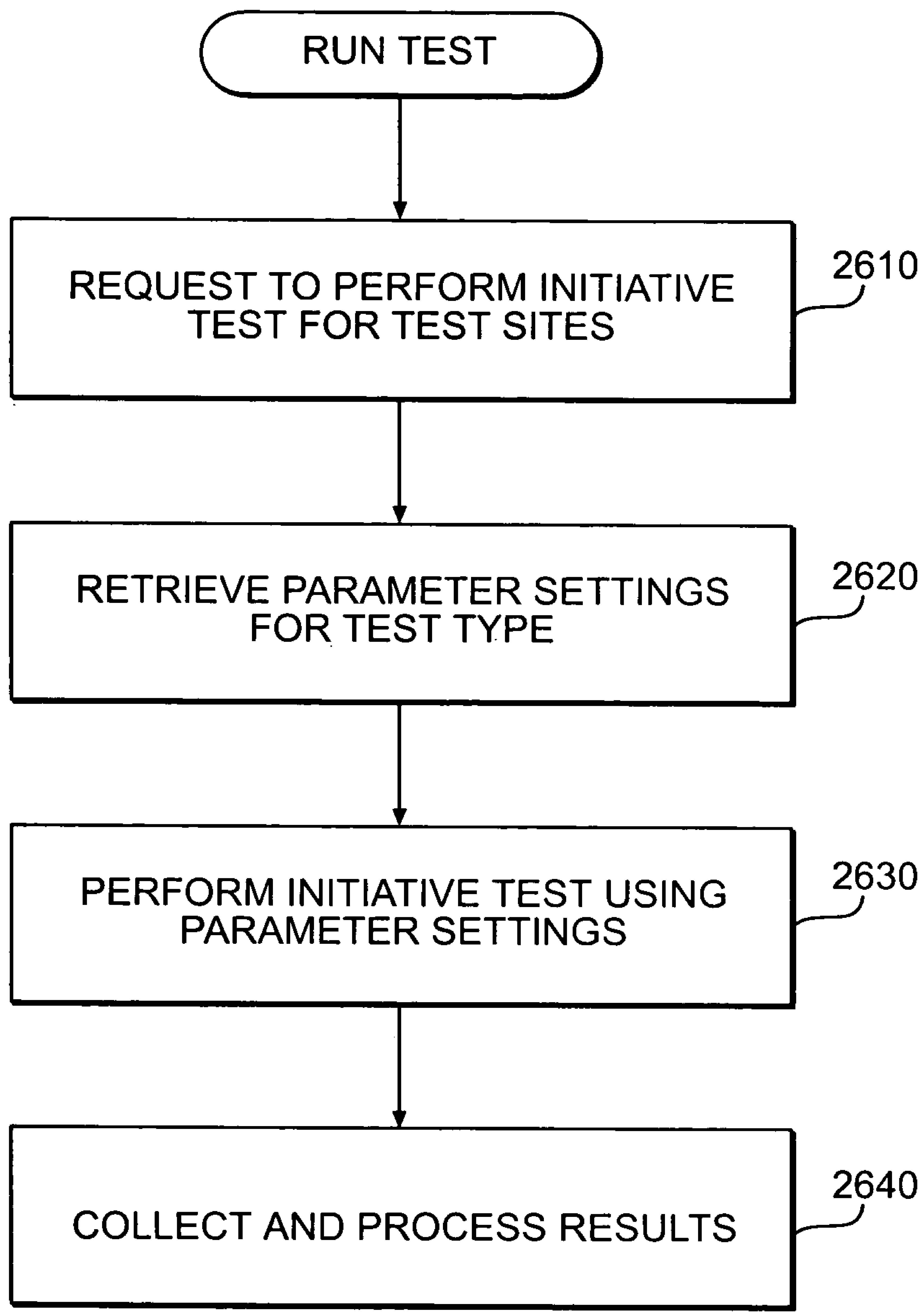

RUN TEST
REQUEST TO PERFORM INITIATIVE TEST FOR TEST SITES
2610
RETRIEVE PARAMETER SETTINGS FOR TEST TYPE
2620
PERFORM INITIATIVE TEST USING PARAMETER SETTINGS
2630
COLLECT AND PROCESS RESULTS
2640

FIG. 26

METHODS, SYSTEMS, AND ARTICLES OF MANUFACTURE FOR DETERMINING OPTIMAL PARAMETER SETTINGS FOR BUSINESS INITIATIVE TESTING MODELS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED [APPLICATION] *APPLICATIONS*

This application is a *Reissue of U.S. Pat. No. 8,571,916 (previously U.S. patent application Ser. No. 11/364,197, filed Mar. 1, 2006), which is a* continuation-in-part of U.S. patent application Ser. No. 10/767,191, entitled "Methods, Systems, and Articles of Manufacture for Analyzing Initiatives for a Business Network," [and] filed Jan. 30, 2004*,* now U.S. Pat. No. 8,010,399, which [is] *are* hereby incorporated by reference in [its] *their* entirety.

DESCRIPTION OF THE INVENTION

1. Field of the Invention

This invention relates to business initiative analysis systems, and more particularly, to methods, systems, and articles of manufacture for performing a segmented initiative analysis for initiatives implemented at selected business locations in order to identify in which other locations to implement the initiative. Further, this invention relates to methods and systems for determining optimal parameter settings for business initiative testing models.

2. Background of the Invention

For as long as retailers have been selling products and services, they have been seeking ways to increase profits. Accordingly, many retailers create new initiatives that they believe will have a positive impact on profits. These initiatives usually cover various aspects of business operations that drive profits. For example, retailers may change product prices, move products to different locations of a sales floor, change the amount of space allocated to each product, test new products, add or reduce staff, introduce new concepts (e.g., in-store kiosks), remodel older stores, and test new marketing campaigns. Retailers may test these new initiatives in selected test locations (i.e., certain stores) and subsequently determine whether to introduce the initiatives to remaining business locations based on the success of the initiatives at the selected test locations. Historically, retail management has used business instinct and/or anecdotal evidence to assess the success of the initiatives in order to make a decision whether to implement the initiatives at the rest of its business locations.

In recent years, however, some retailers have become more structured and analytical in their set up and analysis of tests. These retailers collect performance metrics, such as sales and gross profit data from the test locations and analyze the data using conventional software products, such as spreadsheet or statistical software packages. Retailers may measure the change in the performance metrics at the locations that introduced the new initiatives relative to a change in the same metrics at a control group of locations that did not implement the initiatives. In doing so, the retailers attempt to identify the impact of the initiatives on the performance metrics in order to determine whether they provide a positive return on investment. This allows these retailers can make an informed decision whether to extend the concept to remaining locations in a business network. However, the way in which the analyst at the retailer sets up this analysis will have an effect on the perceived results. For example, the analyst has to decide which of the stores that did not implement the initiative should serve as the control group and the analyst has to decide what time periods to use in measuring impact. Retailers often define one or more parameters for their analysis in a manner that seems intuitive, but lack empirical evidence that the parameters are in fact optimized for isolating the impact of an initiative. As a result, retailers may not recognize and filter inconsistent data, and therefore be less able to measure the impact of their initiatives.

Accordingly, there is a need for a system and method that automatically identifies one or more analytical parameters that filter out the most inconsistent data to maximize a retailer's ability to analyze the results of an initiative test. Using more consistent data allows retailers to better identify those initiatives to extend to certain locations that will provide the most anticipated profit gains.

SUMMARY OF THE INVENTION

Methods and systems consistent with certain aspects of the present invention identify optimum parameter settings for initiative testing models.

In one aspect of the invention, a method is provided for determining parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network. In one aspect, the method includes defining a first test type of a business initiative testing model having a set of parameter settings. Each parameter setting may include a set of one or more parameter setting options. The method may also include performing a virtual test on a set of virtual test sites based on the defined test type. Each virtual test site may reflect a selected business location in the business network. Also, the method may include determining a set of optimal parameter settings for the first test type of the business initiative testing model based on results from the virtual test. Moreover, the method may include configuring the business initiative testing model using the optimal parameter settings from the set for the first test type to test a business initiative for application in the business network.

In another aspect of the invention, a system is provided for determining parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network. In one aspect, the system may include a computer configured to define a first test type of a business initiative testing model having a set of parameter settings. Each parameter setting including a set of one or more parameter setting options. Further, the computer is configured to execute a virtual test on a set of virtual test sites based on the defined test type. Each virtual test site may reflect a selected business location in the business network. Also, the computer may determine a set of optimal parameter settings for the first test type of the business initiative testing model based on results from the virtual test. Also, the computer may configure the business initiative testing model using the optimal parameter settings from the set for the first test type to a test on a business initiative to apply to the business network.

In another aspect, a computer-readable medium is disclosed that includes instructions for, when executed by a processor, performing a method for determining parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network. In one aspect, the method includes defining a first test type of a business initiative testing model having a set of parameter settings. Each parameter setting may include a set of one or more parameter setting options. The method may also include performing a virtual test on a set of virtual test sites based on the defined test type. Each virtual test site may reflect a selected business location in the business network. Also, the method may include determining a set of optimal parameter settings for the first test type of the business initiative testing model based on results from the virtual test. Moreover, the method may include configuring the business initiative testing model using the optimal parameter settings from the set for the first test type to test a business initiative to apply to the business network.

Additional aspects of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of methods, systems, and articles of manufacture consistent with features of the present invention. The aspects of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several aspects of the invention and together with the description, serve to explain the principles of the invention. In the drawings,

FIG. **1** illustrates an exemplary system environment in which methods, systems, and articles of manufacture, consistent with features and principles of the present invention may be implemented;

FIG. **2** illustrates a flowchart of an exemplary initiative segmentation process, consistent with certain aspects of the present invention;

FIGS. **3**A and **3**B illustrate flowcharts of an exemplary initiative analysis process, consistent with certain aspects of the present invention;

FIG. **4** shows a screen shot of an exemplary test site selection web page, consistent with certain aspects of the present invention;

FIG. **5** shows a screen shot of an exemplary analysis set up web page, consistent with certain aspects of the present invention;

FIG. **6** shows a screen shot of an exemplary initial analysis results web page, consistent with certain aspects of the present invention;

FIG. **7** illustrates a flowchart of an exemplary segmentation process, consistent with certain aspects of the present invention;

FIG. **8** shows an exemplary test site attribute table, consistent with certain aspects of the present invention;

FIG. **9** shows an exemplary unsegmented attribute quartile result graph, consistent with certain aspects of the present invention;

FIG. **10** shows a block diagram of a segmented attribute quartile comparison process, consistent with certain aspects of the present invention;

FIG. **11** shows a screen shot of an exemplary attribute table web page, consistent with certain aspects of the present invention;

FIG. **12** shows a screen shot of an exemplary attribute details web page, consistent with certain aspects of the present invention;

FIG. **13** shows a screen shot of an exemplary model selection web page, consistent with certain aspects of the present invention;

FIG. **14** shows a screen shot of an exemplary model results web page, consistent with certain aspects of the present invention;

FIG. **15** shows a screen shot of an exemplary model results graph web page, consistent with certain aspects of the present invention;

FIG. **16** shows an exemplary business location analysis table, consistent with certain aspects of the present invention;

FIG. **17** shows an exemplary business region analysis table, consistent with certain aspects of the present invention;

FIG. **18** shows a flow chart of an exemplary parameter setting process, consistent with certain aspects of the present invention;

FIG. **19** shows a flow chart of an exemplary virtual test process, consistent with certain aspects of the present invention;

FIG. **20** shows a flow chart of an exemplary noise determination process, consistent with certain aspects of the present invention;

FIG. **21** shows a block diagram of exemplary performance data associated with a virtual test, consistent with certain aspects of the present invention;

FIG. **22** shows a flow chart of an exemplary parameter setting determination process, consistent with certain aspects of the present invention;

FIG. **23** shows a block diagram of an exemplary data structure with selected optimal parameter setting options, consistent with certain aspects of the present invention;

FIG. **24** shows a block diagram of another exemplary data structure, consistent with certain aspects of the present invention;

FIG. **25** shows a block diagram of another exemplary data structure with selected optimal parameter setting options, consistent with certain aspects of the present invention; and

FIG. **26** shows a flow chart of an exemplary initiative testing process, consistent with certain aspects of the present invention.

DETAILED DESCRIPTION

Methods, systems and articles of manufacture consistent with certain aspects of the present invention identify business locations that respond most positively to a tested initiative and build a model based on the common attributes of those identified test sites to predict the impact of the tested initiative on other locations in a business network.

In one aspect of the invention, a server is disclosed for performing one or more processes for analyzing a business initiative for a business network including business locations having a set of test sites that have implemented the business initiative for a predetermined test period and a set of control group sites that did not have the initiative implemented. Each of the sites have an associated set of attributes reflecting various characteristics corresponding to the respective site, such as geographical location, size of business location, number of employees, etc. In one aspect of the invention, the server collects from a client a performance value for each of the test and control group sites reflecting a level of performance of each site during the test period. The server then calculates the change in performance in the test sites during the test period, relative to the change in performance in the control group sites over the same time period. The server may segment the performance values for each test site attribute to identify those attributes that have a greater impact on the performance values of the test sites than other attributes. Further, the system configures a model for predicting the performance values of the test sites using the identified attributes and determines whether the model accurately predicts these performance values. If so, the server applies the model to all non-tested sites (i.e., all sites in business network **110** excluding the test sites) to predict the performance values of each site. Based on the predicted performance values, a user operating the client or associated with the business network may select one or more of those sites to implement the business initiative.

Reference will now be made in detail to the exemplary aspects of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

The above-noted features and other aspects and principles of the present invention may be implemented in various environments. Such environments and related applications may be specially constructed for performing the various processes and operations of the invention or they may include a general purpose computer or computing platform selectively activated or reconfigured by program code to provide the necessary functionality. The processes disclosed herein are not inherently related to any particular computer or other apparatus, and may be implemented by a suitable combination of hardware, software, and/or firmware. For example, various general purpose machines may be used with programs written in accordance with teachings of the invention, or it may be more convenient to construct a specialized apparatus or system to perform the required methods and techniques.

The present invention also relates to computer readable media that include program instructions or program code for performing various computer-implemented operations based on the methods and processes of the invention. The program instructions may be those specially designed and constructed for the purposes of the invention, or they may be of the kind well-known and available to those having skill in the computer software arts. Examples of program instructions include for example machine code, such as produced by a compiler, and files containing a high level code that can be executed by the computer using an interpreter.

I. SYSTEM OVERVIEW

FIG. **1** illustrates an exemplary system environment **100** in which certain aspects related to the present invention may be implemented. As shown, system environment **100** may include a business network **110**, network **120**, and a server **130**.

Business network **110** represents a network of businesses that provide similar products and/or services to customers. The businesses may be geographically dispersed. Business network **110** may include one or more business regions **112-1** to **112**-N that represent different geographical locations, such as cities, counties, states, country regions, virtual boundaries having a predetermined bounded distance (e.g., 100 mile radius), and any other type of defined region within a particular location. Each region **112-1** to **112**-N may include one or more business locations **114** that represent retailers that sell products and/or services associated with business network **110**. For example, business network **110** may represent a grocery store chain that includes a plurality of stores geographically dispersed among a state of the United States. Each region **112-1** to **112**-N may represent locations that include grocery stores in the chain (e.g., business locations **114**) that are within a predetermined distance of one another (e.g., **100** mile radius).

Also included in business network **110** is business management unit **116**, which represents a business entity that manages business network **110**. For example, business management unit **116** may be an organization headquarters or a marketing division for business network **110**. Unit **116** may include one or more clients **118** that are operated by one or more users associated with business network **110** that perform various management and/or marketing duties for business network **110**. Following the above example, business management unit **110** may be a marketing division of the exemplary grocery store chain that determines which products and/or services each retailer location (e.g., **114**) should provide.

In one aspect of the invention, client **118** may be one or more computer systems such as a desktop computer, workstation, laptop, personal digital assistant or any other similar computing system operated by a user. Client **118** may include a processor, associated memory, and other elements and functionalities available in computer systems (all not shown). These elements may include input/output devices, such as a keyboard, mouse, and display, although these input means may take other forms. Also, client **118** may include a network interface for communicating with external resources, such as network **120** and server **130**. Further, client **118** may execute browser software that enables a user to request, receive, and render information from network **120**.

Although FIG. **1** shows business network **110** including a single business management unit **116** (and accompanying client **118**), each business location **114** may include a client **118** that is capable of accessing network **120** and server **130** to access and perform processes consistent with certain aspects related to the present invention. Further, although business network **110** is shown including a plurality of regions **112-1** to **112**-N, network **110** may include business locations **114** that are all included within a single region.

Network **120** may be a shared, public, or private network and encompasses a wide area or local area. Network **120** may be implemented through any suitable combination of wired and/or wireless communication networks. For example, network **120** may be implemented through a Wide Area Network ("WAN"), Local Area Network ("LAN"), an intranet and/or the Internet. Further, network **120** may represent multiple networks, such as a wireless carrier network connected to the Internet.

Server **130** may be a computer system such as a desktop computer, workstation, or any other similar server side computing system that performs one or more server-side processes. In one aspect of the invention, server **130** may include, among other things, interface unit **132**, processing unit, **134**, memory **136**, and database **140**. Although server **130** is shown including elements **132-140**, it may include additional computing elements, such as an input/output device (e.g., display, mouse, keyboard) that enables a user to access the data and software in server **130**. In addition, server **130** may be a group of servers.

Interface unit **132** may be one or more hardware and/or software components that are configured to receive and send information from/to network **120**. Interface unit **132** may include, or leverage, different types of software to control access to information maintained by server **130**. For example, interface unit **132** may execute firewall software that controls access to information and processes provided by server **130** using one or more security protocols (e.g., password processing, encryption technologies, etc. The above listed functionalities are not intended to be limiting and interface unit **132** may perform other types of interface processes to facilitate the exchange of information between server **130** and network **120**.

Processing unit **134** may be one or more processing devices that execute software processes stored in one or more memory devices, such as memory **136**. Further, processing unit **134** may execute software processes stored internally, such as internal flash memory configured within processing unit **134**.

Memory **136** may be one or more memory devices that store data and software programs that, when executed by processing unit **134**, perform processes consistent with certain aspects related to the present invention. These programs may include segmentation engine **137**, and model processing engine **138**. Further, memory **136** may include server-side software applications that enable server **130** to create and provide content including information produced by other programs executed by processing unit **134**, such as web server software. Alternatively, server **130** may leverage web server software that is located in another memory device (not shown) internal or external to server **130**. The above software programs and functionalities are not intended to be limiting and memory **136** may be configured to store additional or fewer types of data and/or software programs that perform other processes consistent with server-side computing systems.

Database **140** may be one or more memory devices that store data and/or executable software that is used by server **130** to perform processes consistent with certain aspects related to the present invention. For example, database **140** may include one or more data structures (e.g., tables, maps, arrays, directories, etc.) that include data that is used by one or more of the software programs stored in memory **136** and executed by processing unit **134**. Although server **130** shows database **140** and memory **136** as separate elements, the information and software stored in these elements may be combined in a single memory device. Also, memory **136** and/or database **140** may be located external to server **130** and accessible through network **120** or a dedicated back-end communication path, such as a Local Area Network (LAN).

II. INITIATIVE ANALYSIS PROCESS

Methods, systems, and articles of manufacturer consistent with aspects of the present invention enable one or more users of client **118** to access functionalities offered by server **130** to determine retail strategies associated with business network **110**. For example, a user in business management unit **116** may execute browser software in client **118** to request analysis information regarding one or more initiatives implemented at one or more business locations **114**. FIG. **2** shows an exemplary initiative segmentation process that may be performed by methods, systems, and/or articles of manufacture consistent with aspects of the present invention.

Initially, a user or users at business management unit **116** may create and select an initiative that is to be applied to a predetermined number of test sites reflecting a set of business locations **114** (e.g., thirty stores) included in business network **110** (Step **210**). The proposed initiative may be a change in store layouts, offering different products and/or services, different marketing campaigns (e.g., advertising, etc.), and any other type of idea that may be implemented at the selected test sites.

The user of business management unit **116** may then direct the selected test sites to implement the proposed initiative (Step **220**). The initiative may be implemented for a predetermined amount of time (e.g., three months, six months, etc.), which is also known as a test period. Alternatively, the initiatives may be implemented at the test sites indefinitely. During the test period, business management unit **116** may collect feedback results from each test site based on one or more performance metrics selected by unit **116** (Step **230**). For example, business management unit **116** may request sales information, foot traffic (i.e., number of persons entering a business location), etc. from each test site during the test period and may request additional performance data for each test site for a period before the test period.

Once the appropriate feedback results are collected, a user at business management unit **116** may use client **118** to perform an initiative analysis process based on the results (Step **240**). The initiative analysis process provides information regarding the effectiveness of the initiative at the test sites. Further, the initiative process provides information regarding a proposed effectiveness of the initiative if implemented in other non-tested business locations in business network **110** (i.e., retailer locations that did not implement the initiative). These other business locations may be referred to as non-test group sites. In one aspect of the invention, the initiative analysis process includes the exchange of information between client **118** (under the operation of a user) and server **130**. For example, a user operating client **118** may use browser software to access a web site that is provided or leveraged by server **130** to perform the initiative analysis process. Accordingly, server **103** may provide content to client **118** that includes queries, data, and analysis information associated with the initiative analysis process.

A user, such as a manager at business management unit **116**, or software processes may analyze the information provided by server **130** and selects one or more applicable non-test group sites to implement the initiative (Step **250**). Accordingly, business management unit **116** determines and implements one or more strategies associated with the tested initiative in a selected number of business locations **114**, and/or groups of locations, such as regions **112-1** to **112**-N.

In certain aspects, client **118** may download information to server **130** associated with the results of the test initiatives at the test sites. Further, server **130** may receive, or retrieve, attributes associated with each business location **114** from client **118**, such as store size, locations, sale data, types of products and/or service offered, location and distances of competing merchant sites, age of the business location, amount of a lease (if any), weather during the test period, staff information, etc. Alternatively, or in addition to the information provided by client **118**, server **130** may execute software that determines, collects, and/or retrieves attribute information associated with business network **110**, regions **112-1** to **112**-N (e.g., population and demographic data, etc.), and business locations **114**. The attribute information may be stored in database **140** for subsequent use by server **130** and/or client **118**.

FIGS. **3**A and **3**B show a flowchart of an exemplary initiative analysis process, consistent with certain aspects of the present invention. As explained above in connection with FIG. **2**, a user operating client **118** may access server **130** through browser software. In one aspect of the invention, server **130** may leverage web server software that creates and renders web page content that includes information associated with the initiative analysis process. For example, the initiative analysis process may begin with a user of client **118** receiving a web page including a list of target sites that implemented the initiative and provided feedback results to client **118**. FIG. **4** shows an exemplary screen shot of a test site selection web page including a list of test sites **410**, the location of each test site **420**, the type of each test site (not shown), and a query section for proposed dates the user may select to perform an analysis **440**. From this information, the user may select the test sites from which server **130** is perform an initiative analysis (Step **305**).

Once the test sites are selected, server **130** may provide client **118** with information that enable the user to set up the initiative analysis (Step **310**). FIG. **5** shows an exemplary screen shot of an analysis setup page that allows the user to define one or more items associated with the initiative analysis process. For example, in setting up the analysis, the user may select one or more performance metrics **510** from which the user wishes to use in its analysis. A performance metric may include sales data in dollars (change in average sales during the predetermined test time period), gross profit margins, number of products sold, and any other type of metric associated with the performance of the business locations **114**. Further, server **130** may allow the user to select a product/service category **520** for the analysis, such as a type of product, all products, etc.

In addition to performance metrics and categories, the user may select time periods **540** from which the initiatives were implemented by the test sites. Also, the user may request that server **130** eliminates any initiative feedback data that appear to be anomalous by removing any outlier sites (selection **550**). An outlier site has performance values that are too different than the rest of its respective test or control group. The user determines a threshold performance value beyond which a site is considered to be too different than its peers and thus deemed an outlier by server **130**. By removing outlier test sites from consideration, the initiative analysis process does not consider the information for this test site during its analysis operations.

Additionally, or alternatively, the user may select a control group **560** of business locations in the network **110** that have not implemented the initiative. For example, the user may select to have all or a portion of the remaining business locations considered in the analysis process, or request that the server select a group of sites that are most similar to the test group of sites in which the initiative was implemented. This group of stores selected by the user or server **130** is the control group.

Once the user has set the appropriate performance metrics, categories, etc. for the initiative analysis process, server **130** may perform an initial analysis on the test site initiative result data (Step **315**). In one aspect, server **130** may determine a performance value for each test site as well as the control group sites for each performance metric and category selected by the user. The performance value of a test site may be measured as a change in a performance metric/category combination for each test site relative to the change in the control group sites over a common time period. Once server **130** determines the performance values for the test sites, it may provide the results of the initial analysis to, user via client **118**. FIG. **6** shows an exemplary screen shot of an initial analysis results web page including data reflecting the results of the initial analysis process.

As shown in FIG. **6**, server **130** may provide information associated with the performance (e.g., performance values) of the test sites relative to the control group sites for the selected performance metric. In the exemplary screen shot of FIG. **6**, server **130** provides the user with performance metric value changes in absolute values (e.g., actual dollars in sales) (e.g., graph **610**), and in percentage values (e.g., graph **620**). Further, server **130** may determine the average change in the selected performance metric for the test sites relative to the change in the same performance metric for the control group sites. This may be displayed in graph form as well. Additionally, server **130** may determine the likelihood that the performance of the test group relative to the control group of sites is not random chance. Server **130** may provide such confidence values to the user as a 1-p value (e.g., graph **640**). The confidence value may be determined based on information reflecting a difference between test site performance metric data and control group site performance metric data.

Once server **130** completes the initial analysis process and provides the results of this process to the user, it may execute a segmentation process consistent with certain aspects related to the present invention (Step **320**). The segmentation process may direct processor unit **134** to access the attributes associated with business locations **114** stored in database **140**. Once accessed, the segmentation process sorts through the attributes to identify those that most strongly relate to the different test site's performance values during implementation of the initiative. In one aspect, server **130** may determine the strength of the relationship between each attribute and differential performance by test site (e.g., the attributes that are most in common among the top performing test sites and most different than the worst performing test sites).

III. SEGMENTATION PROCESS

FIG. **7** shows a flowchart of an exemplary segmentation process consistent with certain aspects of the present invention. To segment the test site results, server **130** may execute segmentation engine **137** that initially sorts the test sites based on their corresponding performance metric results (Step **705**). For example, if the selected performance metric is an average percentage of sales difference over a predetermined test period, then segmentation engine **137** may sort the test sites from highest to lowest average sales difference. FIG. **8** shows an exemplary test site attribute table including a sorted list of selected test sites **801** based on their corresponding performance metric performance values **802**. Each test site is associated with one or more attributes **803** that correspond to some characteristic related to the test sites. Accordingly, segmentation engine **137** may determine a measurement of the strength of the relationship between each attribute **803** and the performance metric values **802** of test sites **801** (Step **710**). In one aspect, segmentation engine **137** will use statistical processes to determine the strength of the relationship between the attributes **803** and performance metrics **802**. For example, segmentation engine **137** may analyze the correlation and R-squared of each attribute to the performance of the test group sites. In such an example, the server **130** would create a scatter plot graph for each attribute. Data points in the scatter plot are associated with individual test sites. Server **130** plots the site's value for a selected attribute **803** on the x-axis and plots the value for the selected performance metric **802** on the y-axis. Server **130** then determines and places a regression line through the scatter plot to calculate the correlation and r-squared values of that regression line. These values (i.e., correlation and r-squared values) indicate the strength of the relationship between the selected attribute **803** and the performance metric **802**. Server **130** repeats this process for every attribute. In one aspect, server **130** determines positive and/or negative correlations. A positive correlation means that as the value of an attribute increases, the value of the selected performance metric also increases. A negative correlation means that as the attribute value increases, the value of the selected performance metric decreases.

Once determined, segmentation engine **137** may sort the attributes based on the strength relationship values (Step **715**). The sorting allows segmentation engine **137** to have a prioritized list of attributes that are ranked based on their relationship with the performance of the test sites. Thus, referring to FIG. **8**, if segmentation process **137** determines that attribute 1 has the strongest relationship with the average sales difference of test sites **801** when compared to other attributes, that attribute may be ranked first in the list.

In certain aspects, segmentation engine **137** may perform an unsegmented or segmented process on the attributes and test sites. Unsegmented processing involves analyzing the performance of each test site against the performance of all control group sites. Segmented processing involves analyzing the performance of each test site against the performance of control group test sites having similar attribute relationships. Steps **725-750** and **760-785** demonstrate the differences between the two processes.

If segmentation engine **137** is directed or configured to perform unsegmented processing (Step **720**; UNSEGMENTED), an initial attribute may be selected for processing (Step **725**). Segmentation engine **137** may analyze the performance metric values associated with the selected attribute and splits the test sites into fragments that represent sets of test sites that are divided based on the statistical rank of their performance metric values (Step **730**). In one aspect of the invention, segmentation engine **137** separates the test sites into quartiles, quintiles, or any number of fragments. Segmentation engine **137** may then analyze the performance metric values of each test site attribute fragment against the performance of all control group test sites (Step **735**). Based on the analysis, segmentation engine **137** may generate unsegmented attribute fragment results, which may include a resultant map of fragments representing the difference between the performance metrics of each test site fragment and all of the control group sites (Step **740**). This information may be stored in memory **136** or database **140**.

In one aspect of the invention, segmentation engine **137** may also determine a value representing a relationship between the performance of the test sites (i.e., performance metric) and the selected attribute. For example, segmentation engine **137** may determine the 1-p value of the relationship between the performance of the test sites (i.e., performance metric) and the selected attribute. The 1-p value represents the probability that the relationship between the attribute and the performance metric (either positive or negative) is not random chance.

FIG. **9** shows a graph **900** reflecting a relationship between the performance of the test sites (i.e., performance metric) and a selected attribute. As shown, graph **900** includes a number of fragments **901-905** reflecting the unsegmented attribute fragment results computed by segmentation engine **137**. For this exemplary attribute, line **910** shows a positive correlation between the performance metric values and the attribute values.

If there are more attributes **803** to process (Step **745**; YES), then segmentation engine **137** may select another attribute (Step **750**) and the unsegmented process continues at Step **730**. On the other hand, if there are no more attributes **803** to process (Step **745**; NO), server **130** may end the segmentation process and proceed to Step **325** of the initiative analysis process of FIG. **3** (Step **790**).

If segmentation engine **137** is directed or configured to perform segmented processing on the attributes (Step **720**; SEGMENTED), an initial attribute **803** is selected for processing (Step **760**). Segmentation engine **137** may split the test site performance metric results into fragments that represent sets of test sites that are divided based on the statistical rank of their values for the selected attribute (Step **765**). In addition, segmentation engine **137** may split the control group sites into fragments based on their values for the same selected attribute (Step **770**). Segmentation engine **137** may then analyze each test site fragment against a corresponding control group fragment (Step **775**). The results of the analysis are processed into segmented attribute fragment results that reflect the differences in the performance metric values for the test sites and corresponding control group sites for the selected attribute (Step **777**). To better understand this segmented analysis, FIG. **10** shows a block diagram of an exemplary segmented attribute fragment comparison process consistent with certain aspects related to the present invention.

As shown, memory **137** may store a set of control group fragment information **1010-1040** and a set of test site fragments **1050-1080** for a particular attribute under analysis. During a segmented process operation, segmentation engine **137** may compare corresponding fragments from each set to generate segmented attribute fragment information **1090-1096**. For example, control group fragment **1010** may be analyzed against test site fragment **1050** to produce segmented attribute fragment **1090**, while control group fragment **1020** is analyzed against test fragment **1060** to produce segmented attribute fragment **1092**. The segmented attribute fragment information **1090-1096** is stored in memory **137** for subsequent processing. Accordingly, at Step **775** of FIG. **7**, segmentation engine **137** generates and stores the segmented attribute fragment results in a memory device, such as memory **136** or database **140**.

Also, segmentation engine **137** may determine a correlation value and a 1-p value in a manner similar to that described above in connection with Step **740** and FIG. **9**. That is, segmentation engine **137** may determine a correlation and 1-p values that represent the strength of the relationship between the performance of the test sites (i.e., performance metric) and the selected attribute. The correlation values, 1-p values, and associated information may be stored in memory **136** or database **140**.

If there are more attributes **803** to process (Step **780**; YES), then segmentation engine **137** may select another attribute (Step **785**) and the segmented process continues at Step **765**. On the other hand, if there are no more attributes **803** to process (Step **780**; NO), server **130** may end the segmentation process and proceed to Step **325** of the initiative analysis process of FIG. **3** (Step **790**).

In addition to the processes performed during the segmentation process, server **130** may also generate pointers, software links, etc. between each attribute and its corresponding unsegmented and/or segmented attribute fragment information. Using these links, server **130** may generate content and data that allows the user to receive, view, and analyze the results of the segmentation processes (Step **325**). For example, FIG. **11** shows an exemplary screen shot of an attribute table **1100** generated by server **130** consistent with aspects of the present invention. Table **1100** may be produced by server **130** using the attribute information generated during the segmentation process performed in Step **320** of FIG. **3**. A user may request to view the attribute information by instructing server **130**, via client **118**, using queries, hyperlinks, and any other form of request technique through the browser software executing at client **118**.

As shown, attribute table **1100** may include a list of all of the attributes **1110** associated with the test sites that have implemented the proposed initiative. These attributes may correspond to attributes **803** described above in connection with FIG. **8**. Further, table **1100** may include a strength value **1120** representing a strength of the relationship between each attribute and the performance metric value on the test sites. As shown, attributes **1110** are ranked based on their corresponding strength values (e.g., R-squared values). Additionally, table **1100** may include correlation values **1130**, and 1-p values for each attribute. These values may reflect the correlation values, 1-p values and information determined in Steps **730** and/or **775** of FIG. **7**. As shown in FIG. **11**, server **130** may determine and present correlation values for the test sites and control group sites.

In another aspect of the invention, the attributes **1110** listed in table **1100** may be active in that the user may select an attribute (e.g., click) using an input device to view additional information regarding the attribute selected. FIG. **12** shows a screen shot of an exemplary attribute details page associated with segmented attribute quartile results for a selected attribute **1210**. In one aspect, the details page may include information representing the fragments generated by segmentation engine **137**. For example, the details page may include a graph having segmented fragments **1220** for attribute **1210**. On the X-axis of the graph may be the attribute information **1240** and the Y-axis is the performance metric values **1230**, determined in this example in segmented form. Further, the details page may include a chart **1250** having information associated with the segmented attribute fragment data reflected in the graph. This information may include data reflecting the number of test sites **1260** and control group sites **1270** in each fragment, the computed performance metric data **1280**, and a 1-p value **1290** reflecting a measure of likelihood that the relationship between the attribute and the performance metric values is not random. Segmentation engine **137** may calculate this value using statistical algorithms and/or processes based on the information provided by the segmented attribute fragment results.

Additionally, or alternatively, server **130** may generate and render a scatter plot graph in which each test site is a data point in the graph, the X-axis is the value for the selected attribute and the Y-axis is the performance metric values. Server **130** may be configured to allow the user to select more than one attribute from attribute table **1100**. In response to this selection, server **130** may process and generate attribute graphs (e.g., fragment-based, scatter plot-based, etc.) including information showing the relationship between the multiple attributes and their corresponding performance metric values for the test sites.

Referring back to FIG. **3**A, once the user has analyzed the segmentation process output data (Step **325**), server **130** allows the user to select a model type and provide associated parameters for the model to be used for analyzing the initiative performed in the test sites (Step **330**). Server **130** is configured to execute the selected model using information related to the test sites to identify the attributes that are deemed most relevant to the success of certain test sites that implemented the initiative. Server **130** uses the test site information to train the selected model. Once the user, or a software program, determines that the model is predicting accurate performance metric data based on the actual initiative feedback data provided by the test sites, server **130** may apply the model to the control group sites.

In one aspect of the invention, server **130** may offer different types of modeling methodologies that are used to predict performance values of the test and/or control group sites, such as linear regression, staged linear regression, neural network basic train, neural network stepwise regression, decision tree, K-means similar site modeling, and any other type of software model that may be used to analyze the information produced and/or collected by segmentation engine **137** and server **130** during the initiative analysis process. Server **130** may generate a web page that includes a list of modeling methodologies from which the user may select. Also, server **130** may allow the user to program a custom modeling methodology that may be used to analyze the initiative. Once the model is selected, server **130** may query the user for parameters and other type of information used by the selected model. FIG. **13** shows a screen shot of an exemplary model selection web page **1300** that includes menus for allowing the user to select a model and provide one or more parameters for the selected model.

As shown, web page **1300** allows the user to select the type of performance metric **1310** to run in the selected model **1320**. Further, server **130** may allow the user to select which attributes **1330** are available for consideration by the selected model when executed. As shown in FIG. **13**, the exemplary web page **1300** may allow the user to select/deselect an attribute **1330** using corresponding selection boxes **1340** and **1350** to indicate that the particular attribute is to be used by the selected model. Also, the user may provide parameter information, such as selecting the maximum number of attributes **1380** the model should use when completing its analysis of the test sites and the implemented initiative. For example, the user may instruct server **130** to consider only a certain number of the attributes with the strongest relationship to performance (e.g., the ten most important attributes) from among the entire list of attributes **1330**. The user may force the model to include a particular attribute by selecting parameter box **1350** for that particular attribute. In this instance, server **130** always considers and uses the attributes selected via parameter **1350** when predicting performance values of the test sites.

Further, the user may also direct server **130** to consider cross correlations **1360** between attributes when executing the selected model. Cross correlation is a parameter that reflects the similarity between attributes and their affect on the selected model's results. For example, two or more of the selected attributes **1330** may be closely related, such as an attribute for the number of competitive business locations within a five mile radius and another attribute for the number of competitive business locations within a ten mile radius. These two exemplary attributes may affect the model in a similar fashion. The user may not want such similar attributes considered in the selected model. Accordingly, by setting the cross correlation parameter **1360**, the user directs server **130** to remove one of the similar attributes (leaving one attribute) from consideration by the selected model. This enables server **130** to consider independent attributes when executing the selected model. Also, the user may select the number of iterations **1370** the model should run when training itself for producing its results.

Once the model and associated parameters are selected, server **130** may execute the selected model (Step **335**). In one aspect, server **130** may leverage model processing engine **138** to process the model. In such an instance, server **130** provides the user's selections and parameters to engine **138** for subsequent processing. Further, model processing engine **138** may re-execute the model based on the number of iterations **1370** selected by user in Step **330**. In this regard, engine **138** tests and trains the model to calibrate its results. For example, model processing engine **138** may build a model using a subset of the test sites (e.g., 20 out of 30 test sites) and tests the results of the model on the remaining test sites (e.g., the remaining 10 test sites). The model may compute predicted performance metrics for each of the remaining test sites based on the attributes selected by the model and compares them to the actual performance metrics of the remaining test sites. Server **130** may repeat this process for the number of iterations set by the user in Step **330**.

Once the model is executed, server **130** may generate and render the results to the user, via client **110**. The user may then analyze the results of the executed model (Step **340**). In one aspect, server **130** may generate a model results web page that includes information pertaining to the results of the executed model. FIG. **14** shows a screen shot of an exemplary model results web page **1400** consistent with certain aspects of the present invention. As shown, model results web page **1400** includes details of the attributes selected by the model. For example, web page **1400** may include a list of attributes **1410** used by the model. For each of these attributes, and based on the type of model selected by the user, server **130** may also provide details regarding the variables, constants, and other data used by the selected model. For example, results web page **1400** shows the results for a selected linear regression model. In this example, server **130** may provide the values for a linear least squares fitting algorithm used to find the best fitting line through a set of points. This algorithm may include a constant and co-efficient that are assigned to each attribute. Accordingly, server **130** may provide the co-efficient values **1420** assigned to each attribute used by the model. Further, the constant **1430** used by the model for this type of model algorithm may be included in results web page **1400**. Additionally, server **130** may provide information showing the average impact **1440** of each attribute on the model results.

Moreover, server **130** may provide information showing how accurate the model predicts performance values of the test sites based on the selected parameters and the initiative. In one aspect, server **130** may provide quantitative measures reflecting the fitness of the model for predicting and analyzing the performance values of the test sites. For example, server **130** may provide an R-squared value **1450** reflecting a quantitative value of the model's fitness for predicting the success of the initiative in the control group sites. Alternatively, server **130** may express the fitness value as an error rate percentage value reflecting whether the predicted performance values are within a certain range of actual performance values associated with the test sites.

Additionally, server **130** may provide confidence measurements **1460** reflecting quantitative values of how well each attribute is actually contributing to producing a model that will successfully predict the performance metrics of the control group sites when implementing the initiative. Also, server **130** may determine and provide a percent populated value **1470** for each attribute **1410** that represents the percentage of test sites that server **130** has information for that particular attribute.

In another aspect of the invention, model processing engine **138** may generate a graph showing the results of the executed model. FIG. **15** shows an exemplary model results graph **1500** page showing the results of the linear regression model explained above with respect to FIG. **14**. The Y-axis of graph **1500** represents the actual performance metric values for each of the test sites and the X-axis represents the predicted performance metric values for the same test sites. Line **1510** represents a match between predicted performance metric values and actual performance metric values. The model processing engine **138** may determine the number of test sites are within certain ranges of a predetermined benchmark value. This information may be reflected as table **1520** that includes information showing the percentage and number of test sites within various percentages of the benchmark.

The user of business management unit **116** uses information reflected in graph **1500** and/or model results web page **1400** to determine whether the selected model and/or attributes are acceptable (Step **345**). Alternatively, a software program executed by server **130** may analyze the information produced by the executed model to determine whether the model and/or attributes considered by the model are acceptable based on predetermined rules. Various factors may be considered by the user, or software program, when determining whether the model and/or attributes are acceptable. For example, a user may determine that one of the attributes **1410** considered by the selected model was not an appropriate attribute based on the percent populated value **1440** for that attribute. Alternatively, or additionally, the confidence measurement **1460** for an attribute may cause the user or the software program to determine that that attribute is not acceptable for consideration by the model. On a broader scale, the user or software program may determine that the selected model is not appropriate for predicting performance metrics for the non-test sites based on the confidence measurement for that model (e.g., r-squared value **1450**). The above exemplary factors are not intended to be limiting and the user and/or software program may use other result information to determine the appropriateness of the selected model and/or attributes.

If the results are not acceptable (Step **345**; NO), the user and/or, software program may re-select a model, attributes, and/or parameters for analyzing the initiative (e.g., return to Step **330**). For example, the user may remove one or more attributes from consideration prior to re-execution of the selected model. If, however, the results are acceptable (Step **345**; YES), the user and/or software program may direct server **130** to apply the model to the non-test group sites to determine a predicted impact of the initiative on these sites (Step **350**). The server **130** may do this by applying attributes **1410** and their corresponding coefficients **1420** selected by the model in step **335** to each non-test site's values for those attributes **1410**. In doing so, server **130** calculates the predicted performance of the initiative on each non-test site based on that site's relevant attributes **1410**.

Once server **130** applies the tested model to the non-test group sites and the test sites, a determination may be made as to those sites having the highest or more acceptable predicted performance metric values. Server **130** may rank the sites accordingly and provide this information to the user via client **118**. FIG. **16** shows a business location analysis table that includes exemplary results from applying the model to the control group sites. As shown, FIG. **16** shows a list of business locations (e.g., control group and test sites) **1610** that are ranked based on each site's predicted performance metric values **1620**. In other words, using the sales lift performance metric as an example, server **130** may place those sites that have an estimated larger sales lift when implementing the initiative higher in the list of sites **1610** than those who have lower estimated sale values. Further, server **130** may provide information showing the actual performance metric values **1630** for those test sites that implemented the initiative and provided actual feedback information to server **130**. Based on the exemplary results depicted in FIG. **16**, the user may select one or more of the non-test sites to implement the initiative. Accordingly, the user analyzes the information provided by model processing engine **138** and server **130** to make an informed decision on which sites to implement the initiative tested at the test sites. Along the same lines, the user may also select those sites that should not implement the proposed initiative.

In another aspect of the invention, server **130** may provide results of the processed model based on any grouping of the sites. One such example of a group of sites are regions **112-1** to **112**-N explained above in connection with FIG. **1**. FIG. **17** shows a table that includes exemplary results from applying the model to the non-test group sites in a region format For example, FIG. **17** shows an exemplary table listing the regions **1710** having those business locations (e.g., control group sites and/or test sites) **1720** and their associated predicted performance metric values **1730** and actual performance metric values **1740** (if applicable). As with the table depicted in FIG. **16**, server **130** may rank the regions **1710** accordingly to their predicted performance metric values. Thus, those regions having business locations with corresponding high estimated performance metric values are ranked above those regions with lower or less attractive performance metric values. Accordingly, instead of selecting individual business locations for implementing the initiatives, the user may determine which regions to apply the proposed initiative based on the information provided by server **130** in this format.

IV. ADDITIONAL EMBODIMENTS

As described, methods and systems consistent with certain aspects of the present invention utilize a software model that is used for analyzing initiatives to be applied in test sites (e.g., business locations). In one aspect, server **130** may configure the model based one on or more selected parameters that control the manner in which the model processes data and measures the performance values of test sites. In one aspect, performance may be measured as a change in relevant performance values for the test sites from before the start of an initiative to during or after the initiative starts, relative to the change in performance in a control group over the same time period. For example, the parameters may include data reflecting whether the model should consider changes in absolute sales or in comparable ("comp") (e.g., year over year) sales, the manner by which the model selects a control site group (e.g., sites not included in a selected set of test sites, for example, balance of market, comparable market, etc.), whether or not the model should filter outliers, the process used by the model to filter outliers, identifying the test measurement period, etc.

Certain aspects of the present invention enable server **130** to identify and set those model parameters that will best filter out noise associated with date related to the stores where the initiative was applied in order to produce more accurate results regarding the impact of the initiative. Noise may be a quantified measurement of inconsistent performance data for sites used in the analysis performed by the model. Aspects of the present invention create a simulation environment where the model performs a number of virtual initiative tests (e.g., initiative tests that have not actually been implemented in a business location) using different parameters. Based on the results of the virtual tests, server **130** may identify parameter settings that best filter noise from the results. Those parameter settings are then automatically selected for a particular test type as default settings that are subsequently used in performing actual initiative tests for predicting the performance of selected business locations based on the proposed initiative.

a. Overview of Determining Parameter Settings

FIG. **18** shows a flowchart of an exemplary parameter setting process consistent with certain aspects related to the present invention. In one aspect, server **130** may execute software that performs the parameter setting process. Initially, server **130** may collect historical data for business locations **114** within business network **110** (Step **1810**). The historical data may include performance data associated with performance metrics, such as sales information, foot traffic, etc. The historical data may have been previously retrieved by server **130** from business locations **114** via client **118** and stored in database **140**. Accordingly, server **130** may collect the historical data from database **140** during step **1810**, although other methods of collecting the historical data may be implemented by aspects of the present invention.

Server, **130** may also define a test type that is associated with the business initiative testing model having a set of parameter settings (Step **1820**). A test type may be a type of business initiative testing model that server **130** executes when running actual initiative tests to predict the performance of certain test sites, in a manner similar to the above disclosed aspects of the present invention. For example, a test type may be defined based on a particular characteristic of the initiative test, such as the length of a test period for the initiative test, etc. For purposes of illustrating aspects of the present invention, server **130** may define the test type based on a selected test period. It should be noted that any other attribute of a test may be used to define a test type. Server **130** may receive input from a user defining the test type or, alternatively, may automatically define the test type.

Once the test type if defined, server **130** may perform a virtual test on the defined test type (Step **1830**). A virtual test reflects a mock initiative test that is performed on a selected number of test sites based on defined configuration settings for the model executed by server **130**. The virtual test is considered a mock initiative test because no actual initiative test is planned or has been implemented in any virtual test sites (e.g., business locations identified for purposes of the virtual test). In this regard, server **130** creates a simulation environment for running virtual initiative tests for collecting information used for identifying the optimal default model parameters settings for the defined test type. Performing a virtual test may include configuring the virtual test such that server **130** iteratively performs a business initiative test for selected virtual test sites for each of a certain number of model parameter settings. Each model parameter setting may include one or more parameter setting options. Thus, for each iteration, server **130** may determine a noise value for each combination of available parameter settings and options and stores the values in a memory device for subsequent processing.

Server **130** may compare the noise values for each parameter setting combination to determine the parameter settings for the defined test type (Step **1840**). In one aspect, server **130** may perform a statistical process on the noise values for each parameter setting combination, such as determining an average noise value for each combination over the iterations of collected noise values. In another aspect, server **130** may determine the parameter settings by identifying a parameter setting combination that produced the least amount of noise during the virtual test. Server **130** may identify this optimal parameter setting combination as a set of parameters settings that are to be used to configure the defined test type when executed for performing actual initiative tests to predict the performance of selected test sites. As such, server **130** may store the parameter settings for the defined test type in memory for subsequent use by the model (Step **1850**). These and other aspects of the parameter setting process are described in further detail below in connection with FIGS. **19-26**.

b. Performing a Virtual Test

FIG. **19** shows a flowchart of an exemplary virtual test process that may be performed by server **130** consistent with certain aspects of the present invention. When performing a virtual test, server **130** may first select a parameter setting set (Step **1910**). To do so, in one aspect, server **130** may execute a process that first determines the number of parameter settings and parameter setting options for the type of model that will perform the initiative tests. As describe above, server **130** may execute a number of different models that are used for performing an initiative test. Each model may have a certain number of parameter settings and each parameter setting may include one or more parameter setting options. For example, a model may include a control group selection parameter setting that may define different methods for selecting a control group. One method may include selecting all business locations (i.e., sites) not included in a virtual test site set to be included in the control group for the virtual test performed by server **130** (e.g., balance of chain process). Alternatively, the control group may be selected based on a balance of market or other geographic region-related data, or based on a determined similarity to the virtual test sites (e.g., size, customer base profiles, sales, etc.), etc. Each of these exemplary control group selection methods may be a parameter setting option for the control group selection parameter setting.

Other types of parameter settings include a parameter that controls whether the model will use algorithms to filter outliers (e.g., performance data for a virtual test site that is too inconsistent with other related performance data). Thus, one option of this type of parameter setting may be to use outlier data, and another option may be to disregard outlier data. Other outlier parameter setting options may include the type of algorithm implemented when disregarding outlier data. For example, one option may be to remove the determined performance data entirely from the set of data used by the model. Another option may be to use a capped algorithm that changes the data of an outlier result to make the result no longer an outlier. For instance, if an outlier is defined as an observation (e.g., data result) that is more than three standard deviations from a mean, the capped algorithm may overwrite a outlier that is four standard deviations from the mean with a value that represents three standard deviations from the mean.

Another type of parameter setting may include whether the model will view changes in absolute performance data (e.g., actual sales data) or comp performance data (e.g., year to year sales data). For example, in measuring actual sales, a test site may have been selling $300 per day before an initiative was implemented. Following implementation, the test site may be selling $330 per day. Accordingly, the test site experienced a 10% lift in absolute sales. Comp sales, on the other hand, measures change in year on year sales. For example, a test site may have been selling 5% higher than in the prior year before an initiative was implemented. Following implementation, the test site may be selling 8% higher than in the prior year. Accordingly, the test site experienced a roughly 3% increase in comp sales.

A model may also have a parameter setting that defines how long of a pre-period to implement in the initiative tests run by the model. A pre-period may be a length of time prior to a selected test start date for a virtual test for which the model will measure performance before the initiative was implemented. In the above example, a test site was selling $300 per day before the initiative was implemented and $330 per day after the initiative was implemented. The $300 in sales per day represents performance in the pre-period. This exemplary parameter setting determines what length of time to use in measuring pre-period performance. For example, if a model is configured to compare performance data for a selected test period following a test start date (e.g., Sep. 1, 2004), a one month selected pre-period may be reflect the time period including all of August, 2004. Similarly, a one year pre-period may include the time period including the beginning of September 2003 to the end of August 2004. Any length of pre-period may be selected in accordance with certain aspects related to the present invention.

The above exemplary parameter settings and parameter setting options are not intended to be limiting. Server **130** may define any type of parameter setting and parameter setting options for any type of model, based on the characteristics of the model.

Once the number parameter settings and parameter setting options are selected, server **130** may determine the maximum number of parameter setting combinations that may be tested using the model. For example, for an exemplary set of parameters including four parameter settings, and each parameter setting having four respective parameter setting options, server **130** may determine there are 256 possible parameter setting combinations available for the model to test (e.g., {P1(1), P2(1), P3(1), P4(1)} . . . {P1(4), P2(4), P3(4), P4(4)}).

Thus, in selecting a parameter setting set, server **130** may set a value, PS(Max), to 256 representing the maximum number of combinations for the test type. Further, server **130** may then select a first parameter setting set reflecting a selected combination of parameter settings including one option from each available parameter setting. For instance, server **130** may select the first option from each of the four exemplary parameter settings mentioned in the above example (e.g., Parameter Setting Set (PS)={PS1(1), PS2(1), PS3(1), PS4(1)}). Server **130** may select any combination during step **1910**. As explained later, however, server **130** may be configured to select a different parameter setting set for each iteration of the virtual test.

Server **130** may also select a number of virtual test sites for the virtual test (Step **1920**). In one aspect, server **130** may randomly select a certain number of virtual test sites from the available sites reflecting business locations **114** in business network **110**. For example, server **130** may select fifty (50) virtual test sites from an available pool of one thousand (1000) sites in business network **110**.

Based on the selected test period associated with the defined test type (e.g., one month), server **130** may select a test start date (Step **1940**). The test start date may be a previous date that is already included in the monitoring periods associated with the historical data collected for the business locations **114** (i.e., sites) in business network **110**. For example, if database **140** maintains historical data up to

Dec. 31, 2004, server **130** may randomly select a start date that is before that date. The test start date may be further bounded based on the selected test period. Thus, for a one month test period, server **130** may be configured to select a test start date that is no later than Nov. 30, 2004 to allow for the test period to include the historical data for Dec. 31, 2004. Similarly, for a six month test period, server **130** may be configured to select the test start date no later than Jun. 30, 2004. Within these boundaries, server **130** may randomly select the test start date. Alternatively, server **130** may receive user input identifying the test start date.

In another aspect of the invention, server **130** may select a pre-period associated with the test period. A pre-period is a selected period of time extending back from the test start date. For example, server **130** may select a pre-period of one month. Thus, if Sep. 1, 2004 is selected as the test start date, the one-month pre-period would include Aug. 1, 2004 through Aug. 31, 2004. The pre-period may be equal to, or different from, the selected test period for the defined test type. Also, the pre-period may be selected based on the type of parameter settings and corresponding parameter setting options selected in step **1910**. That is, if the test type includes a parameter setting option for determining how to select the pre-period, server **130** selects the pre-period according to that selected parameter setting option.

Also, based on the selected parameter settings, server **130** may determine a control site group for the virtual test, reflecting a selected set of sites (i.e., business locations **114**) within business network **110**. For example, a control group selection parameter setting option may direct server **130** to select the control group from the remaining sites in business network **110** that are not included in the set of selected virtual test sites. Thus, server **130** may select the remaining 950 sites in the exemplary **1000** sites of business network **110** that were not chosen for the 50 virtual test sites. As noted above, a control group parameter setting may configure server **130** to select the control group based on different criteria, and thus the above examples are not intended to be limiting.

Once the parameter setting set, virtual test sites, and test start date are determined, server **130** may execute the model to run a virtual test. The model may execute an initiative test based on the configuration information and produce a result for a selected performance metric (Step **1950**). For instance, if the model is configured to monitor sales data, server **130** may execute a process to collect sales data for the selected virtual test sites for the selected pre-period and test period. Thus, following the above examples, server **130** may collect and analyze the historical data to determine the sales data for the fifty virtual test sites during August 2004 and September 2004. Additionally, server **130** may collect and analyze the historical data for the control group to determine the sales data for the sites within that group (e.g., 950 sites). As noted above, server **130** may produce different types of result data based on the type of performance metric being monitored by server **130** when performing the virtual test.

Once the performance data (e.g., sales data) is determined, server **130** may determine the noise for the parameter setting set selected in step **1910** (e.g., (PS)={PS1(1), PS2(1), PS3(1), PS4(1)}) (Step **1960**). As explained, noise may be represented as a value reflecting an inconsistency in the performance data for the virtual test sites in relation to the control site group. Thus, when the performance data for the virtual test sites vary from the performance data for the control group sites, server **130** may calculate a value reflecting this difference. Because the server **130** has created a simulation environment by performing the virtual test on the virtual test sites, no actual initiative was performed in these test sites. Accordingly, the performance data for the virtual test sites determined during the virtual test should be similar, if not identical to, the performance data for the control group. For instance, server **130** may determine during the virtual test that the control group experienced a 2.5% sales lift from August 2004 to September 2004 (e.g., performance metric result data for the pre-period vs. the performance metric result data for the test period). Server **130** may also determine that the virtual test sites experienced a 3% sales lift during the same time frame. This difference (i.e., 0.5% lift) may be the result of a difference in the sales trends between the test set and control group. Accordingly, server **130** may identify the difference as a quantified value of noise. Server **130** may then store the determined noise for the selected parameter setting set in a data structure maintained in a memory device, such as database **140** (Step **1970**).

According to certain aspects of the invention, server **130** may be configured to iteratively run a virtual test for the selected parameter setting for a predetermined number of times. Accordingly, server **130** may define a iteration threshold that controls how many times the selected parameter setting set is tested (e.g., 10 times, 100 times, etc.). The iteration threshold value may be determined at any time before checking the threshold, such as when the test type is defined (e.g., step **1820**), when selecting the parameter setting set (step **1910**), etc. Therefore, as server **130** performs a virtual test for a selected parameter setting set, it may track the number of times it has run a virtual test on the set. As such, in step **1980**, server **130** determines whether the iteration threshold has been met. If so (Step **1980**; Yes), the virtual test process continues to Step **1990**. However, if the iteration threshold is not met (Step **1980**; No), server **130** may return to step **1920** to select a new set of virtual test sites and new test date to run another virtual test for determining a new noise value for the selected parameter setting set. The new noise value for the current iteration is also stored in the data structure. This process continues until the iteration threshold is met (e.g., the selected parameter setting is tested 100 times).

Once the iteration threshold is met, server **130** may determine whether all combinations of the parameter settings have been iteratively tested. In one aspect, server **130** may determine whether a parameter setting set threshold is met, which may be set equal to PS(Max) previously determined by server **130** (Step **1990**). If the threshold is met (Step **1990**; Yes), the virtual test process ends (Step **1995**). On the other hand, if the parameter setting set threshold is not met (Step **1990**; No), server **130** selects a new parameter setting set from the available combinations previously determined, and repeats the iterative testing processes described above. In this regard, server **130** ensures each combination of parameter settings based on their corresponding options have been iteratively tested, and a noise value determined and stored in the data structure.

c. Determining Noise

As explained, server **130** may execute a software process that determines noise for each iteration of a virtual test of a selected parameter setting set. Noise reflects a quantified measurement of inconsistent performance data for sites used in the analysis performed by a business initiative testing model. FIG. **20** shows a flowchart of an exemplary noise determination process consistent with certain aspects related to the present invention.

In step **2010**, server **130** may determine the performance data for the virtual test during the pre-period and test period.

In one aspect, server **130** may access database **140** to collect the historical data for each virtual test site to determine, based on the selected performance metric, the performance data during each time period. Server **130** may average the determined performance data for the virtual test sites, or determine other statistical values associated with the determined performance data. Similarly, server **130** also determines the performance data for the control group sites during the pre-period and test period (Step **2020**). Server **130** may then determine the noise for the selected parameter setting set based on a comparison of the performance data for the virtual test sites and control group sites (Step **2030**).

To better understand these aspects of the present invention, FIG. **21** shows a block diagram of performance data associated with a virtual test having a test period **2160** and pre-period **2150** of one month, a test start date **2710** of Sep. 1, 2004, and a performance metric of total sales. As shown, server **130** may determine for the virtual test sites the performance data for a pre-period **2110** (e.g., August 2004) and a test period **2120** (e.g., September 2004). Server **130** may also determine, for the control group sites, the performance data for the pre-period **2130** and test period **2140**. Server **130** may also determine a statistical value associated with the performance data of each period for both control sites and virtual test sites. For instance, based on a parameter setting controlling how server **130** looks at performance data during the virtual test, server **130** may determine that the absolute sales performance data for the virtual test sites shows a 3% lift from August 2004 to September 2004. On the other hand, server **130** may determine that the absolute sales performance data for the control group sites shows a 2.5% lift in the same time frame. Server **130** may quantify this difference as noise. Thus, based on the determined performance data, server **130** determines the noise value for the selected parameter setting set as roughly 0.5 (i.e., (1.03/1.025)−1). This noise value is stored in the data structure in accordance with the disclosed aspects of the present invention.

Although as described above, server **130** determines noise based on a difference of performance data, methods and systems consistent with certain aspects of the present invention are not limited to the above examples and may quantify noise based on other relationships between performance data of the test and control sites.

d. Determining Parameter Settings

FIG. **22** shows a flowchart of an exemplary parameter setting process consistent with certain aspects of the present invention. In one aspect, once the noise values for each iterative test of each parameter setting set are determined and stored, server **130** may determine the average noise for each parameter setting set and store the average noise value in the data structure. (Step **2210**). Thus, server **130** may maintain in database **140**, for example, a data structure of noise values corresponding to each parameter setting set. FIG. **23** shows a block diagram of an exemplary data structure **2300** consistent with certain aspects of the present invention. In one example, data structure **2300** includes a field for each parameter setting set **2310** included in the available combinations of parameter setting sets (e.g., up to PS(Max)). As shown, each parameter setting set includes particular parameter setting set options for each parameter setting. Data structure **2300** shows exemplary parameter setting options for four parameter settings, each having four parameter setting options. Thus, parameter setting set **1** includes the set, {PS1(1), PS2(1), PS3(1), PS4(1)} and parameter setting set PS(MAX) includes the set {PS1(4), PS2(4), PS3(4), PS4(4)}. Further, each parameter setting set field **2310** includes a noise value **2320** for each virtual test iteration performed by server **130**. In this example, data structure **2300** includes 100 noise values representing the determined noise for each of the 100 virtual test iterations performed by server **130** for a given parameter setting set. Additionally, server **130** may determine and store the average noise value **2330** for a given parameter setting set based on the iteration noise values **2320**.

In another aspect of the present invention, server **130** may store noise values in a data structure based on each parameter setting option. FIG. **24** shows a block diagram of an exemplary data structure **2400** consistent with these aspects. As shown, exemplary data structure **2400** includes data associated with a four parameter setting combination, each parameter setting including four options. Data structure includes fields including data identifying each parameter setting option **2450** for a given parameter setting **2410-2440**. Each parameter setting option **2450** is associated with fields including noise values **2460** determined by server **130** during different iterations of the virtual tests. In this example, data structure **2400** include 100 noise values reflecting the 100 times server **130** determined a noise value when the given parameter setting option was used during the virtual test (e.g., 1, 2, 3, or 4). For example, parameter setting option 1 of the first parameter setting **2410** includes noise values for 100 iterations of the virtual test when that option was used to configure the model performing the virtual test. Thus, when performing the virtual test process, server **130** may store a noise value in a successive field for parameter setting option 1, each time that option was tested. Server **130** may also determine and store the average noise **2470** for each parameter setting option **2450** of each parameter setting **2410-2440** in data structure **2400**.

Aspects of the present invention are not limited to the configurations shown in FIGS. **23** and **24**. Server **130** may configure and store noise values in any type of data structure and memory device. Further, aspects of the present invention are not limited to server **130** storing average noise values and/or parameter setting set noise values in the same data structure as the noise values. For example, data structures **2300** and/or **2400** may each represent a data structure formed from multiple data structures distributed across multiple memory devices.

Once the average noise value for each parameter setting is determined, server **130** may determine the optimal combination of parameter settings for the parameter settings (Step **2220**). In one aspect, server **130** may identify the parameter setting set having the lowest average noise as the optimal parameter setting set. For example, server **130** may search the data structure storing the average noise values to identify the lowest values. Thus, for example, if a parameter setting set **3** of FIG. **23** includes the lowest average noise **2360**, server **130** may designate parameter setting {PS1(3), PS2(1), PS3(1), PS4(1)} as the optimal parameter setting. In other words, server **130** will define the parameter settings for the given test type to include the third parameter setting option of parameter setting one, and the first parameter setting option of parameter settings two through four.

In another example corresponding to data structure **2400**, server **130** may identify the lowest average noise value for each parameter setting option for each parameter setting, and then combine these lowest average noise values to form the optimal parameter settings to define the default settings. For example, FIG. **25** shows data structure **2400** identifying exemplary lowest average noise values **2515**, **2525**, **2535**, and **2545** for respective parameter setting options **2510**, **2520**, **2530**, and **2540**. Accordingly, in this example, server

130 may form an optimal parameter setting set including, {PS1(4), PS2(4), PS3(3), PS4(1)}.

It should be noted, server **130** may be configured to execute programs that identify the lowest noise values for the parameter settings using different methods than that described above. As such, the above described processes are exemplary and not intended to be limiting.

e. Performing an Initiative Test Using Parameters

In accordance with certain aspects of the present invention, once server **130** identifies the parameter settings for a given test type, the setting is stored in a memory device (e.g., database **140**) for subsequent use by server **130** when running an initiative test for selected test sites. FIG. **26** shows a flowchart of an exemplary initiative test process consistent with these aspects of the invention. Initially, at some time, server **130** may receive a request to perform an initiative test for a selected set of test sites in a manner consistent with that described above and in parent U.S. patent application Ser. No. 10/767,191. Server **130** may retrieve parameter settings for the requested initiative test based on the type of test to be performed (Step **2620**). In one aspect, server **130** may access database **140** to retrieve the parameter settings previously determined by running the virtual tests for that test type in accordance with the processes described above. Once retrieved, server **130** configures the initiative test in accordance with the parameter settings, and performs the test (Step **2630**). Results may then be collected and processed by server **130** in a manner consistent with that described above and in parent U.S. patent application Ser. No. 10/767,191 (Step **2640**).

VI. CONCLUSION

Variations of the methods and systems consistent with features of the present invention previously described may be implemented without departing from the scope of the invention. For example, server **130** may be configured with software that automatically performs some or all of the analysis and decisions performed by a user operating client **118**. For instance, server **130** may include software stored in memory **136** that, when executed by processing unit **134**, analyzes the list of attributes ranked according to their impact on the performance metric values of the test sites (e.g., correlation and/or r-squared values). Server **130** may also execute software that selects the model and associated parameters (e.g., attributes, iterations, etc.) for predicting the performance levels of the test and non-test group sites. Additional, server **130** may execute software that selects one or more of the non-test group sites to implement the tested initiative based on the predicted performance values produced by the executed model. The above processes are not intended to be limiting and other procedures may be performed by software processes executed by server **130** and/or client **118** to supplement and/or compliment those decisions, data input, and analysis performed by a user.

Also, although the initiative analysis process is described as using web server and browser software for exchanging information with client **118** and server **120**, methods and systems consistent with aspects of the invention may use any type of technology to allow a user to send and receive information from server **120**. Further, although the above described aspects of the invention include communications between a client **118** and a server **120**, methods and systems consistent with aspects of the invention are not limited to client-server network configurations. That is, a user associated with business network **110** may leverage a computing environment that is local (i.e., same computing system) to a system operated by the user.

Moreover, the virtual test processes described herein are not limited to the sequences, steps, and systems shown in FIGS. **18**-**26**. Additional, fewer, and different processes and elements may be implemented to configure and run the virtual test processes to identify noise values for given parameter settings.

Further, methods, systems, and articles of manufacture, consistent with features of the present invention may be implemented using various network models, and is not limited to a particular computer and/or network environment. Furthermore, methods, systems, and articles of manufacture, consistent with features of the present invention are not limited to the implementation of systems and processes compliant any particular type of programming language. Any number of programming languages may be utilized without departing from the scope of the present invention.

Additionally, although aspects of the present invention are described as being associated with data stored in memory and other storage mediums, one skilled in the art will appreciate that these aspects can also be stored on or read from other types of computer-readable media, such as secondary storage devices, like hard disks, floppy disks, or CD-ROM; a carrier wave from the Internet; or other forms of RAM or ROM. Accordingly, the invention is not limited to the above described aspects of the invention, but instead is defined by the appended claims in light of their full scope of equivalents.

What is claimed is:

[1. A method for determining optimal parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network, comprising:

identifying, by a computer, a business initiative testing model having a set of parameter settings;

selecting a first parameter setting set for performing the virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the business initiative testing model;

performing, by a computer, a virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test performed on test sites where no actual initiative test has been implemented at those test sites, and wherein the virtual test is performed on the virtual test sites using a variation of each parameter setting;

determining, by a computer, actual performance data associated with the set of virtual test sites;

determining, by a computer, actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining a noise value for the first parameter setting set, the noise value reflecting an inconsistency between performance data associated, with the set of virtual test sites and performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining, by a computer, a set of optimal parameter settings for the business initiative testing model based on results from the virtual test whereby the optimal parameter settings best minimize noise from the results; and

configuring, by a computer, the business initiative testing model using the optimal parameter settings to test a business initiative for application in the business network.]

[2. The method of claim 1, wherein performing the virtual test includes:

performing a series of virtual tests for each possible combination of the parameter settings for the business initiative testing model.]

[3. The method of claim 2, wherein iteratively performing the series of virtual tests includes:

determining a noise value for the respective parameters settings combination for each iteration of the series of virtual tests for a given parameter settings combination.]

[4. The method of claim 3, further including:

for each iteration of the series of virtual tests for a given parameter settings combination,

storing the determined noise value in a data structure including data reflecting noise values for each iteration of the virtual test performed on the virtual test sites for each of the parameter settings combinations.]

[5. The method of claim 3, further including:

for each given parameter settings combination,

determining an average noise value for the given parameter settings combination based on stored noise values for each iteration of the virtual test for the given parameter settings combination.]

[6. The method of claim 2, wherein performing the series of virtual tests for each possible combination of the parameter settings includes:

for each iteration of the series of virtual tests,

randomly selecting the set of virtual test sites, and

randomly selecting a test start date for collecting historical data associated with each of the randomly selected virtual test sites.]

[7. The method of claim 1, further including:

iteratively performing the virtual test on the set of virtual test sites using the first parameter setting set until an iteration threshold is met.]

[8. The method of claim 1, wherein iteratively performing the virtual test includes:

storing a noise value for each iteration and first parameter setting in a data structure.]

[9. The method of claim 1, further including:

selecting a second parameter setting set when the iteration threshold is met; and

iteratively performing the virtual test on the set of virtual test sites using the second parameter setting set until the iteration threshold is met.]

[10. The method of claim 1, wherein iteratively performing the virtual test includes:

storing a noise value for each iteration and second parameter setting in the data structure.]

[11. The method of claim 1, wherein determining optimal parameter settings for the first test type includes:

analyzing the noise values associated with the first and second parameter settings sets; and

selecting either the first or second parameter settings set as the optimal parameter settings based on whether the first or second parameter settings sets have a lower average noise value over the iterations of the virtual test.]

[12. The method according to claim 1, further comprising defining a test type associated with the business initiative testing model, wherein the test type is defined based on an attribute of the business initiative test.]

[13. The method of claim 12, wherein determining the set of optimal parameter settings includes:

identifying the parameter settings combination having the lowest average noise value as the optimal parameter settings for the first test type of the business initiative testing model.]

[14. The method of claim 12, wherein configuring the business initiative testing model further includes:

receiving a request identifying the first test type to test the business initiative to apply to the business network.]

[15. The method of claim 12, wherein defining the first test type includes:

defining a test period and a test pre-period, each reflecting a period of time that historical data was collected for the business locations included in the business network.]

[16. The method of claim 12, further including:

defining a second test type of the business initiative model;

performing the virtual test based on the defined second test type to determine second optimal parameter settings for the second test type; and

performing a business initiative test using the second test type of the business initiative testing model that is automatically configured using the second optimal parameter settings.]

[17. The method according to claim 1, wherein each parameter setting comprises a set of one or more parameter setting options, wherein a parameter setting option further defines a parameter setting.]

[18. A system for determining optimal parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network, the system including:

a computer configured to: identify a business initiative testing model having a set of parameter settings;

selecting a first parameter setting set for performing the virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the business initiative testing model;

execute a virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test for-test sites where no actual initiative test has been implemented at those test sites, and wherein the virtual test is performed on the virtual test sites using a variation of each parameter setting;

determine actual performance data associated with the set of virtual test sites;

determine actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining a noise value for the first parameter setting set, the noise value reflecting an inconsistency between performance data associated, with the set of virtual test sites and performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determine a set of optimal parameter settings for the business initiative testing model based on results from the virtual test whereby the optimal parameter settings best minimize noise from the results; and

configure the business initiative testing model using the optimal parameter settings to a test on a business initiative to apply to the business network.]

[19. The system of claim **18**, wherein the computer is further configured to:

perform a series of virtual tests for each possible combination of the parameter settings for the business initiative testing model.]

[20. The system of claim **19**, wherein the computer is further configured to perform the series of virtual tests by:

determining a noise value for the respective parameters settings combination for each iteration of the series of virtual tests for a given parameter settings combination.]

[21. The system of claim **20**, wherein the computer is further configured to:

for each iteration of the series of virtual tests for a given parameter settings combination,

store the determined noise value in a data structure including data reflecting noise values for each iteration of the virtual test performed on the virtual test sites for each of the parameter settings combinations.]

[22. The system of claim **20**, wherein the computer is further configured to:

for each given parameter settings combination,

determine an average noise value for the given parameter settings combination based on stored noise values for each iteration of the virtual test for the given parameter settings combination.]

[23. The system of claim **22**, wherein the computer is further configured to determine the set of optimal parameter settings by identifying the parameter settings combination having the lowest average noise value as the optimal parameter settings of the business initiative testing model.]

[24. The system of claim **19**, wherein the computer is further configured to perform the series of virtual tests for each possible combination of the parameter settings by:

for each iteration of the series of virtual tests, randomly selecting the set of virtual test sites, and

randomly selecting a test start date for collecting historical' data associated with each of the randomly selected virtual test sites.]

[25. The system of claim **24**, wherein the computer is further configured to:

defining a test period and a test pre-period, each reflecting a period of time that historical data was collected for the business locations included in the business network.]

[26. The system of claim **18**, wherein the computer is further configured to:

receive a request identifying the first test type to test the business initiative to apply to the business network, and

define the first test type of the business initiative testing model based on the request.]

[27. The system of claim **18**, wherein the computer is further configured to:

iteratively perform the virtual test on the set of virtual test sites using the first parameter setting set until an iteration threshold is met.]

[28. The system of claim **18**, wherein the computer is further configured to iteratively perform the virtual test by storing a noise value for each iteration and first parameter setting in a data structure.]

[29. The system of claim **18**, wherein the computer is further configured to:

select a second parameter setting set when the iteration threshold is met; and

iteratively perform the virtual test on the set of virtual test sites using the second parameter setting set until the iteration threshold is met.]

[30. The system of claim **18**, wherein the computer is further configured to iteratively perform the virtual test by storing a noise value for each iteration and second parameter setting in the data structure.]

[31. The system of claim **18**, wherein the computer is further configured to determine optimal parameter settings by:

analyzing the noise values associated with the first and second parameter settings sets; and

selecting either the first or second parameter settings set as the optimal parameter settings based on whether the first or second parameter settings sets have a lower average noise value over the iterations of the virtual test.]

[32. The system according to claim **18**, wherein a test type is associated with the business initiative testing model and is defined based on an attribute of the business initiative test.]

[33. The system of claim **32**, wherein the computer is further configured to:

define a second test type of the business initiative model;

perform the virtual test based on the defined second test type to determine second optimal parameter settings for the second test type; and

perform a business initiative test using the second test type of the business initiative testing model that is configured using the second optimal parameter settings.]

[34. A non-transitory computer-readable medium including instructions for, when executed by a processor, performing a method for determining optimal parameter settings for business initiative testing software used for testing initiatives for business locations included in a business network, the method comprising:

identifying, by a computer, a business initiative testing model having a set of parameter settings;

selecting a first parameter setting set for performing the virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the business initiative testing model;

performing, by a computer, a virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test using a variation of each parameter setting and is performed on test sites where no actual initiative test is performed on the virtual test sites;

determining, by a computer, actual performance data associated with the set of virtual test sites;

determining, by a computer, actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining a noise value for the first parameter setting set, the noise value reflecting an inconsistency between performance data associated, with the set of virtual test sites and performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining, by a computer, a set of optimal parameter settings for the business initiative testing model based on results from the virtual test whereby the optimal parameter settings best minimize noise from the results; and

configuring, by a computer, the business initiative testing model using the optimal parameter settings to test a business initiative to apply to the business network.]

[35. A method for testing business initiatives comprising:

receiving, by a computer, a request to test a business initiative to be applied to a set of business locations in a business network;

determining, by a computer, actual performance data associated with a set of virtual test sites;

determining, by a computer, actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

configuring, by a computer, a business initiative testing model based on the request and a default set of parameter settings for the model, each default parameter setting having a set of parameter setting options and the default set of parameter settings reflecting optimal parameter settings for the model that are determined by identifying a combination of parameter setting options that produce the least amount of noise during iterations of a set of virtual business initiative tests performed for selected virtual test sites, wherein each virtual test is a simulated business initiative test performed on test sites where no actual initiative test has been implemented at those test sites and wherein noise is a measurement of inconsistency between performance data associated with the set of virtual test sites and performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings; and

testing, by a computer, the business initiative using the configured business initiative testing model to produce results reflecting a predicted performance of the business initiative if applied to the set of business locations.]

36. A method for determining optimal parameter settings for a predictive machine-learning model in business initiative testing software used to filter inconsistent data for testing initiatives for business locations included in a business network, comprising:

identifying, by a computer, a predictive machine-learning business initiative testing model having a set of parameter settings;

selecting, by the computer, a first parameter setting set for performing a virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the predictive machine-learning business initiative testing model, wherein at least one parameter setting includes a time period;

simulating performance of the first parameter setting set by performing, by the computer, the virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test performed on test sites where no actual initiative test has been implemented at those test sites, and wherein the virtual test is iteratively performed on the virtual test sites using a variation of a parameter setting option for each parameter setting;

determining, by the computer, actual performance data associated with the set of virtual test sites;

determining, by the computer, actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using tested parameter settings;

determining, by the computer, a noise value for the first parameter setting set, the noise value reflecting an inconsistency between actual performance data associated with the set of virtual test sites and actual performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining, by the computer, a set of optimal parameter settings for the predictive machine-learning business initiative testing model based on results from performing the virtual test whereby the optimal parameter settings best minimize the noise value from the results;

training, by the computer, the predictive machine-learning business initiative testing model by configuring, by the computer, the predictive machine-learning business initiative testing model using the optimal parameter settings based on the noise value for each parameter setting option of each parameter setting of the parameter setting set to test a business initiative for application in the business network; and

executing, by the computer, the predictive machine-learning model using the set of optimal parameter settings.

37. The method of claim 36, wherein performing the virtual test includes:

performing, by the computer, a series of virtual tests for each possible combination of the parameter settings for the predictive machine-learning business initiative testing model.

38. The method of claim 37, wherein iteratively performing the series of virtual tests includes:

determining, by the computer, a noise value for the respective parameters settings combination for each iteration of the series of virtual tests for a given parameter settings combination.

39. The method of claim 38, further including:

for each iteration of the series of virtual tests for a given parameter settings combination, storing, by the computer, the determined noise value in a data structure including data reflecting noise values for each iteration of the virtual test performed on the virtual test sites for each of the parameter settings combinations.

40. The method of claim 38, further including:

for each given parameter settings combination, determining, by the computer, an average noise value for the given parameter settings combination based on stored noise values for each iteration of the virtual test for the given parameter settings combination.

41. The method of claim 37, wherein performing the series of virtual tests for each possible combination of the parameter settings includes:

for each iteration of the series of virtual tests, randomly selecting, by the computer, the set of virtual test sites, and

randomly selecting, by the computer, a test start date for collecting historical data associated with each of the randomly selected virtual test sites.

42. The method of claim 36, further including:

iteratively performing, by the computer, the virtual test on the set of virtual test sites using the first parameter setting set until an iteration threshold is met.

43. The method of claim 36, wherein iteratively performing the virtual test includes:

storing, by the computer, a noise value for each iteration and first parameter setting in a data structure.

44. The method of claim 42, further including:

selecting, by the computer, a second parameter setting set when the iteration threshold is met; and

iteratively performing, by the computer, the virtual test on the set of virtual test sites using the second parameter setting set until the iteration threshold is met.

45. The method of claim 44, wherein iteratively performing the virtual test includes:

storing, by the computer, a noise value for each iteration and second parameter setting in a data structure.

46. The method of claim 44, wherein determining optimal parameter settings for a first test type includes:

analyzing, by the computer, the noise values associated with the first and second parameter settings sets; and

selecting, by the computer, either the first or second parameter settings set as the optimal parameter settings based on whether the first and second parameter settings sets have a lower average noise value over the iterations of the virtual test,

wherein the first test type is defined based on an attribute of the simulated business initiative test.

47. The method according to claim 36, further comprising defining, by the computer, a test type associated with the predictive machine-learning business initiative testing model, wherein the test type is defined based on an attribute of the simulated business initiative test.

48. The method of claim 46, wherein determining the set of optimal parameter settings includes:

identifying, by the computer, the parameter settings combination having the lowest average noise value as the optimal parameter settings for the first test type of the predictive machine-learning business initiative testing model.

49. The method of claim 46, wherein configuring the predictive machine-learning business initiative testing model further includes:

receiving, by the computer, a request identifying the first test type to test the business initiative to apply to the business network.

50. The method of claim 46, wherein defining the first test type includes:

defining, by the computer, a test period and a test pre-period, each reflecting a period of time that historical data was collected for the business locations included in the business network.

51. The method of claim 46, further including:

defining, by the computer, a second test type of the predictive machine-learning business initiative testing model;

performing, by the computer, the virtual test based on the defined second test type to determine second optimal parameter settings for the second test type; and

performing, by the computer, a simulated business initiative test using the second test type of the business initiative testing model that is automatically configured using the second optimal parameter settings.

52. The method according to claim 36, wherein each parameter setting comprises a set of one or more parameter setting options, wherein a parameter setting option further defines a parameter setting.

53. A system for determining optimal parameter settings for a predictive machine-learning model in business initiative testing software used to filter inconsistent data for testing initiatives for business locations included in a business network, the system including:

a computer comprising a processor and a non-transitory computer-readable medium including instructions that when executed by the processor are configured to:

identify a predictive machine-learning business initiative testing model having a set of parameter settings;

selecting a first parameter setting set for performing a virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the predictive machine-learning business initiative testing model, wherein at least one parameter setting includes a time period;

execute the virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test for test sites where no actual initiative test has been implemented at those test sites, and wherein the virtual test is iteratively performed on the virtual test sites using a variation of a parameter setting option for each parameter setting;

determine actual performance data associated with the set of virtual test sites; determine actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using tested parameter settings;

determine a noise value for the first parameter setting set, the noise value reflecting an inconsistency between actual performance data associated with the set of virtual test sites and actual performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

train the predictive machine-learning business initiative testing model by automatically configuring the predictive machine-learning business initiative testing model when the processor determines a set of optimal parameter settings for the predictive machine-learning business initiative testing model based on results from performing the virtual test whereby the optimal parameter settings best minimize the noise value from the results based on the noise value for each parameter setting option of each parameter setting;

configure the predictive machine-learning business initiative testing model using the optimal parameter settings to test a business initiative to apply to the business network; and

execute the predictive machine-learning business initiative testing model using the set of optimal parameter settings.

54. The system of claim 53, wherein the computer is further configured to:

perform a series of virtual tests for each possible combination of the parameter settings for the predictive machine-learning business initiative testing model.

55. The system of claim 54, wherein the computer is further configured to perform the series of virtual tests by:

determining a noise value for the respective parameters settings combination for each iteration of the series of virtual tests for a given parameter settings combination.

56. The system of claim 55, wherein the computer is further configured to:

for each iteration of the series of virtual tests for a given parameter settings combination, store the determined noise value in a data structure including data reflecting noise values for each iteration of the virtual test performed on the virtual test sites for each of the parameter settings combinations.

57. The system of claim 55, wherein the computer is further configured to:

for each given parameter settings combination, determine an average noise value for the given parameter settings combination based on stored noise values for each iteration of the virtual test for the given parameter settings combination.

58. The system of claim 57, wherein the computer is further configured to determine the set of optimal parameter settings by identifying the parameter settings combination having the lowest average noise value as the optimal parameter settings of the predictive machine-learning business initiative testing model.

59. The system of claim 54, wherein the computer is further configured to perform the series of virtual tests for each possible combination of the parameter settings by:

for each iteration of the series of virtual tests, randomly selecting the set of virtual test sites, and randomly selecting a test start date for collecting historical data associated with each of the randomly selected virtual test sites.

60. The system of claim 59, wherein the computer is further configured to:

define a test period and a test pre-period, each reflecting a period of time that historical data was collected for the business locations included in the business network.

61. The system of claim 53, wherein the computer is further configured to:

receive a request, identifying a first test type, to test the business initiative to apply to the business network, and

define the first test type of the predictive machine-learning business initiative testing model based on the request.

62. The system of claim 53, wherein the computer is further configured to:

iteratively perform the virtual test on the set of virtual test sites using the first parameter setting set until an iteration threshold is met.

63. The system of claim 53, wherein the computer is further configured to iteratively perform the virtual test by storing a noise value for each iteration and first parameter setting in a data structure.

64. The system of claim 62, wherein the computer is further configured to:

select a second parameter setting set when the iteration threshold is met; and

iteratively perform the virtual test on the set of virtual test sites using the second parameter setting set until the iteration threshold is met.

65. The system of claim 64, wherein the computer is further configured to iteratively perform the virtual test by storing a noise value for each iteration and second parameter setting set in a data structure.

66. The system of claim 64, wherein the computer is further configured to determine optimal parameter settings by:

analyzing the noise values associated with the first and second parameter settings sets; and

selecting either the first or second parameter settings sets set as the optimal parameter settings based on whether the first or second parameter settings sets have a lower average noise value over the iterations of the virtual test.

67. The system according to claim 53, wherein the first test type is associated with the predictive machine-learning business initiative testing model and is defined based on an attribute of the simulated business initiative test.

68. The system of claim 61, wherein the computer is further configured to:

define a second test type of the predictive machine learning business initiative model;

perform the virtual test based on the defined second test type to determine a second optimal parameter settings set for the second test type; and

perform a business initiative test using the second test type of the predictive machine-learning business initiative testing model that is configured using the second optimal parameter settings set.

69. A non-transitory computer-readable medium including instructions for, when executed by a processor, performing a method for determining optimal parameter settings for a predictive machine-learning model in business initiative testing software used to filter inconsistent data for testing initiatives for business locations included in a business network, the method comprising:

identifying, by a computer, a predictive machine-learning model business initiative testing model having a set of parameter settings;

selecting, by the computer, a first parameter setting set for performing a virtual test, the first parameter setting set including a set of selected parameter setting options each respectively corresponding to one of the parameter settings for the predictive machine-learning model business initiative testing model, wherein at least one parameter setting includes a time period;

performing, by the computer, the virtual test on a set of virtual test sites, each virtual test site reflecting a selected business location in the business network, wherein each virtual test is a simulated business initiative test iteratively performed using a variation of a parameter setting option for each parameter setting and is performed on test sites where no actual initiative test is performed on the virtual test sites;

determining, by the computer, actual performance data associated with the set of virtual test sites;

determining, by the computer, actual performance data associated with a set of control group sites reflecting second selected business locations in the business network using tested parameter settings;

determining, by the computer, a noise value for the first parameter setting set, the noise value reflecting an inconsistency between actual performance data associated, with the set of virtual test sites and actual performance data associated with the set of control group sites reflecting second selected business locations in the business network using the tested parameter settings;

determining, by the computer, a set of optimal parameter settings for the predictive machine-learning model business initiative testing model based on results from performing the virtual test whereby the optimal parameter settings best minimize the noise value from the results;

training, by the computer, the predictive machine-learning business initiative testing model by automatically configuring, by the computer, the predictive machine-learning model business initiative testing model using *the optimal parameter settings to best minimize noise based on the noise value for each parameter setting option of each parameter setting of the parameter setting set to test a business initiative to apply to the business network; and*

executing, by the computer, the predictive machine-learning business initiative testing model using the set of optimal parameter settings.

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