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**Courbage et al.**

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(54) **SYSTEM AND METHOD FOR PROVIDING AN AGGREGATION TOOL**

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CPC ..... ***G06Q 40/025*** (2013.01); ***G06F 16/90*** (2019.01); ***G06Q 40/04*** (2013.01); *G06F 1/00* (2013.01); *G06F 11/07* (2013.01); *G06F 11/22* (2013.01)

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(56) **References Cited**

U.S. PATENT DOCUMENTS

3,316,395 A 4/1967 Lavin et al.
4,305,059 A 12/1981 Benton
(Continued)

FOREIGN PATENT DOCUMENTS

DE 91 08 341 10/1991
EP 0 350 907 1/1990
(Continued)

OTHER PUBLICATIONS

12/022954, U.S. Pat. No. 8,606,666, System and Method for Providing an Aggregation Tool, filed Jan. 30, 2008.
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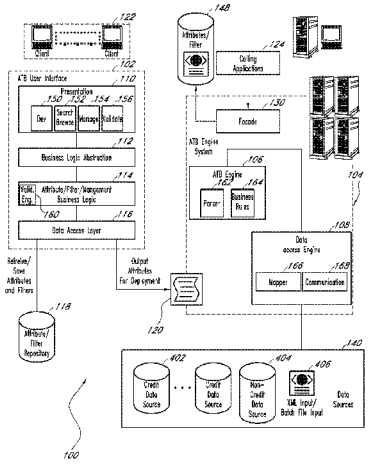
(57) **ABSTRACT**

Embodiments of the present invention assist in the development, management, and deployment of aggregated data attributes for multiple data sources. One embodiment provides a development interface that allows for elements of attributes, including filters, to be moved into a coding area in which an attribute or an attribute element is being edited. In another embodiment, the user interface presents data fields to assist in the development of filters for multiple data sources with divergent formats. The application further provides a validation interface through which users can validate attributes and trace the results returned by various elements referenced by the attributes under validation. Another embodiment provides a system for managing attributes and deploying them to various systems by creating a
(Continued)



deployment file that is used by an attribute calculation system. In one embodiment, the attribute calculation system is a scalable system that dynamically calculates attributes for multiple data sources.

**19 Claims, 17 Drawing Sheets**

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(58) **Field of Classification Search**
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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS


| | | | | |
|---|---|---|---|---|
| 4,371,739 | A | 2/1983 | Lewis et al. | |
| 4,398,055 | A | 8/1983 | Ijaz et al. | |
| 4,578,530 | A | 3/1986 | Zeidler | |
| 4,617,195 | A | 10/1986 | Mental | |
| 4,672,149 | A | 6/1987 | Yoshikawa et al. | |
| 4,736,294 | A | 4/1988 | Gill | |
| 4,754,544 | A | 7/1988 | Hanak | |
| 4,774,664 | A | 9/1988 | Campbell et al. | |
| 4,812,628 | A | 3/1989 | Boston et al. | |
| 4,827,508 | A | 5/1989 | Shear | |
| 4,868,570 | A | 9/1989 | Davis | |
| 4,876,592 | A | 10/1989 | Von Kohorn | |
| 4,895,518 | A | 1/1990 | Arnold | |
| 4,935,870 | A | 6/1990 | Burk, Jr. et al. | |
| 4,947,028 | A | 8/1990 | Gorog | |
| 5,025,138 | A | 6/1991 | Cuervo | |
| 5,025,373 | A | 6/1991 | Keyser, Jr. et al. | |
| 5,034,807 | A | 7/1991 | Von Kohorn | |
| 5,060,153 | A | 10/1991 | Nakagawa | |
| 5,148,365 | A | 9/1992 | Dembo | |
| 5,201,010 | A | 4/1993 | Deaton et al. | |
| 5,216,612 | A | 6/1993 | Cornett et al. | |
| 5,220,501 | A | 6/1993 | Lawlor et al. | |
| 5,247,575 | A | 9/1993 | Sprague et al. | |
| 5,259,766 | A | 11/1993 | Sack | |
| 5,262,941 | A | 11/1993 | Saladin | |
| 5,274,547 | A | 12/1993 | Zoffel et al. | |
| 5,297,031 | A | 3/1994 | Gutterman et al. | |
| 5,325,509 | A | 6/1994 | Lautzenheiser | |
| 5,336,870 | A | 8/1994 | Hughes et al. | |
| 5,341,429 | A | 8/1994 | Stringer et al. | |
| 5,454,030 | A | 9/1995 | de Oliveira et al. | |
| 5,468,988 | A | 11/1995 | Glatfelter et al. | |
| 5,504,675 | A | 4/1996 | Cragun et al. | |
| 5,528,701 | A | 6/1996 | Aref | |
| 5,555,409 | A | 9/1996 | Leenstra, Sr. et al. | |
| 5,563,783 | A | 10/1996 | Stolfo et al. | |
| 5,583,763 | A | 12/1996 | Atcheson et al. | |
| 5,590,038 | A | 12/1996 | Pitroda | |
| 5,592,560 | A | 1/1997 | Deaton et al. | |
| 5,611,052 | A | 3/1997 | Dykstra et al. | |
| 5,615,408 | A | 3/1997 | Johnson | |
| 5,621,201 | A | 4/1997 | Langhans et al. | |
| 5,629,982 | A | 5/1997 | Micali | |
| 5,630,070 | A | 5/1997 | Dietrich et al. | |
| 5,630,127 | A | 5/1997 | Moore et al. | |
| 5,640,551 | A | 6/1997 | Chu et al. | |
| 5,640,577 | A | 6/1997 | Scharmer | |
| 5,655,129 | A | 8/1997 | Ito | |
| 5,659,731 | A | 8/1997 | Gustafson | |
| 5,666,528 | A | 9/1997 | Thai | |
| 5,679,176 | A | 10/1997 | Tsuzuki et al. | |
| 5,689,651 | A | 11/1997 | Lozman | |
| 5,692,107 | A | 11/1997 | Simoudis et al. | |
| 5,696,907 | A | 12/1997 | Tom | |
| 5,704,029 | A | 12/1997 | Wright, Jr. | |
| 5,732,400 | A | 3/1998 | Mandler | |
| 5,737,732 | A | 4/1998 | Gibson et al. | |
| 5,745,654 | A | 4/1998 | Titan | |
| 5,748,098 | A | 5/1998 | Grace | |
| 5,765,143 | A | 6/1998 | Sheldon et al. | |
| 5,768,423 | A | 6/1998 | Aref et al. | |
| 5,771,562 | A | 6/1998 | Harvey et al. | |
| 5,774,692 | A | 6/1998 | Boyer et al. | |
| 5,774,868 | A | 6/1998 | Cragun et al. | |
| 5,774,883 | A | 6/1998 | Andersen | |
| 5,778,405 | A | 7/1998 | Ogawa | |
| 5,793,972 | A | 8/1998 | Shane | |
| 5,797,136 | A | 8/1998 | Boyer et al. | |
| 5,802,142 | A | 9/1998 | Browne | |
| 5,812,840 | A | 9/1998 | Shwartz | |
| 5,819,226 | A | 10/1998 | Gopinathan et al. | |
| 5,822,750 | A | 10/1998 | Jou et al. | |
| 5,822,751 | A | 10/1998 | Gray et al. | |
| 5,825,884 | A | 10/1998 | Zdepski et al. | |
| 5,828,833 | A | 10/1998 | Belville et al. | |
| 5,832,068 | A | 11/1998 | Smith | |
| 5,835,915 | A * | 11/1998 | Carr | G06F 11/1458 714/38.14 |
| 5,844,218 | A | 12/1998 | Kawan et al. | |
| 5,864,830 | A | 2/1999 | Armetta et al. | |
| 5,870,721 | A | 2/1999 | Norris | |
| 5,875,108 | A | 2/1999 | Hoffberg et al. | |
| 5,875,236 | A | 2/1999 | Jankowitz | |
| 5,878,403 | A | 3/1999 | DeFrancesco | |
| 5,881,131 | A | 3/1999 | Farris et al. | |
| 5,884,287 | A | 3/1999 | Edesess | |
| 5,884,289 | A | 3/1999 | Anderson et al. | |
| 5,893,090 | A | 4/1999 | Friedman et al. | |
| 5,905,985 | A | 5/1999 | Malloy et al. | |
| 5,912,839 | A | 6/1999 | Ovshinsky et al. | |
| 5,924,082 | A | 7/1999 | Silverman et al. | |
| 5,930,764 | A | 7/1999 | Melchione et al. | |
| 5,930,774 | A | 7/1999 | Chennault | |
| 5,930,776 | A | 7/1999 | Dykstra et al. | |
| 5,940,812 | A | 8/1999 | Tengel et al. | |
| 5,950,172 | A | 9/1999 | Klingman | |
| 5,956,693 | A | 9/1999 | Geerlings | |
| 5,963,932 | A | 10/1999 | Jakobsson et al. | |
| 5,966,695 | A | 10/1999 | Melchione et al. | |
| 5,974,396 | A * | 10/1999 | Anderson | G06Q 30/02 705/14.25 |
| 5,995,947 | A | 11/1999 | Fraser et al. | |
| 6,014,688 | A | 1/2000 | Venkatraman et al. | |
| 6,021,362 | A | 2/2000 | Maggard et al. | |
| 6,026,368 | A | 2/2000 | Brown et al. | |
| 6,029,139 | A | 2/2000 | Cunningham et al. | |
| 6,029,149 | A | 2/2000 | Dykstra et al. | |
| 6,029,154 | A | 2/2000 | Pettitt | |
| 6,038,551 | A | 3/2000 | Barlow et al. | |
| 6,044,357 | A | 3/2000 | Garg | |
| 6,058,375 | A | 5/2000 | Park | |
| 6,061,658 | A | 5/2000 | Chou et al. | |
| 6,061,691 | A | 5/2000 | Fox | |
| 6,064,973 | A | 5/2000 | Smith et al. | |
| 6,064,987 | A | 5/2000 | Walker | |
| 6,070,141 | A | 5/2000 | Houvener | |
| 6,070,142 | A | 5/2000 | McDonough et al. | |
| 6,070,147 | A | 5/2000 | Harms et al. | |
| 6,073,140 | A | 6/2000 | Morgan et al. | |
| 6,088,686 | A | 7/2000 | Walker et al. | |

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,094,643 A 7/2000 Anderson et al.
6,105,007 A 8/2000 Norris
6,115,690 A 9/2000 Wong
6,115,693 A 9/2000 McDonough et al.
6,119,103 A 9/2000 Basch et al.
6,121,901 A 9/2000 Welch et al.
6,128,599 A 10/2000 Walker
6,128,602 A 10/2000 Northington et al.
6,128,603 A 10/2000 Dent
6,128,624 A 10/2000 Papierniak et al.
6,134,548 A 10/2000 Gottsman et al.
6,144,957 A 11/2000 Cohen et al.
6,151,601 A 11/2000 Papierniak et al.
6,157,927 A 12/2000 Schaefer et al.
6,178,442 B1 1/2001 Yamazaki
6,185,543 B1 2/2001 Galperin et al.
6,198,217 B1 3/2001 Suzuki et al.
6,202,053 B1 3/2001 Christiansen et al.
6,208,979 B1 3/2001 Sinclair
6,223,171 B1 * 4/2001 Chaudhuri ..... G06F 11/3447 707/718
6,226,408 B1 5/2001 Sirosh
6,233,566 B1 5/2001 Levine et al.
6,236,977 B1 5/2001 Verba et al.
6,239,352 B1 5/2001 Luch
6,249,770 B1 6/2001 Erwin et al.
6,254,000 B1 7/2001 Degen et al.
6,256,630 B1 7/2001 Gilai et al.
6,263,334 B1 7/2001 Fayyad et al.
6,263,337 B1 7/2001 Fayyad et al.
6,266,649 B1 7/2001 Linden et al.
6,278,055 B1 8/2001 Forrest et al.
6,285,983 B1 9/2001 Jenkins
6,285,987 B1 9/2001 Roth et al.
6,289,252 B1 9/2001 Wilson et al.
6,304,869 B1 10/2001 Moore et al.
6,307,958 B1 10/2001 Deaton et al.
6,311,169 B2 10/2001 Duhon
6,324,524 B1 11/2001 Lent et al.
6,330,546 B1 12/2001 Gopinathan et al.
6,330,575 B1 12/2001 Moore et al.
6,334,110 B1 12/2001 Walter et al.
6,339,769 B1 1/2002 Cochrane et al.
6,345,300 B1 2/2002 Bakshi et al.
6,366,903 B1 4/2002 Agrawal et al.
6,385,594 B1 5/2002 Lebda et al.
6,393,406 B1 5/2002 Eder
6,405,173 B1 6/2002 Honarvar
6,405,181 B2 6/2002 Lent et al.
6,412,012 B1 6/2002 Bieganski et al.
6,418,436 B1 7/2002 Degen et al.
6,424,956 B1 7/2002 Werbos
6,430,539 B1 8/2002 Lazarus et al.
6,442,577 B1 8/2002 Britton et al.
6,446,200 B1 9/2002 Ball et al.
6,456,979 B1 9/2002 Flagg
6,457,012 B1 9/2002 Jatkowski
6,496,819 B1 12/2002 Bello et al.
6,505,168 B1 1/2003 Rothman et al.
6,513,018 B1 1/2003 Culhane
6,523,022 B1 2/2003 Hobbs
6,523,041 B1 2/2003 Morgan et al.
6,542,894 B1 4/2003 Lee et al.
6,549,919 B2 4/2003 Lambert et al.
6,567,791 B2 5/2003 Lent et al.
6,574,623 B1 6/2003 Laung et al.
6,597,775 B2 7/2003 Lawyer et al.
6,601,234 B1 * 7/2003 Bowman-Amuah ..... G06Q 10/06375 717/108
6,611,816 B2 8/2003 Lebda et al.
6,615,193 B1 9/2003 Kingdon et al.
6,615,247 B1 9/2003 Murphy
6,622,266 B1 9/2003 Goddard et al.
6,623,529 B1 9/2003 Lakritz
6,640,215 B1 10/2003 Galperin et al.
6,651,220 B1 11/2003 Penteroudakis et al.
6,654,727 B2 11/2003 Tilton
6,658,393 B1 12/2003 Basch et al.
6,665,715 B1 12/2003 Houri
6,687,713 B2 2/2004 Mattson et al.
6,708,166 B1 3/2004 Dysart et al.
6,714,918 B2 3/2004 Hillmer et al.
6,714,944 B1 3/2004 Shapiro et al.
6,735,572 B2 5/2004 Landesmann
6,738,748 B2 5/2004 Wetzer
6,748,426 B1 6/2004 Shaffer et al.
6,757,740 B1 6/2004 Parekh et al.
6,766,327 B2 7/2004 Morgan, Jr. et al.
6,804,346 B1 10/2004 Mewhinney
6,804,701 B2 10/2004 Muret et al.
6,823,319 B1 11/2004 Lynch et al.
6,836,764 B1 12/2004 Hucal
6,839,682 B1 1/2005 Blume et al.
6,839,690 B1 1/2005 Foth et al.
6,850,606 B2 2/2005 Lawyer et al.
6,850,895 B2 2/2005 Brodersen et al.
6,859,785 B2 2/2005 Case
6,865,566 B2 3/2005 Serrano-Morales et al.
6,873,979 B2 3/2005 Fishman et al.
6,901,406 B2 5/2005 Nabe et al.
6,910,624 B1 6/2005 Natsuno
6,934,714 B2 8/2005 Meinig
6,954,757 B2 10/2005 Zargham et al.
6,959,281 B1 10/2005 Freeling et al.
6,965,889 B2 11/2005 Serrano-Morales et al.
6,983,379 B1 1/2006 Spalink et al.
6,983,478 B1 1/2006 Grauch et al.
6,985,887 B1 1/2006 Sunstein et al.
6,991,159 B2 1/2006 Zenou
6,993,493 B1 1/2006 Galperin et al.
7,003,504 B1 * 2/2006 Angus ..... G06F 16/254
7,028,001 B1 4/2006 Muthuswamy et al.
7,028,052 B2 4/2006 Chapman et al.
7,031,945 B1 4/2006 Donner
7,035,855 B1 4/2006 Kilger et al.
7,039,176 B2 5/2006 Borodow et al.
7,047,251 B2 5/2006 Reed et al.
7,050,986 B1 5/2006 Vance et al.
7,050,989 B1 5/2006 Hurt et al.
7,054,828 B2 5/2006 Heching et al.
7,072,963 B2 7/2006 Anderson et al.
7,076,462 B1 7/2006 Nelson et al.
7,076,475 B2 7/2006 Honarvar et al.
7,082,435 B1 7/2006 Guzman et al.
7,117,172 B1 10/2006 Black
7,133,935 B2 11/2006 Hedy
7,143,063 B2 11/2006 Lent
7,152,053 B2 12/2006 Serrano-Morales et al.
7,165,036 B2 1/2007 Kruk et al.
7,165,037 B2 1/2007 Lazarus et al.
7,167,907 B2 1/2007 Shaffer et al.
7,184,974 B2 2/2007 Shishido
7,185,016 B1 2/2007 Rasmussen
7,188,169 B2 3/2007 Buus et al.
7,200,602 B2 4/2007 Jonas
7,212,995 B2 5/2007 Schulkins
7,234,156 B2 6/2007 French et al.
7,240,059 B2 7/2007 Bayliss et al.
7,249,048 B1 7/2007 O'Flaherty
7,249,114 B2 7/2007 Burchetta et al.
7,263,506 B2 8/2007 Lee et al.
7,272,591 B1 9/2007 Ghazal et al.
7,275,083 B1 9/2007 Seibel et al.
7,277,875 B2 10/2007 Serrano-Morales et al.
7,277,900 B1 10/2007 Ganesh et al.
7,283,974 B2 10/2007 Katz et al.
7,296,734 B2 11/2007 Pliha
7,313,618 B2 12/2007 Braemer et al.
7,314,166 B2 1/2008 Anderson et al.
7,314,167 B1 1/2008 Kiliccote
7,324,962 B1 1/2008 Valliani et al.
7,328,169 B2 2/2008 Temares et al.
7,337,133 B1 2/2008 Bezos et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,343,149 B2 3/2008 Benco
7,346,551 B2 3/2008 Pe Jimenez et al.
7,346,573 B1 3/2008 Cobrinik et al.
7,366,694 B2 4/2008 Lazerson
7,367,011 B2 4/2008 Ramsey et al.
7,370,044 B2 5/2008 Mulhern et al.
7,373,324 B1 5/2008 Engin et al.
7,376,603 B1 5/2008 Mayr et al.
7,376,618 B1 5/2008 Anderson et al.
7,376,714 B1 5/2008 Gerken
7,379,880 B1 5/2008 Pathria et al.
7,383,215 B1 6/2008 Navarro et al.
7,386,786 B2 6/2008 Davis et al.
7,392,203 B2 6/2008 Edison et al.
7,392,216 B1 6/2008 Palmgren et al.
7,403,942 B1 7/2008 Bayliss
7,409,362 B2 8/2008 Calabria
7,418,431 B1 8/2008 Nies et al.
7,421,322 B1 9/2008 Silversmith et al.
7,421,442 B2 9/2008 Gelb et al.
7,424,439 B1 9/2008 Fayyad et al.
7,428,509 B2 9/2008 Klebanoff
7,428,526 B2 9/2008 Miller et al.
7,433,855 B2 10/2008 Gavan et al.
7,433,864 B2 10/2008 Malik
7,444,302 B2 10/2008 Hu et al.
7,451,113 B1 11/2008 Kasower
7,458,508 B1 12/2008 Shao et al.
7,467,127 B1 12/2008 Baccash et al.
7,467,401 B2 12/2008 Cicchitto
7,472,088 B2 12/2008 Taylor et al.
7,475,118 B2 1/2009 Leiba et al.
7,483,842 B1 1/2009 Fung et al.
7,499,868 B2 3/2009 Galperin et al.
7,505,938 B2 3/2009 Lang et al.
7,509,117 B2 3/2009 Yum
7,512,221 B2 3/2009 Toms
7,516,149 B2 4/2009 Motwani et al.
7,529,698 B2 5/2009 Joao
7,533,179 B2 5/2009 Tarquini et al.
7,536,346 B2 5/2009 Aliffi et al.
7,542,993 B2 6/2009 Satterfield et al.
7,546,266 B2 6/2009 Beirne et al.
7,548,886 B2 6/2009 Kirkland et al.
7,552,089 B2 6/2009 Bruer et al.
7,556,192 B2 7/2009 Wokaty, Jr.
7,562,093 B2 7/2009 Gelb et al.
7,562,184 B2 7/2009 Henmi et al.
7,571,139 B1 8/2009 Giordano et al.
7,575,157 B2 8/2009 Barnhardt et al.
7,580,856 B1 8/2009 Pliha
7,581,112 B2 8/2009 Brown et al.
7,584,126 B1 9/2009 White
7,584,146 B1 9/2009 Duhon
7,590,589 B2 9/2009 Hoffberg
7,593,893 B1 9/2009 Ladd et al.
7,596,512 B1 9/2009 Raines et al.
7,596,716 B2 9/2009 Frost et al.
7,610,216 B1 10/2009 May et al.
7,610,243 B2 10/2009 Haggerty et al.
7,610,257 B1 * 10/2009 Abrahams ..... G06Q 20/10 705/38
7,613,671 B2 11/2009 Serrano-Morales et al.
7,620,592 B2 11/2009 O'Mara et al.
7,620,596 B2 11/2009 Knudson et al.
7,623,844 B2 11/2009 Herrmann et al.
7,624,068 B1 11/2009 Heasley et al.
7,653,592 B1 1/2010 Flaxman et al.
7,657,471 B1 2/2010 Sankaran et al.
7,657,540 B1 2/2010 Bayliss
7,668,769 B2 2/2010 Baker et al.
7,668,840 B2 2/2010 Bayliss et al.
7,672,833 B2 3/2010 Blume et al.
7,672,865 B2 3/2010 Kumar et al.
7,672,924 B1 3/2010 Scheurich et al.
7,672,926 B2 3/2010 Ghazal et al.
7,676,418 B1 * 3/2010 Chung ..... G06Q 10/06393 705/36 R
7,676,751 B2 3/2010 Allen et al.
7,686,214 B1 3/2010 Shao et al.
7,689,494 B2 3/2010 Torre et al.
7,689,504 B2 3/2010 Warren et al.
7,689,505 B2 3/2010 Kasower
7,690,032 B1 3/2010 Peirce
7,698,163 B2 4/2010 Reed et al.
7,702,550 B2 4/2010 Perg et al.
7,707,059 B2 4/2010 Reed et al.
7,707,102 B2 4/2010 Rothstein
7,708,190 B2 5/2010 Brandt et al.
7,711,635 B2 5/2010 Steele et al.
7,720,846 B1 5/2010 Bayliss
7,725,300 B2 5/2010 Pinto et al.
7,734,523 B1 6/2010 Cui et al.
7,734,539 B2 6/2010 Ghosh et al.
7,742,982 B2 6/2010 Chaudhuri et al.
7,747,480 B1 6/2010 Agresta et al.
7,747,559 B2 6/2010 Leitner et al.
7,752,236 B2 7/2010 Williams et al.
7,756,789 B2 7/2010 Welker et al.
7,761,384 B2 7/2010 Madhogarhia
7,778,885 B1 8/2010 Semprevivo et al.
7,783,515 B1 8/2010 Kumar et al.
7,783,562 B1 8/2010 Ellis
7,788,147 B2 8/2010 Haggerty et al.
7,788,152 B2 8/2010 Haggerty et al.
7,792,732 B2 9/2010 Haggerty et al.
7,793,835 B1 9/2010 Coggeshall et al.
7,797,252 B2 9/2010 Rosskamm et al.
7,801,811 B1 9/2010 Merrell et al.
7,801,812 B2 9/2010 Conlin et al.
7,802,104 B2 9/2010 Dickinson
7,805,345 B2 9/2010 Abrahams et al.
7,805,362 B1 9/2010 Merrell et al.
7,814,004 B2 10/2010 Haggerty et al.
7,814,005 B2 10/2010 Imrey et al.
7,818,228 B1 10/2010 Coulter
7,818,231 B2 10/2010 Rajan
7,822,665 B2 10/2010 Haggerty et al.
7,827,115 B2 11/2010 Weller et al.
7,835,983 B2 11/2010 Lefner et al.
7,836,111 B1 11/2010 Shan
7,840,484 B2 11/2010 Haggerty et al.
7,844,534 B2 11/2010 Haggerty et al.
7,848,987 B2 12/2010 Haig
7,853,518 B2 12/2010 Cagan
7,853,998 B2 12/2010 Blaisdell et al.
7,856,397 B2 12/2010 Whipple et al.
7,856,494 B2 12/2010 Kulkarni
7,870,078 B2 1/2011 Clark et al.
7,877,304 B1 1/2011 Coulter
7,877,320 B1 1/2011 Downey
7,890,420 B2 2/2011 Haggerty et al.
7,908,242 B1 * 3/2011 Achanta ..... G06F 16/2453 707/602
7,912,770 B2 3/2011 Haggerty et al.
7,912,842 B1 3/2011 Bayliss et al.
7,912,865 B2 3/2011 Akerman et al.
7,925,549 B2 4/2011 Looney et al.
7,925,582 B1 4/2011 Kornegay et al.
7,930,242 B2 4/2011 Morris et al.
7,930,285 B2 4/2011 Abraham et al.
7,941,363 B2 5/2011 Tanaka et al.
7,958,126 B2 * 6/2011 Schachter ..... G06F 16/9535 707/748
7,962,404 B1 6/2011 Metzger, II et al.
7,966,255 B2 6/2011 Wong et al.
7,970,676 B2 6/2011 Feinstein
7,983,932 B2 7/2011 Kane
7,983,976 B2 7/2011 Nafeh et al.
7,991,666 B2 8/2011 Haggerty et al.
7,991,677 B2 8/2011 Haggerty et al.
7,991,689 B1 8/2011 Brunzell et al.
7,991,901 B2 8/2011 Tarquini et al.
7,996,521 B2 8/2011 Chamberlain et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,996,912 B2 8/2011 Spalink et al.
8,005,759 B2 8/2011 Hirtenstein et al.
8,006,261 B1 8/2011 Haberman et al.
8,015,045 B2 9/2011 Galperin et al.
8,019,843 B2 9/2011 Cash et al.
8,024,245 B2 9/2011 Haggerty et al.
8,024,264 B2 9/2011 Chaudhuri et al.
8,024,778 B2 9/2011 Cash et al.
8,036,979 B1 10/2011 Torrez et al.
8,046,271 B2 10/2011 Jimenez et al.
8,060,424 B2 11/2011 Kasower
8,065,234 B2 11/2011 Liao et al.
8,073,752 B2 12/2011 Haggerty et al.
8,073,768 B2 12/2011 Haggerty et al.
8,078,524 B2 12/2011 Crawford et al.
8,082,202 B2 12/2011 Weiss
8,086,509 B2 12/2011 Haggerty et al.
8,086,524 B1 12/2011 Craig et al.
8,099,341 B2 1/2012 Varghese
8,103,530 B2 1/2012 Quiring et al.
8,121,918 B2 2/2012 Haggerty et al.
8,126,805 B2 2/2012 Sulkowski et al.
8,127,982 B1 3/2012 Casey et al.
8,127,986 B1 3/2012 Taylor et al.
8,131,614 B2 3/2012 Haggerty et al.
8,131,639 B2 3/2012 Haggerty et al.
8,145,754 B2 3/2012 Chamberlain et al.
8,160,960 B1 * 4/2012 Fei ..... G06Q 20/10 705/39
8,161,104 B2 4/2012 Tomkow
8,170,938 B2 5/2012 Haggerty et al.
8,175,945 B2 5/2012 Haggerty et al.
8,180,654 B2 5/2012 Berkman et al.
8,185,408 B2 5/2012 Baldwin, Jr. et al.
8,204,774 B2 6/2012 Chwast et al.
8,209,250 B2 6/2012 Bradway et al.
8,214,238 B1 7/2012 Fairfield et al.
8,214,262 B1 7/2012 Semprevivo et al.
8,271,378 B2 9/2012 Chaudhuri et al.
8,280,805 B1 10/2012 Abrahams et al.
8,285,577 B1 10/2012 Galperin et al.
8,285,656 B1 * 10/2012 Chang ..... G06N 5/02 706/15
8,290,840 B2 10/2012 Kasower
8,296,229 B1 10/2012 Yellin et al.
8,312,033 B1 11/2012 McMillan
8,315,942 B2 11/2012 Haggerty et al.
8,315,943 B2 11/2012 Torrez et al.
8,321,952 B2 11/2012 Spalink et al.
8,326,671 B2 12/2012 Haggerty et al.
8,326,672 B2 12/2012 Haggerty et al.
8,326,760 B2 12/2012 Ma et al.
8,352,343 B2 1/2013 Haggerty et al.
8,364,518 B1 * 1/2013 Blake ..... G06Q 30/02 705/7.32
8,386,377 B1 2/2013 Xiong et al.
8,392,334 B2 3/2013 Hirtenstein et al.
8,401,889 B2 3/2013 Chwast et al.
8,417,587 B2 4/2013 Jimenez et al.
8,458,074 B2 6/2013 Showalter
8,463,919 B2 6/2013 Tarquini et al.
8,468,198 B2 6/2013 Tomkow
8,478,673 B2 7/2013 Haggerty et al.
8,478,674 B1 7/2013 Kapczynski et al.
8,510,184 B2 8/2013 Imrev et al.
8,510,189 B2 8/2013 Imrey et al.
8,515,828 B1 8/2013 Wolf et al.
8,515,862 B2 * 8/2013 Zhang ..... G06Q 40/00 705/38
8,533,322 B2 9/2013 Chamberlain et al.
8,560,434 B2 10/2013 Morris et al.
8,595,101 B1 11/2013 Daukas et al.
8,600,854 B2 12/2013 Mayr et al.
8,606,626 B1 12/2013 DeSoto et al.
8,606,666 B1 12/2013 Courbage et al.
8,626,646 B2 1/2014 Torrez et al.
8,630,929 B2 1/2014 Haggerty et al.
8,639,616 B1 1/2014 Rolenaitis et al.
8,639,920 B2 1/2014 Stack et al.
8,694,390 B2 4/2014 Imrey et al.
8,706,596 B2 4/2014 Cohen et al.
8,732,004 B1 5/2014 Ramos et al.
8,738,515 B2 5/2014 Chaudhuri et al.
8,768,826 B2 7/2014 Imrey et al.
8,775,299 B2 7/2014 Achanta et al.
8,781,953 B2 7/2014 Kasower
8,781,975 B2 7/2014 Bennett et al.
8,825,544 B2 9/2014 Imrey et al.
9,058,340 B1 6/2015 Chamberlain et al.
9,063,226 B2 6/2015 Zheng et al.
9,378,500 B2 6/2016 Jimenez et al.
9,508,092 B1 11/2016 De Soto et al.
9,509,711 B1 * 11/2016 Keanini ..... G06F 21/6254
9,563,916 B1 2/2017 Torrez et al.
9,619,579 B1 4/2017 Courbage et al.
9,652,802 B1 * 5/2017 Kasower ..... G06Q 40/00
9,870,589 B1 * 1/2018 Arnold ..... G06Q 40/025
9,916,596 B1 3/2018 DeSoto et al.
9,916,621 B1 * 3/2018 Wasser ..... G06Q 40/025
10,078,868 B1 9/2018 Courbage et al.
10,121,194 B1 11/2018 Torrez et al.
2001/0011245 A1 8/2001 Duhon
2001/0013011 A1 8/2001 Day et al.
2001/0016833 A1 8/2001 Everling et al.
2001/0027413 A1 10/2001 Bhutta
2001/0037332 A1 11/2001 Miller et al.
2001/0039523 A1 11/2001 Iwamoto
2002/0019804 A1 2/2002 Sutton
2002/0023051 A1 2/2002 Kunzle et al.
2002/0023143 A1 2/2002 Stephenson et al.
2002/0026507 A1 2/2002 Sears et al.
2002/0035511 A1 3/2002 Haji et al.
2002/0046096 A1 4/2002 Srinivasan et al.
2002/0049626 A1 4/2002 Mathias et al.
2002/0049701 A1 4/2002 Nabe et al.
2002/0049738 A1 4/2002 Epstein
2002/0052836 A1 5/2002 Galperin et al.
2002/0055869 A1 5/2002 Hegg
2002/0069122 A1 6/2002 Yun et al.
2002/0077964 A1 * 6/2002 Brody ..... G06Q 30/02 705/38
2002/0082892 A1 6/2002 Raffel et al.
2002/0087460 A1 7/2002 Hornung
2002/0095360 A1 7/2002 Joao
2002/0099628 A1 7/2002 Takaoka et al.
2002/0099641 A1 7/2002 Mills et al.
2002/0099649 A1 7/2002 Lee et al.
2002/0099824 A1 7/2002 Bender et al.
2002/0101979 A1 * 8/2002 Borodow ..... H04L 29/06027 379/265.02
2002/0103809 A1 8/2002 Starzl et al.
2002/0111816 A1 8/2002 Lortscher et al.
2002/0111845 A1 8/2002 Chong
2002/0123928 A1 9/2002 Eldering et al.
2002/0128960 A1 9/2002 Lambiotte et al.
2002/0128962 A1 9/2002 Kasower
2002/0133444 A1 9/2002 Sankaran et al.
2002/0133504 A1 9/2002 Vlahos et al.
2002/0138297 A1 9/2002 Lee
2002/0138331 A1 9/2002 Hosea et al.
2002/0138417 A1 9/2002 Lawrence
2002/0143661 A1 10/2002 Tumulty et al.
2002/0147623 A1 10/2002 Rifaat
2002/0147669 A1 10/2002 Taylor et al.
2002/0147695 A1 10/2002 Khedkar et al.
2002/0156676 A1 10/2002 Ahrens et al.
2002/0161664 A1 10/2002 Shaya et al.
2002/0161711 A1 10/2002 Sartor et al.
2002/0165757 A1 11/2002 Lisser
2002/0169747 A1 11/2002 Chapman et al.
2002/0173984 A1 11/2002 Robertson et al.
2002/0184255 A1 12/2002 Edd et al.
2002/0188544 A1 12/2002 Wizon et al.
2002/0194099 A1 12/2002 Weiss

(56) **References Cited**

U.S. PATENT DOCUMENTS

2002/0194140 A1 12/2002 Makuck
2002/0198824 A1 12/2002 Cook
2003/0000568 A1 1/2003 Gonsiorawski
2003/0002639 A1 1/2003 Huie
2003/0004787 A1 1/2003 Tripp et al.
2003/0004855 A1 1/2003 Dutta et al.
2003/0004865 A1 1/2003 Kinoshita
2003/0009368 A1 1/2003 Kitts
2003/0009393 A1 1/2003 Norris et al.
2003/0009418 A1 1/2003 Green et al.
2003/0009426 A1 1/2003 Ruiz-Sanchez
2003/0018549 A1 1/2003 Fei et al.
2003/0018578 A1 1/2003 Schultz
2003/0018769 A1 1/2003 Foulger et al.
2003/0023489 A1 1/2003 McGuire et al.
2003/0033242 A1 2/2003 Lynch et al.
2003/0033261 A1 2/2003 Knegendorf
2003/0036996 A1 2/2003 Lazerson
2003/0041031 A1 2/2003 Hedy
2003/0046222 A1 3/2003 Bard et al.
2003/0046223 A1 3/2003 Crawford et al.
2003/0050882 A1 3/2003 Degen et al.
2003/0061132 A1 3/2003 Yu et al.
2003/0061163 A1 3/2003 Durfield
2003/0065563 A1 4/2003 Elliott et al.
2003/0069839 A1 4/2003 Whittington et al.
2003/0078877 A1 4/2003 Beirne et al.
2003/0083893 A1* 5/2003 Aliffi ..... G06Q 20/403 705/1.1
2003/0093311 A1 5/2003 Knowlson
2003/0093366 A1 5/2003 Halper et al.
2003/0097320 A1 5/2003 Gordon
2003/0097342 A1 5/2003 Whittingtom
2003/0097380 A1 5/2003 Mulhern et al.
2003/0101344 A1 5/2003 Wheeler et al.
2003/0105696 A1 6/2003 Kalotay et al.
2003/0105728 A1 6/2003 Yano et al.
2003/0110111 A1 6/2003 Nalebuff et al.
2003/0110293 A1 6/2003 Friedman et al.
2003/0113727 A1 6/2003 Girn et al.
2003/0115080 A1 6/2003 Kasravi et al.
2003/0115133 A1 6/2003 Bian
2003/0120591 A1 6/2003 Birkhead et al.
2003/0135451 A1 7/2003 O'Brien et al.
2003/0139986 A1 7/2003 Roberts
2003/0144950 A1 7/2003 O'Brien et al.
2003/0149610 A1 8/2003 Rowan et al.
2003/0158751 A1 8/2003 Suresh et al.
2003/0164497 A1 9/2003 Carcia et al.
2003/0167218 A1 9/2003 Field et al.
2003/0171942 A1 9/2003 Gaito
2003/0182214 A1 9/2003 Taylor
2003/0191731 A1 10/2003 Stewart et al.
2003/0195830 A1 10/2003 Merkoulovitch et al.
2003/0195859 A1 10/2003 Lawrence
2003/0205845 A1 11/2003 Pichler et al.
2003/0208428 A1 11/2003 Raynes et al.
2003/0212618 A1 11/2003 Keyes et al.
2003/0212654 A1 11/2003 Harper et al.
2003/0216965 A1 11/2003 Libman
2003/0225656 A1 12/2003 Aberman et al.
2003/0225692 A1 12/2003 Bosch et al.
2003/0229892 A1 12/2003 Sardera
2003/0233323 A1 12/2003 Bilski et al.
2003/0233370 A1* 12/2003 Barabas ..... G06F 16/278
2003/0233655 A1 12/2003 Gutta et al.
2003/0236738 A1 12/2003 Lange et al.
2004/0002916 A1 1/2004 Timmerman et al.
2004/0006536 A1 1/2004 Kawashima et al.
2004/0010443 A1 1/2004 May et al.
2004/0010458 A1 1/2004 Friedman
2004/0019518 A1 1/2004 Abraham et al.
2004/0023637 A1 2/2004 Johnson et al.
2004/0024692 A1 2/2004 Turbeville et al.
2004/0029311 A1 2/2004 Snyder et al.
2004/0030649 A1 2/2004 Nelson et al.
2004/0030667 A1 2/2004 Xu et al.
2004/0033375 A1 2/2004 Mori
2004/0034570 A1 2/2004 Davis et al.
2004/0039681 A1 2/2004 Cullen et al.
2004/0039688 A1 2/2004 Sulkowski et al.
2004/0044615 A1 3/2004 Xue et al.
2004/0044617 A1 3/2004 Lu
2004/0046497 A1 3/2004 Shaepkens et al.
2004/0049452 A1 3/2004 Blagg
2004/0054619 A1 3/2004 Watson et al.
2004/0059653 A1 3/2004 Verkuylen et al.
2004/0062213 A1 4/2004 Koss
2004/0078248 A1 4/2004 Altschuler
2004/0088221 A1 5/2004 Katz et al.
2004/0093278 A1 5/2004 Burchetta et al.
2004/0098625 A1 5/2004 Lagadec et al.
2004/0102197 A1 5/2004 Dietz
2004/0103147 A1 5/2004 Flesher et al.
2004/0107123 A1 6/2004 Haffner et al.
2004/0107125 A1 6/2004 Guheen et al.
2004/0107132 A1 6/2004 Honarvar et al.
2004/0111305 A1 6/2004 Gavan et al.
2004/0111358 A1 6/2004 Lange et al.
2004/0111359 A1 6/2004 Hudock
2004/0111363 A1 6/2004 Trench et al.
2004/0117235 A1 6/2004 Shacham
2004/0117358 A1 6/2004 Von Kaenel et al.
2004/0122730 A1 6/2004 Tucciarone et al.
2004/0128150 A1 7/2004 Lundegren
2004/0128227 A1 7/2004 Whipple et al.
2004/0128230 A1 7/2004 Oppenheimer et al.
2004/0128232 A1 7/2004 Descloux
2004/0128236 A1 7/2004 Brown et al.
2004/0139035 A1 7/2004 Wang
2004/0143526 A1 7/2004 Monasterio et al.
2004/0143546 A1 7/2004 Wood et al.
2004/0153330 A1 8/2004 Miller et al.
2004/0153448 A1* 8/2004 Cheng ..... G06F 16/24535
2004/0158520 A1 8/2004 Noh
2004/0163101 A1 8/2004 Swix
2004/0167793 A1 8/2004 Masuoka et al.
2004/0176995 A1 9/2004 Fusz
2004/0177046 A1 9/2004 Ogram
2004/0193535 A1 9/2004 Barazesh
2004/0199456 A1 10/2004 Flint et al.
2004/0199458 A1 10/2004 Ho
2004/0199462 A1 10/2004 Starrs
2004/0199789 A1 10/2004 Shaw et al.
2004/0212299 A1 10/2004 Ishikawa et al.
2004/0220896 A1 11/2004 Finlay et al.
2004/0225586 A1 11/2004 Woods et al.
2004/0225594 A1 11/2004 Nolan, III et al.
2004/0225596 A1 11/2004 Kemper et al.
2004/0230448 A1 11/2004 Schaich
2004/0230459 A1 11/2004 Dordick et al.
2004/0230527 A1 11/2004 Hansen et al.
2004/0230534 A1 11/2004 McGough
2004/0230820 A1 11/2004 Hui Hsu et al.
2004/0243450 A1* 12/2004 Bernard, Jr. ..... G06Q 40/02 705/4
2004/0243518 A1 12/2004 Clifton et al.
2004/0243588 A1 12/2004 Tanner et al.
2004/0243641 A1 12/2004 Allen et al.
2004/0261116 A1 12/2004 Mckeown et al.
2005/0010513 A1 1/2005 Duckworth et al.
2005/0010555 A1 1/2005 Gallivan
2005/0015330 A1 1/2005 Beery et al.
2005/0021397 A1 1/2005 Cui et al.
2005/0021476 A1 1/2005 Candella et al.
2005/0027983 A1 2/2005 Klawon
2005/0033734 A1 2/2005 Chess et al.
2005/0038726 A1 2/2005 Salomon et al.
2005/0049991 A1 3/2005 Aggarwal
2005/0050027 A1 3/2005 Yeh et al.
2005/0058262 A1 3/2005 Timmins et al.
2005/0086261 A1 4/2005 Mammone
2005/0086579 A1* 4/2005 Leitner ..... G06Q 30/02 715/229

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0091164 A1 4/2005 Varble
2005/0097039 A1 5/2005 Kulcsar et al.
2005/0102206 A1 5/2005 Savasoglu et al.
2005/0102226 A1 5/2005 Oppenheimer et al.
2005/0125350 A1 6/2005 Tidwell et al.
2005/0130704 A1 6/2005 McParland et al.
2005/0137963 A1 6/2005 Ricketts et al.
2005/0144641 A1 6/2005 Lewis
2005/0149433 A1 7/2005 Rothstein
2005/0154664 A1 7/2005 Guy et al.
2005/0154665 A1 7/2005 Kerr
2005/0159996 A1 7/2005 Lazaraus et al.
2005/0177489 A1 8/2005 Neff et al.
2005/0189414 A1 9/2005 Fano et al.
2005/0192008 A1 9/2005 Desai et al.
2005/0197953 A1 9/2005 Broadbent et al.
2005/0197954 A1 9/2005 Maitland et al.
2005/0201272 A1 9/2005 Wang et al.
2005/0209922 A1 9/2005 Hofmeister
2005/0222900 A1 10/2005 Fuloria et al.
2005/0228692 A1 10/2005 Hodgon
2005/0251820 A1 11/2005 Stefanik et al.
2005/0256809 A1 11/2005 Sadri
2005/0262014 A1 11/2005 Fickes
2005/0262158 A1 11/2005 Sauermann
2005/0273442 A1 12/2005 Bennett et al.
2005/0278246 A1 12/2005 Friedman et al.
2005/0278542 A1 12/2005 Pierson et al.
2005/0288998 A1 12/2005 Verma et al.
2005/0289003 A1* 12/2005 Thompson ..... G06Q 30/02 705/14.28
2006/0004731 A1 1/2006 Seibel et al.
2006/0010055 A1 1/2006 Morita et al.
2006/0014129 A1 1/2006 Coleman et al.
2006/0020611 A1 1/2006 Gilbert et al.
2006/0031158 A1 2/2006 Orman
2006/0031747 A1 2/2006 Wada et al.
2006/0032909 A1 2/2006 Seegar
2006/0036543 A1 2/2006 Blagg et al.
2006/0041443 A1 2/2006 Horvath
2006/0041464 A1 2/2006 Powers et al.
2006/0041840 A1* 2/2006 Blair ..... G06F 17/227 715/249
2006/0059073 A1 3/2006 Walzak
2006/0059110 A1 3/2006 Madhok et al.
2006/0074986 A1 4/2006 Mallalieu et al.
2006/0074991 A1 4/2006 Lussier et al.
2006/0080126 A1 4/2006 Greer et al.
2006/0080230 A1 4/2006 Freiberg
2006/0080233 A1 4/2006 Mendelovich et al.
2006/0080251 A1 4/2006 Fried et al.
2006/0080263 A1 4/2006 Willis et al.
2006/0085454 A1 4/2006 Blegen et al.
2006/0089842 A1 4/2006 Medawar
2006/0095363 A1 5/2006 May
2006/0095923 A1 5/2006 Novack et al.
2006/0100954 A1 5/2006 Schoen
2006/0122921 A1 6/2006 Comerford et al.
2006/0129428 A1 6/2006 Wennberg
2006/0129481 A1 6/2006 Bhatt et al.
2006/0131390 A1 6/2006 Kim
2006/0136330 A1 6/2006 DeRoy et al.
2006/0149674 A1 7/2006 Cook et al.
2006/0155624 A1 7/2006 Schwartz
2006/0155639 A1 7/2006 Lynch et al.
2006/0161435 A1 7/2006 Atef et al.
2006/0173726 A1 8/2006 Hall et al.
2006/0173772 A1 8/2006 Hayes et al.
2006/0173776 A1 8/2006 Shalley et al.
2006/0178189 A1 8/2006 Walker et al.
2006/0178957 A1 8/2006 LeClaire
2006/0178971 A1 8/2006 Owen et al.
2006/0178983 A1 8/2006 Nice et al.
2006/0195390 A1 8/2006 Rusk et al.
2006/0202012 A1 9/2006 Grano et al.
2006/0204051 A1 9/2006 Holland, IV
2006/0206416 A1 9/2006 Farias
2006/0212350 A1 9/2006 Ellis et al.
2006/0218069 A1 9/2006 Aberman et al.
2006/0218079 A1 9/2006 Goldblatt et al.
2006/0229943 A1 10/2006 Mathias et al.
2006/0229961 A1 10/2006 Lyftogt et al.
2006/0229996 A1 10/2006 Keithley et al.
2006/0239512 A1 10/2006 Petrillo
2006/0241923 A1 10/2006 Xu et al.
2006/0242039 A1 10/2006 Haggerty et al.
2006/0242046 A1 10/2006 Haggerty et al.
2006/0242047 A1 10/2006 Haggerty et al.
2006/0242048 A1 10/2006 Haggerty et al.
2006/0242049 A1 10/2006 Haggerty et al.
2006/0242050 A1 10/2006 Haggerty et al.
2006/0242051 A1 10/2006 Haggerty et al.
2006/0253328 A1 11/2006 Kohli et al.
2006/0253358 A1 11/2006 Delgrosso et al.
2006/0259364 A1 11/2006 Strock et al.
2006/0262929 A1 11/2006 Vatanen et al.
2006/0265243 A1 11/2006 Racho et al.
2006/0265323 A1 11/2006 Winter et al.
2006/0267999 A1* 11/2006 Cash ..... G06Q 40/02 345/581
2006/0271456 A1 11/2006 Romain et al.
2006/0271457 A1 11/2006 Romain et al.
2006/0271472 A1* 11/2006 Cagan ..... G06Q 40/02 705/38
2006/0271552 A1 11/2006 McChesney et al.
2006/0277092 A1 12/2006 Williams
2006/0277102 A1 12/2006 Agliozzo
2006/0277141 A1 12/2006 Palmer
2006/0282328 A1 12/2006 Gerace et al.
2006/0282359 A1 12/2006 Nobili et al.
2006/0293932 A1* 12/2006 Cash ..... G06Q 40/02 705/30
2006/0293979 A1* 12/2006 Cash ..... G06Q 20/4016 705/34
2006/0294199 A1* 12/2006 Bertholf ..... G06F 16/972 709/217
2007/0005508 A1 1/2007 Chiang
2007/0011026 A1 1/2007 Higgins et al.
2007/0011083 A1 1/2007 Bird et al.
2007/0016500 A1 1/2007 Chatterji et al.
2007/0016501 A1 1/2007 Chatterji et al.
2007/0016518 A1 1/2007 Atkinson et al.
2007/0016522 A1 1/2007 Wang
2007/0022141 A1 1/2007 Singleton et al.
2007/0027778 A1 2/2007 Schellhammer et al.
2007/0027791 A1 2/2007 Young et al.
2007/0030282 A1* 2/2007 Cash ..... G06Q 30/00 345/581
2007/0033227 A1 2/2007 Gaito et al.
2007/0038483 A1 2/2007 Wood
2007/0043654 A1 2/2007 Libman
2007/0055598 A1 3/2007 Arnott et al.
2007/0055599 A1 3/2007 Arnott
2007/0067207 A1 3/2007 Haggerty et al.
2007/0067208 A1 3/2007 Haggerty et al.
2007/0067209 A1 3/2007 Haggerty et al.
2007/0067285 A1* 3/2007 Blume ..... G06F 17/278
2007/0067297 A1 3/2007 Kublickis
2007/0067437 A1 3/2007 Sindambiwe
2007/0072190 A1 3/2007 Aggarwal
2007/0078741 A1 4/2007 Haggerty et al.
2007/0078985 A1 4/2007 Shao et al.
2007/0083460 A1 4/2007 Bachenheimer
2007/0093234 A1 4/2007 Willis et al.
2007/0094137 A1 4/2007 Phillips et al.
2007/0106582 A1 5/2007 Baker et al.
2007/0112667 A1 5/2007 Rucker
2007/0118393 A1 5/2007 Rosen et al.
2007/0156554 A1 7/2007 Nikoley et al.
2007/0156718 A1* 7/2007 Hossfeld ..... G06Q 50/20
2007/0168246 A1 7/2007 Haggerty et al.
2007/0168267 A1 7/2007 Zimmerman et al.
2007/0185797 A1 8/2007 Robinson
2007/0192165 A1 8/2007 Haggerty et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2007/0192248 A1 8/2007 West
2007/0205266 A1 9/2007 Carr et al.
2007/0208653 A1 9/2007 Murphy
2007/0220611 A1 9/2007 Socolow et al.
2007/0226093 A1* 9/2007 Chan ..... G06Q 40/00 705/35
2007/0226114 A1 9/2007 Haggerty et al.
2007/0226130 A1 9/2007 Haggerty et al.
2007/0244732 A1 10/2007 Chatterji et al.
2007/0244807 A1 10/2007 Andringa et al.
2007/0271178 A1 11/2007 Davis et al.
2007/0282684 A1 12/2007 Prosser et al.
2007/0282730 A1 12/2007 Carpenter et al.
2007/0282736 A1 12/2007 Conlin et al.
2007/0288271 A1 12/2007 Klinkhammer
2007/0288355 A1 12/2007 Roland et al.
2007/0288559 A1 12/2007 Parsadayan
2007/0294163 A1 12/2007 Harmon et al.
2007/0299759 A1 12/2007 Kelly
2007/0299771 A1 12/2007 Brody
2008/0004957 A1 1/2008 Hildreth et al.
2008/0005313 A1 1/2008 Flake et al.
2008/0010687 A1 1/2008 Gonen et al.
2008/0015887 A1 1/2008 Drabek et al.
2008/0015938 A1 1/2008 Haddad et al.
2008/0016099 A1* 1/2008 Ikeda ..... G06Q 30/06
2008/0021804 A1 1/2008 Deckoff
2008/0028067 A1 1/2008 Berkhin et al.
2008/0033852 A1 2/2008 Megdal et al.
2008/0059224 A1 3/2008 Schechter
2008/0059317 A1* 3/2008 Chandran ..... G06Q 20/20 705/16
2008/0059449 A1 3/2008 Webster et al.
2008/0065774 A1 3/2008 Keeler
2008/0066188 A1 3/2008 Kwak
2008/0071882 A1 3/2008 Hering et al.
2008/0077526 A1 3/2008 Arumugam
2008/0086368 A1 4/2008 Bauman et al.
2008/0091463 A1 4/2008 Shakamuri
2008/0097768 A1 4/2008 Godshalk
2008/0097928 A1 4/2008 Paulson
2008/0103800 A1 5/2008 Domenikos et al.
2008/0103972 A1 5/2008 Lanc
2008/0109444 A1 5/2008 Williams et al.
2008/0120155 A1 5/2008 Pliha
2008/0120569 A1 5/2008 Mann et al.
2008/0126233 A1 5/2008 Hogan
2008/0133322 A1 6/2008 Kalia et al.
2008/0133531 A1* 6/2008 Baskerville ..... G06F 21/6254
2008/0134042 A1 6/2008 Jankovich
2008/0140476 A1 6/2008 Anand et al.
2008/0140507 A1 6/2008 Hamlisch et al.
2008/0140549 A1 6/2008 Eder
2008/0147454 A1 6/2008 Walker et al.
2008/0167883 A1 7/2008 Thavildar Khazaneh
2008/0167936 A1 7/2008 Kapoor
2008/0175360 A1 7/2008 Schwarz et al.
2008/0177836 A1 7/2008 Bennett
2008/0183504 A1 7/2008 Highley
2008/0183564 A1 7/2008 Tien et al.
2008/0195425 A1 8/2008 Haggerty et al.
2008/0195600 A1 8/2008 Deakter
2008/0208548 A1 8/2008 Metzger et al.
2008/0208631 A1 8/2008 Morita et al.
2008/0208788 A1 8/2008 Merugu et al.
2008/0215470 A1 9/2008 Sengupta et al.
2008/0221934 A1 9/2008 Megdal et al.
2008/0221947 A1 9/2008 Megdal et al.
2008/0221970 A1 9/2008 Megdal et al.
2008/0221971 A1 9/2008 Megdal et al.
2008/0221972 A1 9/2008 Megdal et al.
2008/0221973 A1 9/2008 Megdal et al.
2008/0221990 A1 9/2008 Megdal et al.
2008/0222016 A1 9/2008 Megdal et al.
2008/0222027 A1 9/2008 Megdal et al.
2008/0228538 A1 9/2008 Megdal et al.
2008/0228539 A1 9/2008 Megdal et al.
2008/0228540 A1 9/2008 Megdal et al.
2008/0228541 A1 9/2008 Megdal et al.
2008/0228556 A1 9/2008 Megdal et al.
2008/0228606 A1 9/2008 Megdal et al.
2008/0228635 A1 9/2008 Megdal et al.
2008/0243680 A1 10/2008 Megdal et al.
2008/0244008 A1 10/2008 Wilkinson et al.
2008/0255897 A1 10/2008 Megdal et al.
2008/0255992 A1 10/2008 Lin
2008/0281737 A1 11/2008 Fajardo
2008/0288382 A1 11/2008 Smith et al.
2008/0294540 A1* 11/2008 Celka ..... G06Q 40/00 705/35
2008/0294546 A1 11/2008 Flannery
2008/0301016 A1 12/2008 Durvasula et al.
2008/0320575 A1 12/2008 Gelb et al.
2009/0006185 A1 1/2009 Stinson
2009/0006475 A1 1/2009 Udezue et al.
2009/0012889 A1 1/2009 Finch
2009/0018996 A1 1/2009 Hunt et al.
2009/0024428 A1 1/2009 Hudock, Jr.
2009/0024505 A1 1/2009 Patel et al.
2009/0037247 A1 2/2009 Quinn
2009/0037323 A1 2/2009 Feinstein et al.
2009/0043637 A1 2/2009 Eder
2009/0044279 A1 2/2009 Crawford et al.
2009/0060343 A1 3/2009 Rosca
2009/0089190 A1 4/2009 Girulat
2009/0089205 A1 4/2009 Bayne
2009/0106150 A1 4/2009 Pelegero et al.
2009/0112650 A1 4/2009 Iwane
2009/0119169 A1 5/2009 Chandratillake et al.
2009/0119199 A1 5/2009 Salahi
2009/0125369 A1 5/2009 Kloostra et al.
2009/0132347 A1 5/2009 Anderson et al.
2009/0132559 A1 5/2009 Chamberlain et al.
2009/0144102 A1 6/2009 Lopez
2009/0144160 A1 6/2009 Haggerty et al.
2009/0182653 A1 7/2009 Zimiles
2009/0199264 A1 8/2009 Lang
2009/0210886 A1 8/2009 Bhojwani et al.
2009/0216591 A1 8/2009 Buerger et al.
2009/0222308 A1 9/2009 Zoldi et al.
2009/0222373 A1 9/2009 Choudhuri et al.
2009/0222374 A1 9/2009 Choudhuri et al.
2009/0222375 A1 9/2009 Choudhuri et al.
2009/0222376 A1 9/2009 Choudhuri et al.
2009/0222377 A1 9/2009 Choudhuri et al.
2009/0222378 A1 9/2009 Choudhuri et al.
2009/0222379 A1 9/2009 Choudhuri et al.
2009/0222380 A1 9/2009 Choudhuri et al.
2009/0228918 A1 9/2009 Rolff et al.
2009/0234665 A1 9/2009 Conkel
2009/0234775 A1 9/2009 Whitney et al.
2009/0240609 A1 9/2009 Cho et al.
2009/0248567 A1 10/2009 Haggerty et al.
2009/0248568 A1 10/2009 Haggerty et al.
2009/0248569 A1 10/2009 Haggerty et al.
2009/0248570 A1 10/2009 Haggerty et al.
2009/0248571 A1 10/2009 Haggerty et al.
2009/0248572 A1 10/2009 Haggerty et al.
2009/0248573 A1 10/2009 Haggerty et al.
2009/0254476 A1 10/2009 Sharma et al.
2009/0254971 A1 10/2009 Herz et al.
2009/0276368 A1 11/2009 Martin et al.
2009/0313163 A1 12/2009 Wang et al.
2009/0319648 A1 12/2009 Dutta et al.
2009/0327120 A1 12/2009 Eze et al.
2010/0009320 A1 1/2010 Wilkelis
2010/0010935 A1 1/2010 Shelton
2010/0030649 A1 2/2010 Ubelhor
2010/0043055 A1 2/2010 Baumgart
2010/0094758 A1* 4/2010 Chamberlain ... G06Q 10/06375 705/50
2010/0094768 A1 4/2010 Miltonberger
2010/0100945 A1 4/2010 Ozzie et al.
2010/0107225 A1 4/2010 Spencer et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0114744 A1 5/2010 Gonen
2010/0121767 A1 5/2010 Coulter et al.
2010/0130172 A1 5/2010 Vendrow et al.
2010/0145836 A1 6/2010 Baker et al.
2010/0145840 A1 6/2010 Kasower
2010/0169159 A1 7/2010 Rose et al.
2010/0169264 A1 7/2010 O'Sullivan et al.
2010/0205662 A1 8/2010 Ibrahim et al.
2010/0211445 A1 8/2010 Bodington
2010/0217837 A1 8/2010 Ansari et al.
2010/0223168 A1 9/2010 Haggerty et al.
2010/0228657 A1 9/2010 Kagarlis
2010/0229245 A1 9/2010 Singhal
2010/0248681 A1 9/2010 Phills
2010/0250364 A1 9/2010 Song et al.
2010/0250411 A1 9/2010 Ogrodski
2010/0250434 A1 9/2010 Megdal et al.
2010/0250469 A1 9/2010 Megdal et al.
2010/0250497 A1 9/2010 Redlich et al.
2010/0274739 A1 10/2010 Haggerty et al.
2010/0293114 A1 11/2010 Khan et al.
2010/0312717 A1 12/2010 Haggerty et al.
2011/0004498 A1 1/2011 Readshaw
2011/0016042 A1 1/2011 Cho et al.
2011/0023115 A1 1/2011 Wright
2011/0035333 A1 2/2011 Haggerty et al.
2011/0047071 A1 2/2011 Choudhuri et al.
2011/0060905 A1 3/2011 Stack et al.
2011/0066495 A1 3/2011 Ayloo et al.
2011/0078073 A1 3/2011 Annappindi et al.
2011/0093383 A1 4/2011 Haggerty et al.
2011/0112958 A1 5/2011 Haggerty et al.
2011/0126275 A1 5/2011 Anderson et al.
2011/0131131 A1 6/2011 Griffin et al.
2011/0137760 A1 6/2011 Rudie et al.
2011/0137789 A1 6/2011 Kortina et al.
2011/0161323 A1 6/2011 Hagiwara
2011/0164746 A1 7/2011 Nice et al.
2011/0173116 A1 7/2011 Yan et al.
2011/0178922 A1 7/2011 Imrey et al.
2011/0184838 A1 7/2011 Winters et al.
2011/0184851 A1 7/2011 Megdal et al.
2011/0211445 A1 9/2011 Chen
2011/0213641 A1 9/2011 Metzger, II et al.
2011/0218826 A1 9/2011 Birtel et al.
2011/0219421 A1 9/2011 Ullman et al.
2011/0238566 A1 9/2011 Santos
2011/0258050 A1 10/2011 Chan et al.
2011/0258142 A1 10/2011 Haggerty et al.
2011/0264581 A1 10/2011 Clyne
2011/0270779 A1 11/2011 Showalter
2011/0282779 A1 11/2011 Megdal et al.
2012/0005070 A1 1/2012 McFall et al.
2012/0011056 A1 1/2012 Ward et al.
2012/0029956 A1 2/2012 Ghosh et al.
2012/0035980 A1 2/2012 Haggerty et al.
2012/0054592 A1 3/2012 Jaffe et al.
2012/0066065 A1 3/2012 Switzer
2012/0066106 A1 3/2012 Papadimitriou
2012/0072464 A1 3/2012 Cohen
2012/0084230 A1 4/2012 Megdal et al.
2012/0101938 A1 4/2012 Kasower
2012/0101939 A1 4/2012 Kasower
2012/0106801 A1 5/2012 Jackson
2012/0116807 A1 5/2012 Hane et al.
2012/0123968 A1 5/2012 Megdal et al.
2012/0124498 A1 5/2012 Santoro et al.
2012/0136763 A1 5/2012 Megdal et al.
2012/0143637 A1 6/2012 Paradis et al.
2012/0173339 A1 7/2012 Flynt et al.
2012/0179536 A1 7/2012 Kalb et al.
2012/0191479 A1 7/2012 Gupta et al.
2012/0265607 A1 10/2012 Belwadi
2012/0265661 A1 10/2012 Megdal et al.
2012/0290660 A1 11/2012 Rao et al.
2013/0085902 A1 4/2013 Chew
2013/0103571 A1 4/2013 Chung et al.
2013/0124392 A1* 5/2013 Achanta ..... G06Q 40/00 705/38
2013/0132151 A1 5/2013 Stibel et al.
2013/0159168 A1 6/2013 Evans
2013/0173359 A1 7/2013 Megdal et al.
2013/0173481 A1 7/2013 Hirtenstein et al.
2013/0238413 A1 9/2013 Carlson et al.
2013/0268324 A1 10/2013 Megdal et al.
2013/0275331 A1 10/2013 Megdal et al.
2013/0293363 A1 11/2013 Plymouth
2014/0012633 A1 1/2014 Megdal et al.
2014/0019331 A1 1/2014 Megdal et al.
2014/0032265 A1 1/2014 Paprocki et al.
2014/0032384 A1 1/2014 Megdal et al.
2014/0096249 A1 4/2014 Dupont et al.
2014/0156501 A1 6/2014 Howe
2014/0164112 A1 6/2014 Kala
2014/0244353 A1 8/2014 Winters
2014/0316969 A1 10/2014 Imrey
2015/0066772 A1 3/2015 Griffin et al.
2015/0332414 A1 11/2015 Unser
2016/0171542 A1 6/2016 Fanous et al.
2016/0210224 A1 7/2016 Cohen et al.
2016/0246581 A1 8/2016 Jimenez et al.
2017/0278182 A1 9/2017 Kasower
2018/0189871 A1 7/2018 Lennert

FOREIGN PATENT DOCUMENTS

EP 0 419 889 4/1991
EP 0 458 698 11/1991
EP 0 468 440 1/1992
EP 0 554 083 8/1993
EP 0 566 736 8/1993
EP 0 559 358 9/1993
EP 0 869 652 10/1998
EP 0 913 789 5/1999
EP 0 977 128 2/2000
EP 1 028 401 8/2000
EP 1 122 664 8/2001
EP 0 772 836 B1 12/2001
GB 2 392 748 3/2004
JP 10-222559 8/1998
JP 10-261009 9/1998
JP 10-293732 11/1998
JP 2000-331068 11/2000
JP 2001-282957 10/2001
JP 2001-297141 10/2001
JP 2001-344463 12/2001
JP 2001-357256 12/2001
JP 2002-149778 5/2002
JP 2002-163449 6/2002
JP 2002-163498 6/2002
JP 2002-259753 9/2002
JP 2003-271851 9/2003
JP 2003-316881 11/2003
JP 2003-316950 11/2003
KR 10-2000-0036594 7/2000
KR 10-2000-0063995 11/2000
KR 10-2001-0016349 3/2001
KR 10-2001-0035145 5/2001
KR 10-2002-0007132 1/2002
KR 10-2004-0078798 9/2004
TW 256569 6/2006
WO WO 94/006103 3/1994
WO WO 95/034155 12/1995
WO WO 96/000945 1/1996
WO WO 98/041931 9/1998
WO WO 98/041932 9/1998
WO WO 98/041933 9/1998
WO WO 98/049643 11/1998
WO WO 99/004350 1/1999
WO WO 99/008218 2/1999
WO WO 99/017225 4/1999
WO WO 99/017226 4/1999
WO WO 99/038094 7/1999
WO WO 99/046710 9/1999

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| WO | WO 00/004465 | 1/2000 |
| WO | WO 00/028441 | 5/2000 |
| WO | WO 00/055789 | 9/2000 |
| WO | WO 00/055790 | 9/2000 |
| WO | WO 01/010090 | 2/2001 |
| WO | WO 01/011522 | 2/2001 |
| WO | WO 01/016896 | 3/2001 |
| WO | WO 01/039090 | 5/2001 |
| WO | WO 01/039589 | 6/2001 |
| WO | WO 01/041083 | 6/2001 |
| WO | WO 01/057720 | 8/2001 |
| WO | WO 01/075754 | 10/2001 |
| WO | WO 01/080053 | 10/2001 |
| WO | WO 01/084281 | 11/2001 |
| WO | WO 02/001462 | 1/2002 |
| WO | WO 02/027610 | 4/2002 |
| WO | WO 03/071388 | 8/2003 |
| WO | WO 03/101123 | 12/2003 |
| WO | WO 2004/046882 | 6/2004 |
| WO | WO 2004/061563 | 7/2004 |
| WO | WO 2004/114160 | 12/2004 |
| WO | WO 2005/059781 | 6/2005 |
| WO | WO 2007/149941 | 12/2007 |
| WO | WO 2008/022289 | 2/2008 |
| WO | WO 2008/054403 | 5/2008 |
| WO | WO 2008/127288 | 10/2008 |
| WO | WO 2009/076555 | 6/2009 |
| WO | WO 2009/117518 | 9/2009 |
| WO | WO 2009/132114 | 10/2009 |
| WO | WO 2010/132492 | 11/2010 |
| WO | WO 2013/009920 | 1/2013 |
| WO | WO 2014/018900 | 1/2014 |
| WO | WO 2015/162681 | 10/2015 |
| WO | WO 2018/128866 | 7/2018 |

OTHER PUBLICATIONS

14/091174, U.S. Pat. No. 9,619,579, System and Method for Providing an Aggregation Tool, filed Nov. 26, 2013.

15/464089, U.S. Pat. No. 10,078,868, System and Method for Providing an Aggregation Tool, filed Mar. 20, 2017.

"A Google Health update," Google Official Blog, Sep. 15, 2010 in 4 pages, http://googleblog.blogspot.com/2010/09/google-health-update.html.

Akl, Selim G., "Digital Signatures: A Tutorial Survey," Computer, Feb. 1983, pp. 15-24.

AISG's National Underwriting Database, A-PLUS, is Now the Largest in the Industry, Business Wire, Aug. 7, 1997.

Announcing TrueProfiler, http://web.archive.org/web/20021201123646/http://www.truecredit.com/index.asp, dated Dec. 1, 2002, 2 pages.

Applied Geographic Solutions, "What is MOSAIC™", as captured Feb. 15, 2004 from http://web.archive.org/web/20040215224329/http://www.appliedgeographic.com/mosaic.html in 2 pages.

"AT&T Expected to Turn Up Heat in Card Wars", American Banker, May 27, 1993, vol. 158, No. 101, pp. 3.

"Balance Transfers Offer Opportunities", Risk Credit Risk Management Report, Jan. 29, 1996, vol. 6, No. 2, pp. 2.

"Bank of America Direct Web-Based Network Adds Core Functionality to Meet Day-to-Day Treasury Needs", Business Wire, Oct. 25, 1999. pp. 2.

Bitran et al., "Mailing Decisions in Catalog Sales Industry", Management Science (JSTOR), vol. 42, No. 9, pp. 1364-1381, Sep. 1996.

Brown et al., "ALCOD IDSS:Assisting the Australian Stock Market Surveillance Team's Review Process," . Applied Artificial Intelligence Journal, Dec. 1, 1996, pp. 625-641.

Bult et al., "Optimal Selection for Direct Mail," Marketing Science, 1995, vol. 14, No. 4, pp. 378-394.

Burr Ph.D. et al., "Utility Payments as Alternative Credit Data: A Reality Check", Asset Builders of America, Inc., Oct. 5, 2006, pp. 1-18, Washington, D.C.

Buxfer, http://www.buxfer.com/ printed Feb. 5, 2014 in 1 page.

Cantor, R. and Packer, F., "The Credit Rating Industry," FRBNY Quarterly Review, Summer-Fall, 1994, pp. 1-24.

ChannelWave.com, PRM Central—About PRM, http://web.archive.org/web/20000510214859/http://www.channelwave.com as printed on Jun. 21, 2006, May 2000 Archive.

"Chase Gets Positive," Bank Technology News, May 6, 2000, vol. 14, No. 5, p. 33.

Chatterjee et al., "Expenditure Patterns and Aggregate Consumer Behavior, Some Experiments with Australian and New Zealand Data", The Economic Record, vol. 70, No. 210, Sep. 1994, pp. 278-291.

Check, http://check.me/ printed Feb. 5, 2014 in 3 pages.

Chen, et al., "Modeling Credit Card 'Share of Wallet': Solving the Incomplete Information Problem", New York University: Kauffman Management Center, http://www.rhsmith.umd.edu/marketing/pdfs_docs/seminarsspr05/abstract%20-%20chen.pdf , Spring 2005, 48 pages.

"Cole Taylor Bank Chooses Integrated E-Banking/E-Payments/Reconciliation Solution from Fundtech", Business Wire, Oct. 21, 1999, pp. 2.

Corepoint Health, "The Continuity of Care Document—Changing the Landscape of Healthcare Information Exchange," Jan. 2009, pp. 9.

CreditAnalyst, Digital Matrix Systems, as printed out Mar. 4, 2008, pp. 2.

CreditToolkit, Digital Matrix Systems, as printed out Mar. 4, 2008, pp. 2.

CreditXpert, http://www.creditxpert.com/Products/individuals.asp printed Oct. 12, 2012 in 1 page.

Cohen et al., "Optimizer: IBM's Multi Echelon Inventory System for Managing Service Logistics", Interfaces, vol. 20, No. 1, Jan.-Feb. 1990, pp. 65-82.

ComScore Networks Launches Business Unit to Help Credit Card Marketers Master Online and Multi-Channel Strategies—Solutions Provide Unprecedented Insight Into Customer Acquisition and Usage Opportunities, Reston, VA, Oct. 11, 2001, 2 pages.

Cowie, Norman, "Warning Bells & 'The Bust-Out'", Business Credit, Jul. 1, 2000, pp. 5.

Credit Card Management, "Neural Nets Shoot for Jackpot," Dec. 1995, pp. 1-6.

Credit Risk Management Report, Potomac, Mar. 9, 1998, vol. 8, No. 4.

CreditXpert Inc., CreditXpert 3-Bureau Comparison™, 2002, pp. 5, http://web.archive.org/web/20030608171018/http://creditxpert.com/CreditXpert%203-Bureau%20Comparison(TM)%20sample.pdf.

CreditXpert Inc., CreditXpert Credit Score & Analysis™, Jan. 11, 2000, pp. 6, http://web.archive.org/web/20030611070058/http://www.creditxpert.com/CreditXpert%20Score%20&%20Analysis%20and%20Credit%20Wizard%20sample.pdf.

CreditXpert Inc., CreditXpert Essentials™, Advisor View—Experian on Jul. 7, 2003, http://www.creditxpert.com/cx_ess_app.pdf.

CreditXpert Inc., CreditXpert Essentials™, Advisor View—TransUnion on Oct. 10, 1999, pp. 6, http://web.archive.org/web/20041211052543/http://creditxpert.com/cx_ess_app.pdf.

CreditXpert Inc., CreditXpert Essentials™, Applicant View—TransUnion on Oct. 10, 1999, pp. 6, http://www.creditxpert.com/cx_ess_app.pdf.

CreditXpert Inc., CreditXpert What-If Simulator™, 2002, pp. 8, http://web.archive.org/web/20030630132914/http://creditxpert.com/CreditXpert%20What-If%20Simulator(TM)%20sample.pdf.

Dataman Group, "Summarized Credit Statistics," Aug. 22, 2001, http://web.archive.org/web/20010822113446/http://www.datamangroup.com/summarized_credit.asp.

David, Alexander, "Controlling Information Premia by Repackaging Asset-Backed Securities," The Journal of Risk and Insurance, Dec. 1997, 26 pages.

Davies, Donald W., "Applying the RSA Digital Signature to Electronic Mail," Computer, Feb. 1983, pp. 55-62.

Dé, Andy, "Will mHealth Apps and Devices Empower ePatients for Wellness and Disease Management? A Case Study," Jan. 10, 2011 in 6 pages, http://www.healthsciencestrategy.com/2011/04/will-

(56) **References Cited**

OTHER PUBLICATIONS

mhealth-apps-and-devices-empower-epatients-for-wellness-and-disease-management-a-case-study-2/.
"Debt Settlement: Watch Video on how to Pay Your Debt Faster", http://www.debtconsolidationcare.com/debt-settlement.html printed Jan. 9, 2013 in 6 pages.
DeGruchy, et al., "Geodemographic Profiling Benefits Stop-Smoking Service;" The British Journal of Healthcare Computing & Information Management; Feb. 2007; 24, 7; pp. 29-31.
Dillon et al., "Good Science", Marketing Research: A Magazine of Management & Applications TM, Winter 1997, vol. 9, No. 4; pp. 11.
eFunds Corporation, "Data & Decisioning: Debit Report" printed Apr. 1, 2007, http://www.efunds.com/web/industry-solutions/financial-services/frm-debit-report/htm in 1 page.
eFunds Introduces QualiFileSM, Deluxe Corporation, eFunds Press Release and Product Launch, Sep. 23, 1999, Milwaukee, WI.
Egol, Len; "What's New in Database Marketing Software," Direct, Aug. 1994, vol. 6, No. 8, pp. 39.
Elmasri et al., "Fundamentals of Database Systems, Third Edition (Excerpts)", Jun. 2000, pp. 253, 261, 268-270, 278-280, 585, 595.
Equifax; "White Paper: Driving Safe Growth in a Fluid Economy", http://www.equifax.com/assets/USCIS/efx_safeGrowth_wp.pdf, Oct. 2012 in 14 pages.
Equifax; "True In-Market Propensity Scores™", http://www.equifax.com/assets/USCIS/efx-00174-11-13_efx_tips.pdf, Nov. 2013 in 1 page.
Ettorre, "Paul Kahn on Exceptional Marketing," Management Review, vol. 83, No. 11, Nov. 1994, pp. 48-51.
"Equifax and FICO Serve Consumers", Mortgage Servicing News, Mar. 2001, vol. 5, No. 3, p. 19.
Experian Announces PLUS Score; Experian Press Release dated Oct. 16, 2003; Experian Global Press Office.
Experian and AGS Select SRC to Deliver Complete Marketing Solutions; Partnership First to Marketplace with Census2000 Data. PR Newswire. New York: Mar. 21, 2001. p. 1.
"Experian Helps Verify the Identity of Patients and Provide Secure Enrollment to Healthcare Portals by Integrating with Major Electronic Medical Records Platform," http://press.experian.com/United-States/Press-Release/experian-helps-verify-the-identity-of-patients-and-provide-secure-enrollment-to-healthcare.aspx?&p=1, Dec. 19, 2013, pp. 2.
"Experian Launches Portfolio Monitor—Owner NoticesSM", News Release, Feb. 2003, Costa Mesa, CA.
Experian-Scorex Announces New Credit Simulation Tool, PR Newswire, Costa Mesa, CA, Jun. 13, 2005.
Experian, Custom Strategist and Qualifile from Funds, 2000, in 2 pages.
Experian; "Case study: SC Telco Federal Credit Union", http://annualcreditreport.experian.com/assets/consumer-information/case-studies/sc-telco-case-study.pdf, Jun. 2011 in 2 pages.
Experian; "In the Market Models℠", http://www.experian.com/assets/consumer-information/product-sheets/in-the-market-models.pdf, Sep. 2013 in 2 pages.
Experian Information Solutions, Inc., Credit Trends: Access Credit Trending Information Instantly, http://kewaneecreditbureau.com/Credit.Trends.pdf, Aug. 2000, pp. 4.
Fair Isaac Announces Integrated, End-to-End Collection and Recovery Solution, Business Wire, New York, Sep. 2, 2004, p. 1.
"Fair Isaac Introduces Falcon One System to Combat Fraud at Every Customer Interaction", Business Wire, May 5, 2005, pp. 3.
"Fair Isaac Offers New Fraud Tool", National Mortgage News & Source Media, Inc., Jun. 13, 2005, pp. 2.
Fickenscher, Lisa, "Merchant American Express Seeks to Mine its Data on Cardholder Spending Patterns," American Banker, vol. 162, Issue 56, Mar. 24, 1997, pp. 1-2.
"FinExtra, Basepoint Analytics Introduces Predictive Technology for Mortgage Fraud", Oct. 5, 2005, pp. 3.
Fisher, Joseph, "Access to Fair Credit Reports: Current Practices and Proposed Legislation," American Business Law Journal, Fall 1981, vol. 19, No. 3, p. 319.
"FTC Testifies: Identity Theft on the Rise", FTC News Release, Mar. 7, 2000, pp. 3.
GAO-03-661, Best Practices: Improved Knowledge of DOD Service Contracts Could Reveal Significant Savings, GAO, Jun. 2003.
Gilje, Shelby, "Keeping Tabs on Businesses That Keep Tabs on Us", NewsRoom, The Seattle Times, Section: Scene, Apr. 19, 1995, pp. 4.
Glenn, Brandon, "Multi-provider patient portals get big boost with ONC ruling", Feb. 25, 2013, http://medicaleconomics.modernmedicine.com/medical-economics/news/user-defined-tags/meaningful-use/multi-provider-patient-portals-get-big-boost in 2 pages.
Gonul, et al., "Optimal Mailing of Catalogs: A New Methodology Using Estimable Structural Dynamic Programming Models", 14 pages, Management Science, vol. 44, No. 9, Sep. 1998.
Haffar, Imad, "'Spam': A Computer Model for Management of Spare-Parts Inventories in Agricultural Machinery Dealerships", Computers and Electronics in Agriculture, vol. 12, Issue 4, Jun. 1995, pp. 323-332.
Handfield et al., "Managing Component Life Cycles in Dynamic Technological Environments", International Journal of Purchasing and Materials Management, Tempe, Spring 1994, vol. 30, No. 2, pp. 20-28.
Haughton et al., "Direct Marketing Modeling with CART and CHAID", Journal of Direct Marketing, Fall 1997, vol. 11, No. 4, pp. 42-52.
Healow.com, Various screenshots from page titled "Health and Online Wellness," https://healow.com/apps/jsp/webview/index.jsp printed Aug. 19, 2013 in 4 pages.
Healthspek.com, "How Good Are We?" http://healthspek.com/how-good-are-we/ printed Jan. 21, 2014 in 2 pages.
"Healthspek Users Can Now Import Their Doctors' Records into Their Personal Health Record," PRWeb, Nashville, TN, Jan. 14, 2014, pp. 1 http://www.prweb.com/releases/2014/01/prweb11485346.htm.
HealthVault, "Share Health Information," https://account.healthvault.com/sharerecord.aspx, printed Feb. 20, 2013 in 2 pages.
HealthVault, "What Can you do with HealthVault?" https://www.healthvault.com/us/en/overview, http://www.eweek.com/mobile/diversinet-launches-mobihealth-wallet-for-patient-data-sharing/, printed Feb. 20, 2013 in 2 pages.
Hill, Kerry, "Identity Theft Your Social Security Number Provides Avenue for Thieves", NewsRoom, Wisconsin State Journal, Sep. 13, 1998, pp. 4.
Horowitz, Brian T., "Diversinet Launches MobiHealth Wallet for Patient Data Sharing," eWeek, Dec. 4, 2012, http://www.eweek.com/mobile/diversinet-launches-mobihealth-wallet-for-patient-data-sharing/.
"ID Thieves These Days Want Your Number, Not Your Name", The Columbus Dispatch, Columbus, Ohio, http://www.dispatch.com/content/stories/business/2014/08/03/id-thieves-these-days-want-your-number-not-your-name.html, Aug 3, 2014 in 2 pages.
Ideon, Credit-Card Registry that Bellyflopped this Year, Is Drawing some Bottom-Fishers, The Wall Street Journal, Aug. 21, 1995, pp. C2.
igiHealth.com, "Orbit® PHR: Personal Health Record (PHR)," http://www.igihealth.com/consumers/orbit_phr.html, printed Jan. 21, 2014 in 2 pages.
"Impac Funding Introduces Enhanced Website for Static Pool Tracking of MBS Transactions," Waltham, MA; Webpage printed out from http://www.lewtan.com/press/1208044_Impac-Lewtan.htm on Mar. 20, 2008.
Inderfurth et al., "Decision Support for Spare Parts Acquisition in Post Product Life Cycle", Central European Journal of Operations Research, 2008, vol. 16, pp. 17-42.
"Industry News, New Technology Identifies Mortgage Fraud: Basepoint Analytics Launches FraudMark", Inman News, American Land Title Association, Oct. 5, 2005, pp. 1.
InsightsOne.com, "Healthcare," http://insightsone.com/healthcare-predictive-analytics/ printed Mar. 6, 2014 in 5 pages.
Instant Access to Credit Reports Now Available Online with DMS' CreditBrowser-based system also Simplifies Credit Decisioning and Offers a Central Point of Control, Business Wire, Dallas, May 23, 2000, p. 0264.

(56) **References Cited**

OTHER PUBLICATIONS

Internal Revenue Service Data Book 2000, Issued Aug. 2001, Revised May 2003.

Jacob et al., A Case Study of Checking Account Inquiries and Closures in Chicago, The Center for Financial Services Innovation, Nov. 2006.

"Japan's JAAI System Appraises Used Cars Over Internet", Asia Pulse, Mar. 3, 2000, p. 1.

Jost, Allen; Neural Networks, Credit World, Mar.-Apr. 1993, vol. 81, No. 4, pp. 26-33.

"JPMorgan Worldwide Securities Services to Acquire Paloma's Middle and Back Office Operations," Webpage printed from http://www.jpmorgan.com on Apr. 1, 2009.

Käki, Anssi, "Forecasting in End-of-Life Spare Parts Procurement", Master's Thesis, Helsinki University of Technology, System Analysis Laboratory, Jul. 27, 2007, pp. 84.

Kim et al., "Optimal Pricing, EOL (End of Life) Warranty, and Spare Parts Manufacturing Strategy Amid Product Transition", European Journal of Operation Research, 2008, vol. 188, pp. 723-745.

Klein, et al., "A Constant-Utility Index of the Cost of Living", The Review of Economic Studies, pp. 84-87, vol. XV-XVI, Kraus Reprint Corporation, New York, 1960.

Klein, et al., "An Econometric Model of the United States: 1929-1952", North-Holland Publishing Company, Amsterdam, 1955, pp. 4-41.

Klein, Lawrence R., "The Keynesian Revolution", New York, The MacMillan Company, 1947, pp. 56-189.

Krupp, James A.G., "Forecasting for the Automotive Aftermarket", The Journal of Business Forecasting Methods & Systems, Winter 1993-1994, vol. 12, No. 4, ABI/Inform Global, pp. 8-12.

Lamons, Bob, "Be Smart: Offer Inquiry Qualification Services," Marketing News, ABI/Inform Global, Nov. 6, 1995, vol. 29, No. 23, pp. 13.

Lanubile, et al., "Evaluating Empirical Models for the Detection of High-Risk Components: Some Lessons Learned", 20th Annual Software Engineering Workshop, Nov. 29-30, 1995, Greenbelt, Maryland, pp. 1-6.

Lapide, Larry, "New Developments in Business Forecasting", The Journal of Business Forecasting, Spring 2002, pp. 12-14.

Lee, W.A.; "Experian, on Deal Hunt, Nets Identity Theft Insurer", American Banker: The Financial Services Daily, Jun. 4, 2003, New York, NY, 1 page.

LifeLock, http://web.archive.org/web/20110724011010/http://www.lifelock.com/? as archived Jul. 24, 2011 in 1 page.

LifeLock, "How LifeLock Works," http://www.lifelock.com/lifelock-for-people printed Mar. 14, 2008 in 1 page.

LifeLock, "LifeLock Launches First ID Theft Prevention Program for the Protection of Children," Press Release, Oct. 14, 2005, http://www.lifelock.com/about-us/press-room/2005-press-releases/lifelock-protection-for-children.

LifeLock, Various Pages, www.lifelock.com/, 2007.

Longo, Tracey, "Managing Money: Your Family Finances", Kiplinger's Personal Finance Magazine, Jun. 1, 1995, vol. 49, No. 6, pp. 4.

Loshin, Intelligent Enterprise: Better Insight for Business Decisions, "Value-Added Data: Merge Ahead", Feb. 9, 2000, vol. 3, No. 3, 5 pages.

Manilla, http://www.manilla.com/how-it-works/ printed Feb. 5, 2014 in 1 page.

McManus et al.; "Street Wiser," American Demographics; ABI/Inform Global; Jul.-Aug. 2003; 25, 6; pp. 32-35.

McNamara, Paul, "Start-up's pitch: The Envelope, please," Network World, Apr. 28, 1997, vol. 14, No. 17, p. 33.

MergePower, Inc., "Attribute Pro", http://web.archive.org/web/20060520135324/http://www.mergepower.com/attribute_pro.html, dated May 20, 2006 in 1 page.

MergePower, Inc., "Attribute Pro", http://web.archive.org/web/20080708204709/http:/www.mergepower.com/APInfo.aspx, dated Jul. 8, 2008 in 2 pages.

MergePower, Inc., "Attribute Pro®—Credit Bureau Attributes", http://web.archive.org/web/20120307000028/http:/www.mergepower.com/APInfo.aspx, dated Mar. 7, 2012 in 2 pages.

MergePower, Inc., "MergePower, Inc", http://web.archive.org/web/20060513003556/http:/www.mergepower.com/, dated May 13, 2006 in 1 page.

MergePower, Inc., "MergePower, Inc", http://web.archive.org/web/20070208144622/http:/www.mergepower.com/, dated Feb. 8, 2007 in 1 page.

MergePower, Inc., "MergePower, Inc", http://web.archive.org/web/20070914144019/http:/www.mergepower.com/, dated Sep. 14, 2007 in 1 page.

MergePower, Inc., "MergePower, Inc", http://web.archive.org/web/20110828073054/http:/www.mergepower.com/, dated Aug. 28, 2011 in 2 pages.

MERit Credit Engine™, Diagram, http://creditengine.net/diagram.htm, copyright 1997, pp. 1.

Merugu, et al.; "A New Multi-View Regression Method with an Application to Customer Wallet Estimation," The 12th International Conference on Knowledge Discovery and Data Mining, Aug. 20-23, 2006, Philadelphia, PA.

Miller, Joe, "NADA Used-Car Prices Go Online", Automotive News, Jun. 14, 1999, p. 36.

Mint.com, http://www.mint.com/how-it-works/ printed Feb. 5, 2013 in 2 pages.

Moore, John R., Jr., "Forecasting and Scheduling for Past-Model Replacement Parts", Management Science, Application Series, vol. 18, No. 4, Part 1, Dec. 1971, pp. B-200-B-213.

Muus, et al., "A Decision Theoretic Framework for Profit Maximization in Direct Marketing", Sep. 1996, pp. 20.

Mvelopes, http://www.mvelopes.com/ printed Feb. 5, 2014 in 2 pages.

"New FICO score extends lenders' reach to credit-underserved millions", Viewpoints: News, Ideas and Solutions from Fair Isaac, Sep.-Oct. 2004 as downloaded from http://www.fairisaac.com/NR/exeres/F178D009-B47A-444F-BD11-8B4D7D8B3532,frame . . . in 6 pages.

"New Privista Product Provides Early Warning System to Combat Identity Theft", PR Newswire, Oct. 24, 2000, PR Newswire Association, Inc., New York.

Occasional CF Newsletter; http://www.halhelms.com/index.cfm?fuseaction=newsletters.oct1999; Oct. 1999.

Office of Integrated Analysis and Forecasting, DOE/EIA-M065(2004), Model Documentation Report: Macroeconomic Activity Module (MAM) of the National Energy Modeling System, EIA, Washington DC, Feb. 2004.

Otter, et al., "Direct Mail Selection by Joint Modeling of the Probability and Quantity of Response", Jun. 1997, pp. 14.

Packer, A. H., "Simulation and Adaptive Forecasting an Applied to Inventory Control", Operations Research, Jul. 1965, vol. 15, No. 4, pp. 660-679.

Pagano, et al., "Information Sharing in Credit Markets," Dec. 1993, The Journal of Finance, vol. 48, No. 5, pp. 1693-1718.

"Parse", Definition from PC Magazine Encyclopedia, http://www/pcmag.com/encyclopedia_term_0,2542,t=parse&i=48862,00.asp as downloaded Mar. 5, 2012.

Partnoy, Frank, Rethinking Regulation of Credit Rating Agencies: An Institutional Investor Perspective, Council of Institutional Investors, Apr. 2009, pp. 21.

Perlich et al., "High Quantile Modeling for Customer Wallet Estimation with Other Applications," The 13th International Conference on Knowledge Discovery and Data Mining, Aug. 12-15, 2007, San Jose, CA.

PersonalCapital.com, http://www.personalcapital.com/how-it-works printed Feb. 5, 2014 in 5 pages.

Peters, Peter-Paul, "A Spare Parts Configurator for the European Service Business" (Graduation Report), Honeywell, Industrial Service Logistic Center, Amsterdam, The Netherlands, Mar. 2000, pp. 80.

Polatoglu et al., "Theory and Methodology, Probability Distributions of Cost, Revenue and Profit over a Warranty Cycle", European Journal of Operational Research, Jul. 1998, vol. 108, Issue 1, pp. 170-183.

(56) **References Cited**

OTHER PUBLICATIONS

Ponniah, Paulraj, "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals", Wiley-Interscience Publication, pp. 257-289, 377-397, Aug. 3, 2001.
Porter, G. Zell, "An Economic Method for Evaluating Electronic Component Obsolescence Solutions", www.gidep.org/data/dmsms/library/zell.pdf, May 1998, pp. 1-9.
"PostX to Present at Internet Showcase", PR Newswire, Apr. 28, 1997, pp. 2.
PostX, "PostX® Envelope and ActiveView", http://web.archive.org/web/19970714203719/http://www.posix.com/priducts_fm.html, Jul. 14, 1997 (retrieved Nov. 7, 2013) in 2 pages.
Powerforms: Declarative Client-Side for Field Validation, ISSN 1386-145x, Dec. 2000.
"PremierGuide Announces Release 3.0 of Local Search Platform", Business Wire, Mar. 4, 2004, Palo Alto, CA, p. 5574.
PrivacyGuard, http://web.archive.org/web/20110728114049/http://www.privacyguard.com/ as archived Jul. 28, 2011 in 1 page.
"Qualifying for Debt Settlement", http://www.certifieddebt.com/debt/settlement-qualifications.shtml printed Jan. 9, 2013 in 2 pages.
Rahm, et al. "Data Cleaning: Problems and Current Approaches", Bulletin of the IEEE Computer Society Technical Committee on Data Engineering, Dec. 2000, vol. 23, No. 4, pp. 11.
Raman, et al., "Potter's Wheel: An Interactive Data Cleaning System", Proceedings of the 27th VLDB Conference, Roma, Italy, 2001, pp. 10.
"Resolve Debt for Less: With Help from Freedom Financial" http://www.debtsettlementusa.com/ printed Jan. 9, 2013 in 6 pages.
Roos Gina,"Web-Based Service Helps OEMs Cure Parts Obsolescence Blues", Electronic Engineering Times, Oct. 8, 2001, p. 86.
Rosset et al., "Wallet Estimation Models", IBM TJ Watson Research Center, 2005, Yorktown Heights, NY, pp. 12.
Santarini, Michael, "Forecasts the Probable Obsolescence of Components—Module Predicts Parts Life", Electronic Engineering Times, Jan. 11, 1999, vol. 1, p. 48.
Saunders, A., "Data Goldmine," Management Today, London: Mar. 1, 2004, 6 pages.
Sawyers, Arlena, "NADA to Offer Residual Guide", Automotive News, May 22, 2000, p. 1.
Sax, Michael M., Data Collection and Privacy Protection: An International Perspective, Presentation: Managing Online Risk and Liability Conference, Aug. 31, 1999, pp. 58.
Schmittlein et al., "Customer Base Analysis: An Industrial Purchase Process Application", Marketing Science, vol. 13, No. 1, Winter 1994, pp. 41-67.
"ScoreNet® Network", FairIsaac, web.archive.org/web/20071009014242/http://www.fairisaac.com/NR/rdonlyres/AC4C2F79-4160-4E44-B0CB-5C899004879A/0/ScoreNetnetworkBR.pdf, May 2006, pp. 6.
"Settling Your Debts—Part 1 in Our Debt Settlement Series", http://www.creditinfocenter.com/debt/settle_debts.shtml printed Jan. 9, 2013 in 6 pages.
Shvachko et al., "The Hadoop Distributed File System", 2010 IEEE 26th Symposium on Mass Storage Systems and Technologies (MSST), May 3, 2010, pp. 1-10.
Singletary, Michelle, "Score One for Open Credit Ratings", The Washington Post, Washington DC, Jun. 18, 2000, 3 pages.
Smith, Richard M., "The Web Bug FAQ", Nov. 11, 1999, Version 1.0, pp. 4.
Smith, Wendell R., "Product Differentiation and Market Segmentation as Alternative Marketing Strategies", The Journal of Marketing, The American Marketing Association, Brattleboro, Vermont, Jul. 1956, vol. XXI, pp. 3-8.
"STAGG Variables Sum Up Credit Attributes for Automated Decisions", PRWeb, May 11, 2011, pp. 2. http://www.prweb.com/releases/2011/5/prweb8404324.htm.
Stanton, T.H., "Credit Scoring and Loan Scoring as Tools for Improved Management of Federal Credit Programs", Financier, Philadelphia, Summer 1999, vol. 6, 36 pages.
Stein, Benchmarking Default Prediction Models: Pitfalls and Remedies in Model Validation, Moody's KMV, Revised Jun. 13, 2002, Technical Report #020305; New York.
Stone, "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand", The Economic Journal: The Journal of the Royal Economic Society, Sep. 1954, pp. 511-527, vol. LXIV, Macmillan & Co., London.
Sullivan, Laurie, "Obsolete-Parts Program Thriving", EBN, Manhasset, NY, Jan. 21, 2002, Issue 1296, p. 26.
Sumner, Anthony, "Tackling the Issue of Bust-Out Fraud", Retail Banker International, Jul. 24, 2007, pp. 4.
Sweat, Jeff; "Know Your Customers," Information Week, Nov. 30, 1998, pp. 20.
Tao, Lixin, "Shifting Paradigms with the Application Service Provider Model"; Concordia University, IEEE, Oct. 2001, Canada.
Tennant, Don, "How a Health Insurance Provider Uses Big Data to Predict Patient Needs," http://www.itbusinessedge.com/blogs/from-under-the-rug/how-a-health-insurance-provider-uses-big-data-to-predict-patient-needs.html, printed Mar. 6, 2014 in 2 pages.
Truston, "Checking if your Child is an ID Theft Victim can be Stressful," as posted by Michelle Pastor on Jan. 22, 2007 at http://www.mytruston.com/blog/credit/checking_if_your_child_is_an_id_theft_vi.html.
Van Collie, Shimon, "The Road to Better Credit-Card Marketing," Bank Technology News, Sep. 1995, pp. 4.
Various Posts from the http://www.2p.wrox.com Forums: http://web.archive.org/web/2005045221950/http://p2p.wrox.com/topic.asp?TOPIC_ID=6513 , dated Nov. 15, 2003-Oct. 7, 2004.
Verstraeten, Geert, Ph.D.; Issues in predictive modeling of individual customer behavior: Applications in targeted marketing and consumer credit scoring; Universiteit Gent (Belgium) 2005.
"WashingtonPost.com and Cars.com Launch Comprehensive Automotive Web Site for the Washington Area", PR Newswire, Oct. 22, 1998. pp. 2.
Watts, Craig, "Consumers Now Can Know What Loan Rate Offers to Expect Based on Their FICO Credit Score at MyFICO.com," San Rafael, CA, Mar. 6, 2002, pp. 2, http://www.myfico.com/PressRoom/PressReleases/2002_03_06.aspx.
Watts, Craig, "Fair, Isaac and Equifax Give Consumers New Score Power Tools Offering Greater Insights for Managing Their Credit Health," May 21, 2002, pp. 3, http://www.myfico.com/PressRoom/PressReleases/2002_05_21.aspx.
Webber, Richard, "The Relative Power of Geodemographics vis a vis Person and Household Level Demographic Variables as Discriminators of Consumer Behavior," CASA:Working Paper Series, http://www.casa.ucl.ac.uk/working_papers/paper84.pdf, Oct. 2004, pp. 17.
Web Page posted at: http://web.archive.org/web20040805124909/http://www.oracle.com/technology/sample_codete/tech/pl_sql/htdocs/x/Case/start.htm, pp. 1 and 4 of the webpages posted on Jan. 7, 2003.
Webpage printed from http://www.magnum.net/pdfs/RapUpBrochure.pdf as printed Mar. 3, 2008.
Webpage printed out from http://www.jpmorgan.com/cm/ContentServer?c=TS_Content&pagename=jpmorgan%2Fts%2FTS_Content%2FGeneral&cid=1139403950394 on Mar. 20, 2008, Feb. 13, 2006, New York, NY.
Webster, Lee R., "Failure Rates & Life-Cycle Costs", Consulting-Specifying Engineer, Apr. 1998, vol. 23, No. 4, ABI/INFORM Global, p. 42.
Working, Holbrook, "Statistical Laws of Family Expenditure", Journal of the American Statistical Association, pp. 43-56, vol. 38, American Statistical Association, Washington, D.C., Mar. 1943.
Wyatt, Craig, "Usage Models just for Merchants," Credit Card Management, Sep. 1995, vol. 8, No. 6, pp. 4.
Yodlee | Money Center, https://yodleemoneycenter.com/ printed Feb. 5, 2014 in 2 pages.
You Need a Budget, http://www.youneedabudget.com/features printed Feb. 5, 2014 in 3 pages.
Yücesan et al., "Distributed Web-Based Simulation Experiments for Optimization", Simulation Practice and Theory 9, 2001, pp. 73-90.

(56) **References Cited**

OTHER PUBLICATIONS

Zimmerman et al., "A Web-Based Platform for Experimental Investigation of Electric Power Auctions," Decision Support Systems, 1999, vol. 24, pp. 193-205.

Zoot—Decision Engine, www.zootweb.com/decision_engine.html, as printed on Mar. 3, 2008.

Zoot—Instant Rules GUI, www.zootweb.com/instant_rules_GUI.html as printed Mar. 3, 2008.

Zoot—Pre-Built Standard Attributes, www.zootweb.com/credit_attributes.html as printed Mar. 3, 2008.

Zoot—Rules Management GUI, www.zootweb.com/business_rules_GUI.html as printed Mar. 3, 2008.

Zoot—Zoot's Hosted Environment, http://www.zootweb.com/zootasp.html as printed Mar. 3, 2008.

Declaration of Paul Clark, DSc. for Inter Partes Review of U.S. Pat. No. 8,504,628 (Symantec Corporation, Petitioner), dated Jan. 15, 2014 in 76 pages.

Exhibit D to Joint Claim Construction Statement, filed in Epsilon Data Management, LLC, No. 2:12-cv-00511-JRG (E.D. Tex.) (combined for pretrial purposes with *RPost Holdings. Inc., et al.* v. *Experian Marketing Solutions. Inc.,* No. 2:12-cv-00513-JRG (E.D. Tex.)) Filed Jan. 14, 2014 in 9 pages.

First Amended Complaint in Civil Action No. 2:12-cv-511-JRG (*Rpost Holdings, Inc. and Rpost Communications Limited* v. *Constant Contact, Inc.; et al.*) filed Feb. 11, 2013 in 14 pages.

First Amended Complaint in Civil Action No. 2:12-cv-511-JRG (*Rpost Holdings, Inc. and Rpost Communications Limited* v. *Epsilon Data Management, LLC.*) filed Sep. 13, 2013 in 9 pages.

First Amended Complaint in Civil Action No. 2:12-cv-513-JRG (*Rpost Holdings, Inc. and Rpost Communications Limited* v. *Experian Marketing Solutions, Inc.*) filed Aug. 30, 2013 in 9 pages.

Petition for Covered Business Method Patent Review in U.S. Pat. No. 8,161,104 (*Experian Marketing Solutions, Inc., Epsilon Data Management, LLC, and Constant Contact, Inc.,* v. *Rpost Communications Limited*) dated Jan. 29, 2014 in 90 pages.

U.S. Appl. No. 08/845,722 by Venkatraman et al., Exhibit A, Part 1 & 2, pp. 32.

International Search Report and Written Opinion for Application No. PCT/US09/37565, dated May 12, 2009.

International Search Report and Written Opinion for Application No. PCT/US2017/068340, dated Feb. 26, 2018.

Gao et al., "Exploring Temporal Effects for Location Recommendation on Location-Based Social Networks", RecSys'13, Oct. 12-16, 2013, Hong Kong, China, pp. 93-100.

Reinartz et al., "On the Profitability of Long-Life Customers in a Noncontractual Setting: An Empirical Investigation and Implications for Marketing" Journal of Marketing, Oct. 2000, vol. 64, pp. 17-35.

Yuan et al., "Time-Aware Point-of-Interest Recommendation", SIGIR'13, Jul. 28-Aug. 1, 2013, Dublin, Ireland, pp. 363-372.

* cited by examiner

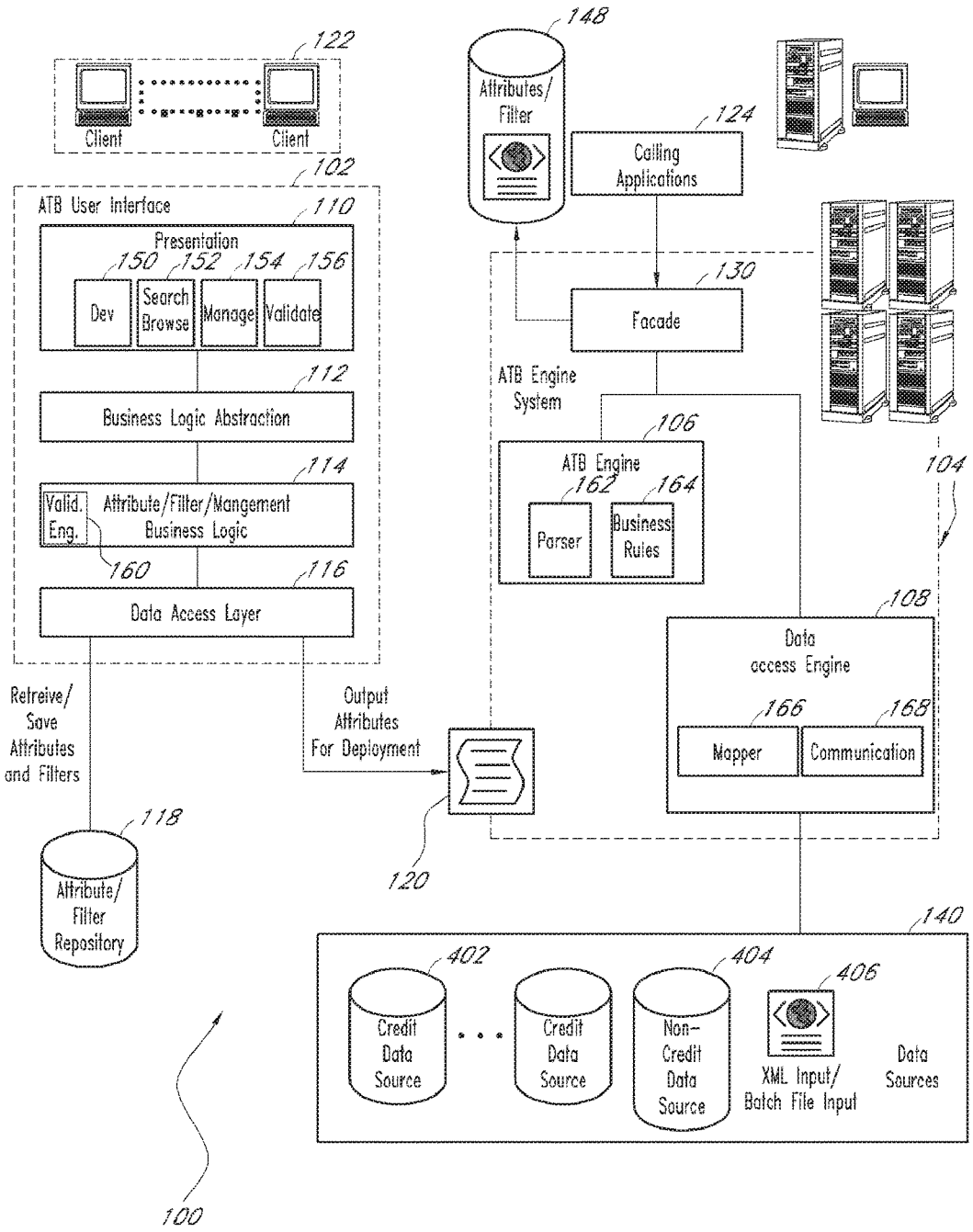

122
Client
Client
102
ATB User Interface
110
Presentation
150
152
154
156
Dev
Search Browse
Manage
Validate
112
Business Logic Abstraction
114
Valid. Eng.
Attribute/Filter/Mangement Business Logic
160
116
Data Access Layer
Retreive/ Save Attributes and Filters
118
Attribute/ Filter Repository
Output Attributes For Deployment
120
148
Attributes/ Filter
124
Calling Applications
130
Facade
ATB Engine System
106
ATB Engine
162
164
Parser
Business Rules
104
108
Data access Engine
166
168
Mapper
Communication
140
402
Credit Data Source
Credit Data Source
404
Non-Credit Data Source
406
XML Input/ Batch File Input
Data Sources
100

FIG. 1

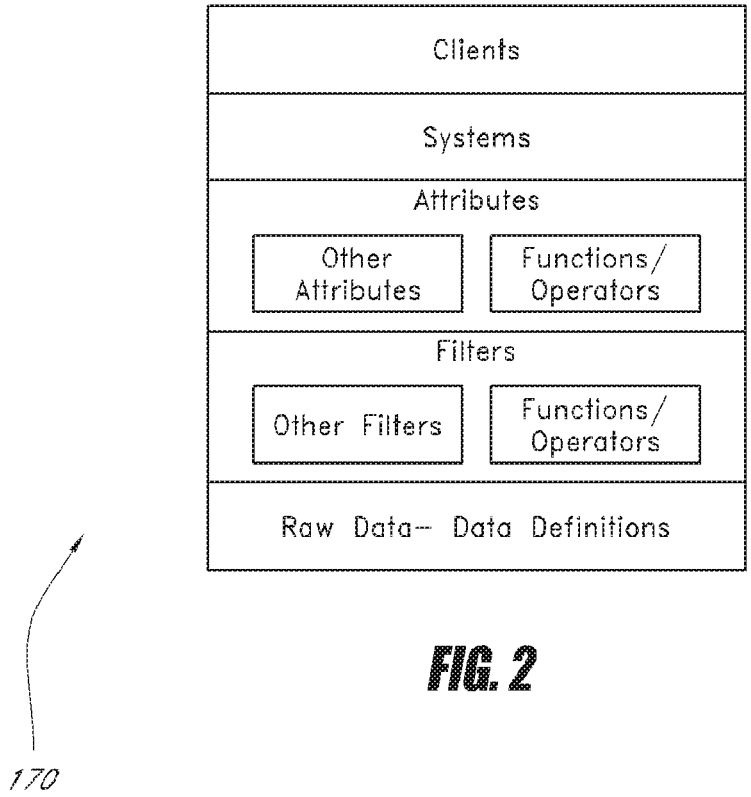

Clients
Systems
Attributes
Other Attributes
Functions/ Operators
Filters
Other Filters
Functions/ Operators
Raw Data-- Data Definitions
170

FIG. 2

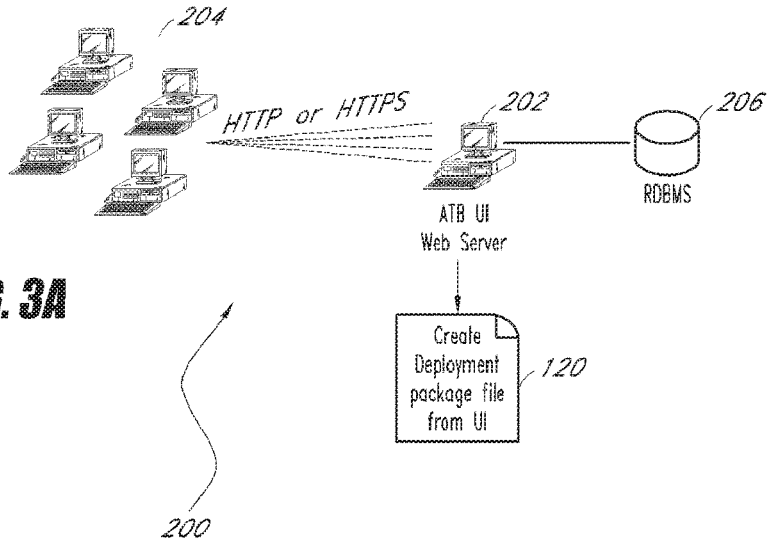

204
HTTP or HTTPS
202
206
RDBMS
ATB UI
Web Server
Create
Deployment
package file
from UI
120
200

FIG. 3A

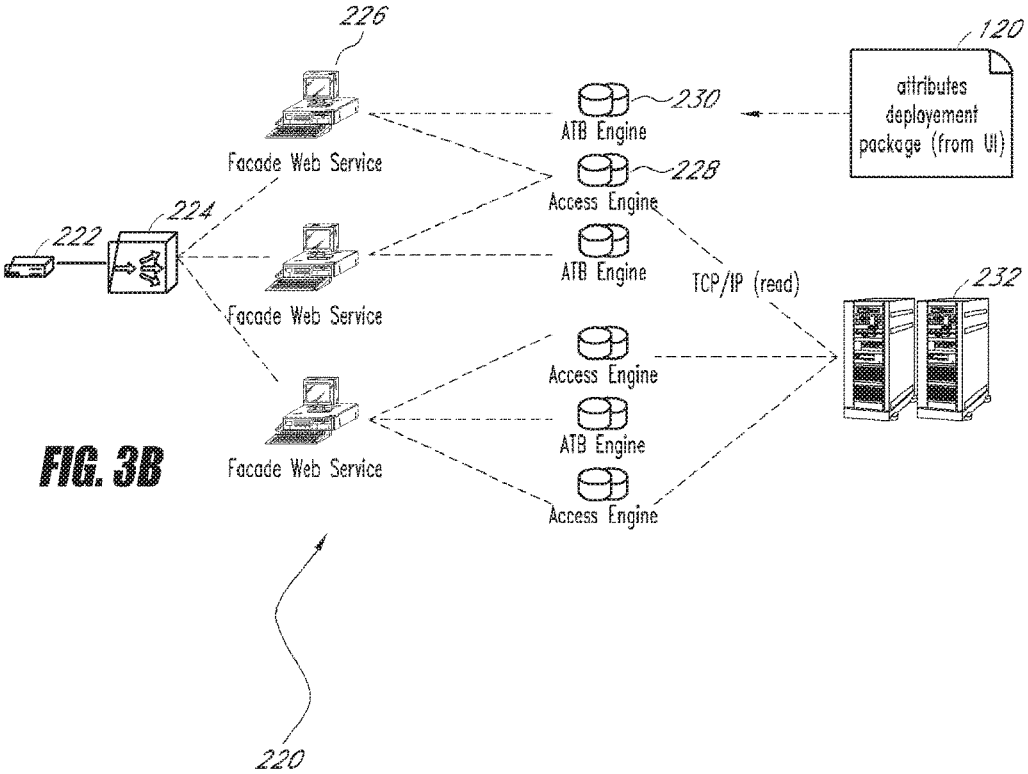

226
Facade Web Service
222
224
Facade Web Service
Facade Web Service
230
ATB Engine
228
Access Engine
ATB Engine
Access Engine
ATB Engine
Access Engine
TCP/IP (read)
120
attributes
deployement
package (from UI)
232
220

FIG. 3B

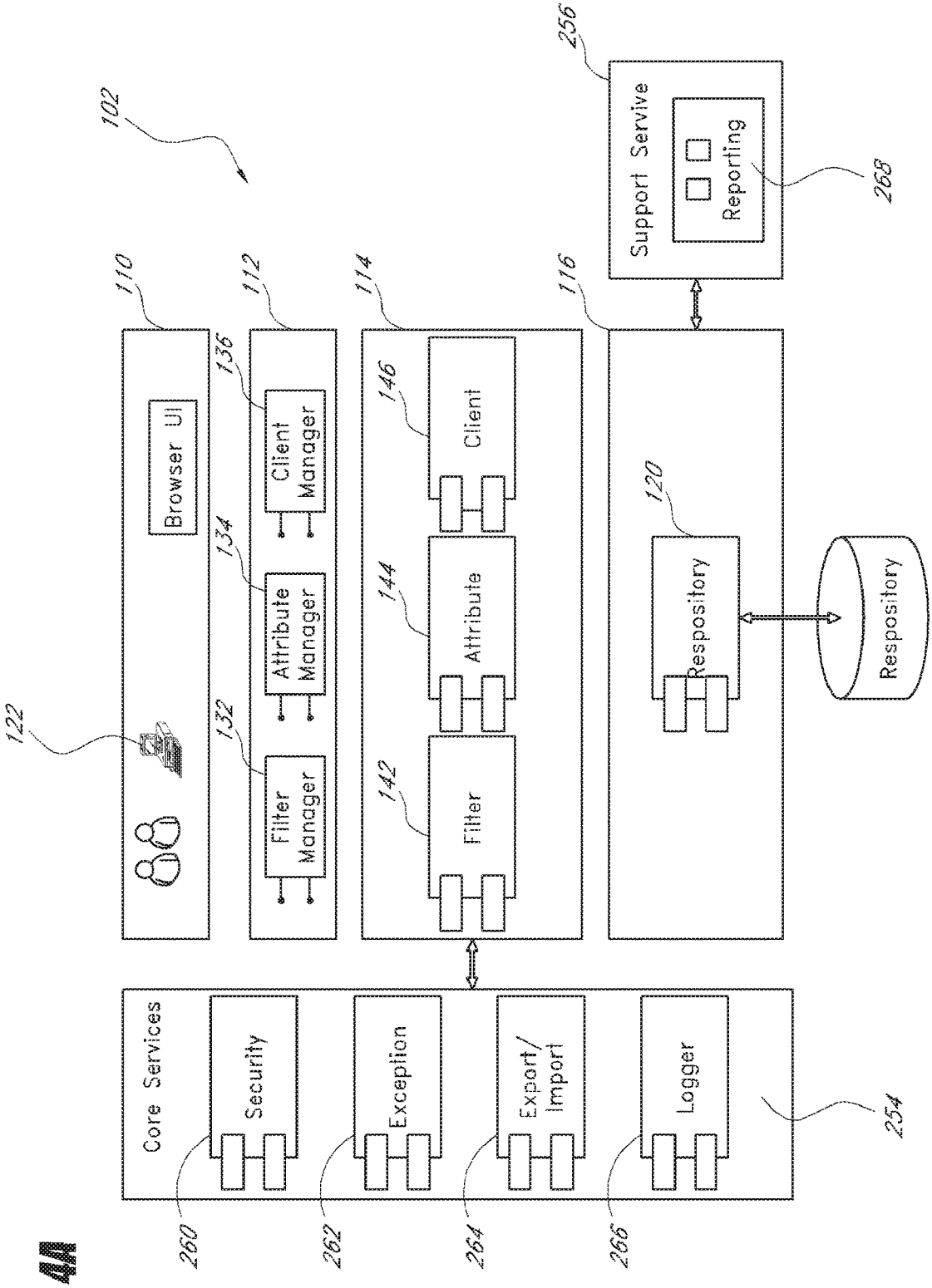

102
110
112
114
116
256
Support Servive
Reporting
268
Browser UI
136
Client Manager
146
Client
120
134
Attribute Manager
144
Attribute
Respository
Respository
122
132
Filter Manager
142
Filter
Core Services
Security
Exception
Export/ Import
Logger
254
260
262
264
266

FIG. 4A

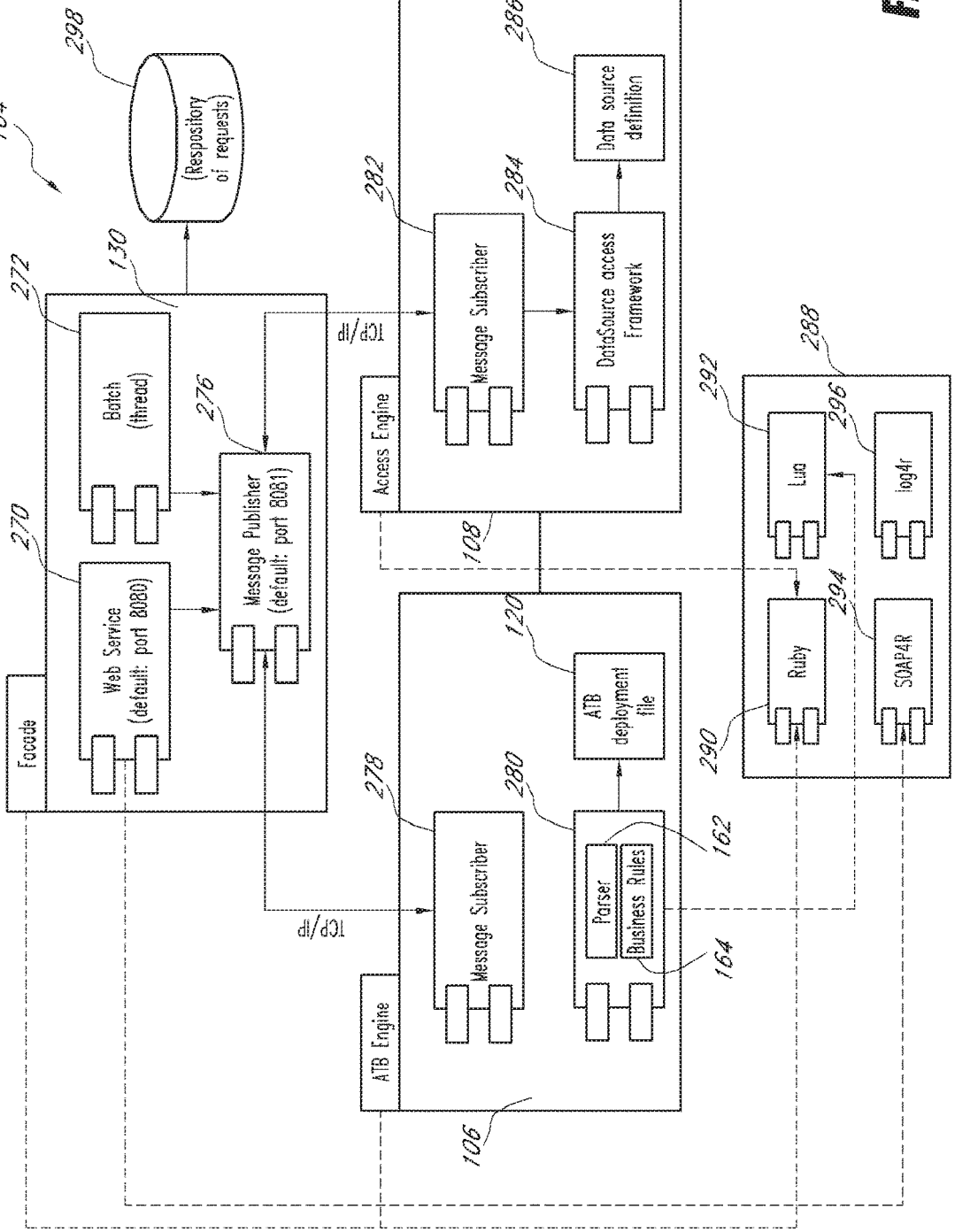

104
298
(Repository of requests)
130
272
Batch (thread)
276
Message Publisher (default: port 8081)
270
Web Service (default: port 8080)
Facade
TCP/IP
TCP/IP
282
Message Subscriber
284
DataSource access Framework
286
Data source definition
Access Engine
108
288
292
Lua
296
log4r
294
Ruby
SOAP4R
290
120
ATB deployment file
278
Message Subscriber
280
Parser
Business Rules
162
164
ATB Engine
106

FIG. 4B

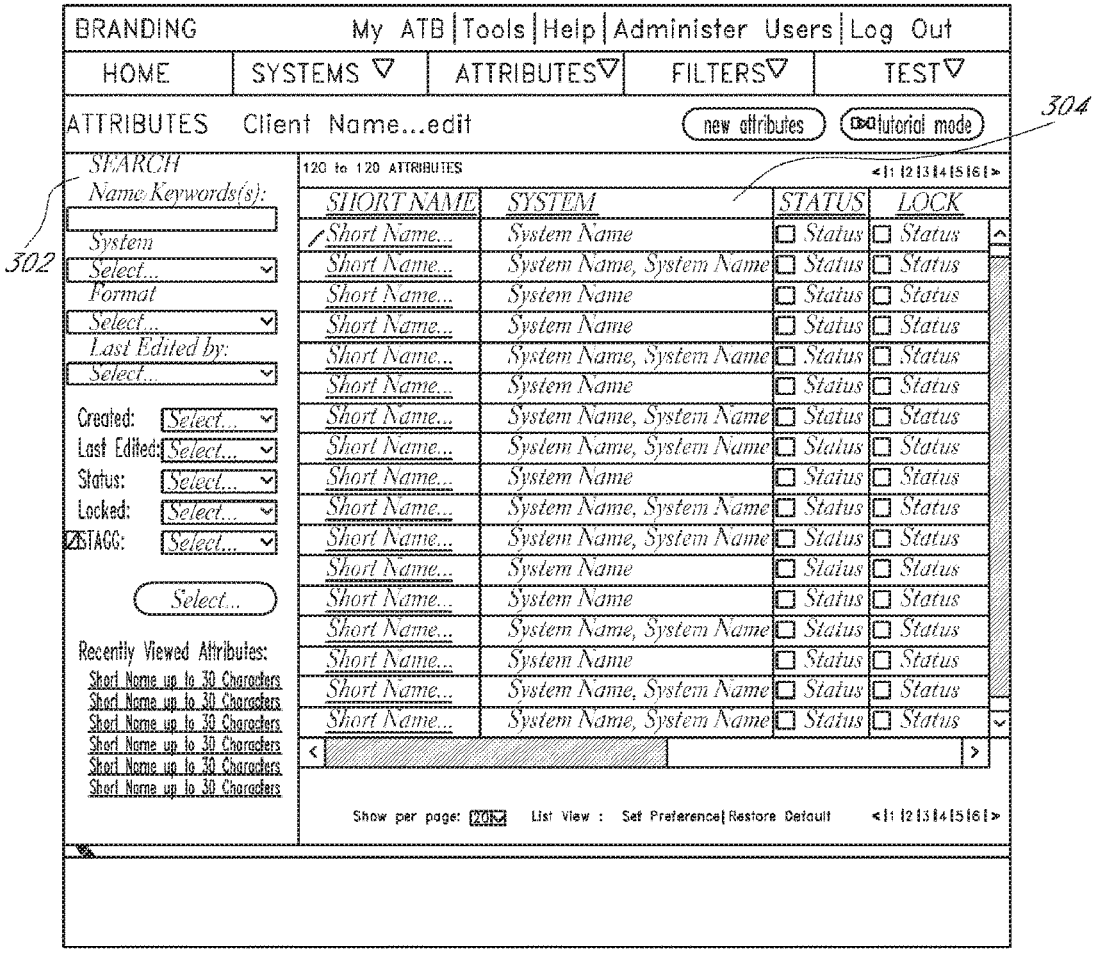

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
ATTRIBUTES Client Name...edit
new attributes
tutorial mode
304
302
SEARCH
Name Keywords(s):
System
Select...
Format
Select...
Last Edited by:
Select...
Created:
Last Edited:
Status:
Locked:
TAGG:
Select...
Select...
Recently Viewed Attributes:
Short Name up to 30 Characters
Short Name up to 30 Characters
Short Name up to 30 Characters
Short Name up to 30 Characters
Short Name up to 30 Characters
Short Name up to 30 Characters
120 to 120 ATTRIBUTES
SHORT NAME
SYSTEM
STATUS
LOCK
Short Name...
System Name
System Name, System Name
Status
Show per page:
List View :
Set Preference | Restore Default

FIG. 5A

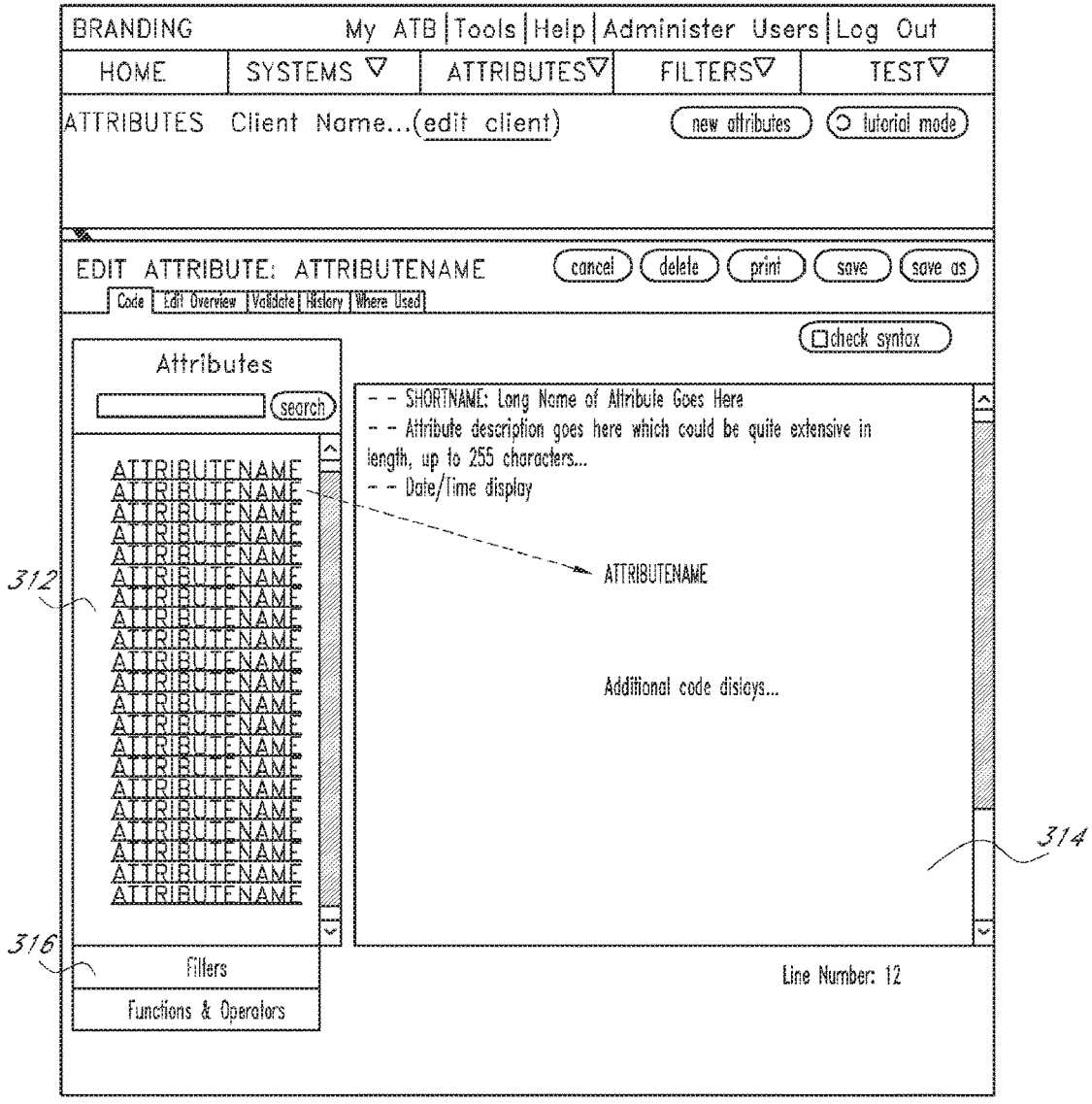

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
ATTRIBUTES Client Name...(edit client)
new attributes
tutorial mode
EDIT ATTRIBUTE: ATTRIBUTENAME
cancel
delete
print
save
save as
Code
Edit Overview
Validate
History
Where Used
check syntax
Attributes
search
ATTRIBUTENAME
- - SHORTNAME: Long Name of Attribute Goes Here
- - Attribute description goes here which could be quite extensive in length, up to 255 characters...
- - Date/Time display
ATTRIBUTENAME
Additional code displays...
312
314
316
Filters
Functions & Operators
Line Number: 12

FIG. 5B

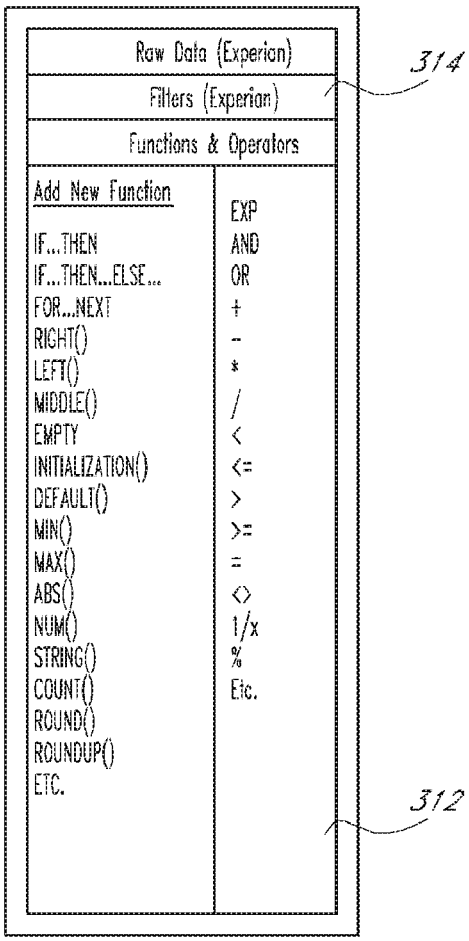

Raw Data (Experian)
Filters (Experian)
Functions & Operators
Add New Function
IF...THEN
IF...THEN...ELSE...
FOR...NEXT
RIGHT()
LEFT()
MIDDLE()
EMPTY
INITIALIZATION()
DEFAULT()
MIN()
MAX()
ABS()
NUM()
STRING()
COUNT()
ROUND()
ROUNDUP()
ETC.
EXP
AND
OR
+
-
*
/
<
<=
>
>=
=
<>
1/x
%
Etc.
314
312

FIG. 5C

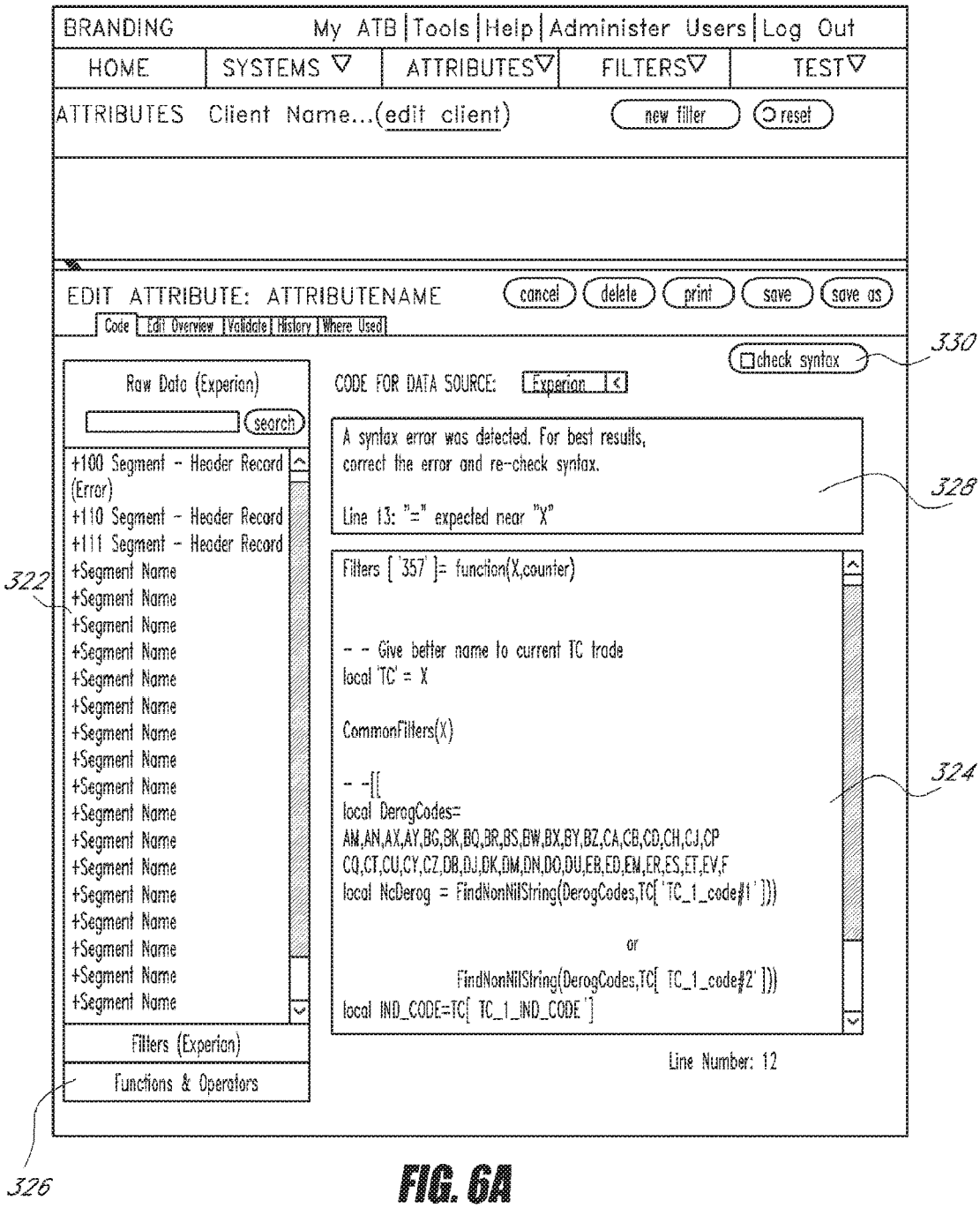

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
ATTRIBUTES Client Name...(edit client)
new filter
reset
EDIT ATTRIBUTE: ATTRIBUTENAME
cancel
delete
print
save
save as
Code
Edit Overview
Validate
History
Where Used
check syntax
330
Raw Data (Experian)
search
+100 Segment - Header Record (Error)
+110 Segment - Header Record
+111 Segment - Header Record
+Segment Name
322
Filters (Experian)
Functions & Operators
326
CODE FOR DATA SOURCE: Experian
A syntax error was detected. For best results, correct the error and re-check syntax.
Line 13: "=" expected near "X"
328
Filters [ '357' ]= function(X,counter)
-- Give better name to current TC trade
local 'TC' = X
CommonFilters(X)
-- -[[
local DerogCodes=
AM,AN,AX,AY,BG,BK,BQ,BR,BS,BW,BX,BY,BZ,CA,CB,CD,CH,CJ,CP
CQ,CT,CU,CY,CZ,DB,DJ,DK,DM,DN,DO,DU,EB,ED,EM,ER,ES,ET,EV,F
local NoDerog = FindNonNilString(DerogCodes,TC[ 'TC_1_code#1' ]))
or
FindNonNilString(DerogCodes,TC[ TC_1_code#2' ]))
local IND_CODE=TC[ TC_1_IND_CODE ']
324
Line Number: 12

FIG. 6A

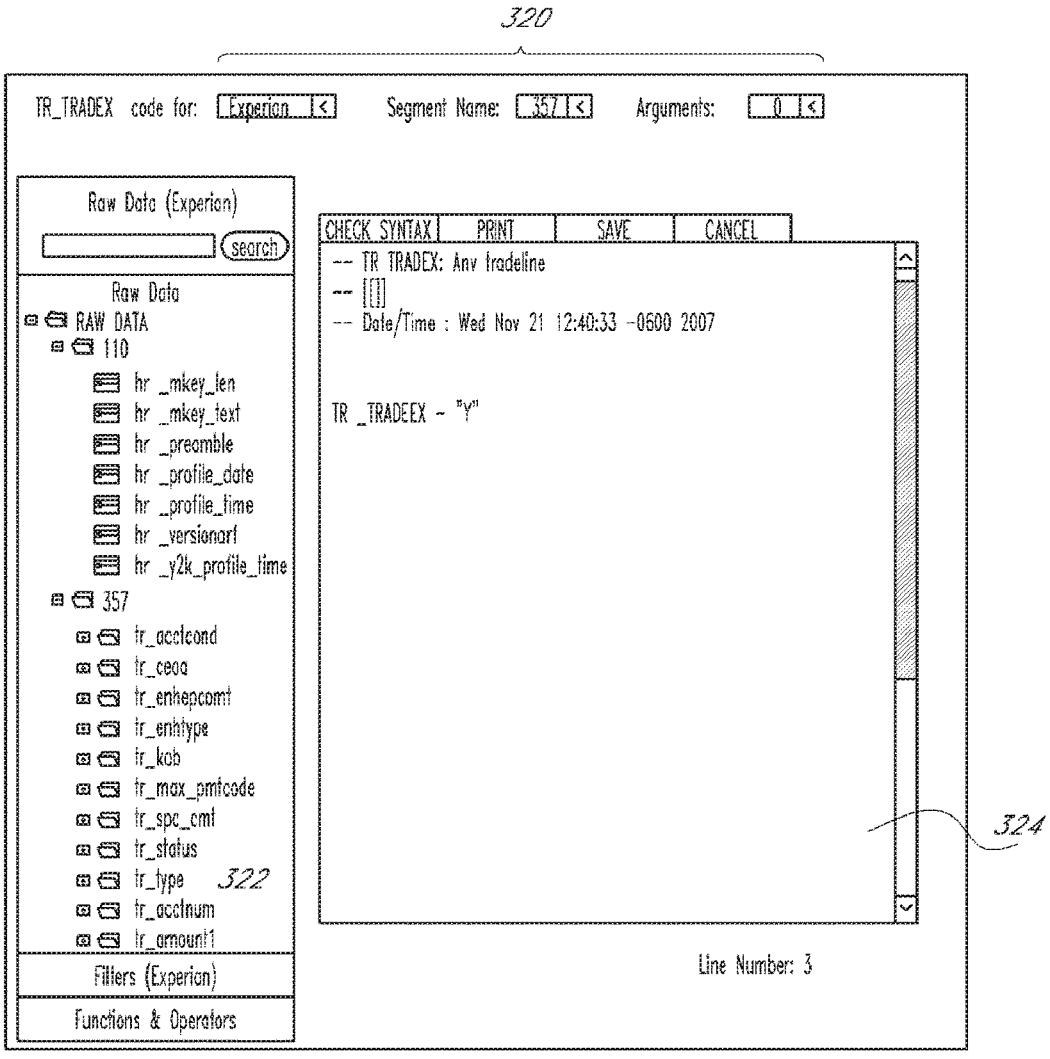

320
TR_TRADEX code for: Experian
Segment Name: 357
Arguments: 0
Raw Data (Experian)
search
Raw Data
RAW DATA
110
hr _mkey_len
hr _mkey_text
hr _preamble
hr _profile_date
hr _profile_time
hr _versionorf
hr _y2k_profile_time
357
tr_accteond
tr_ceoa
tr_enhepcomt
tr_enhtype
tr_kob
tr_max_pmtcode
tr_spc_cmt
tr_status
tr_type
322
tr_acctnum
tr_amount1
Filters (Experian)
Functions & Operators
CHECK SYNTAX
PRINT
SAVE
CANCEL
-- TR TRADEX: Anv tradeline
-- [[]]
-- Date/Time : Wed Nov 21 12:40:33 -0600 2007
TR _TRADEEX ~ "Y"
324
Line Number: 3

FIG. 6B

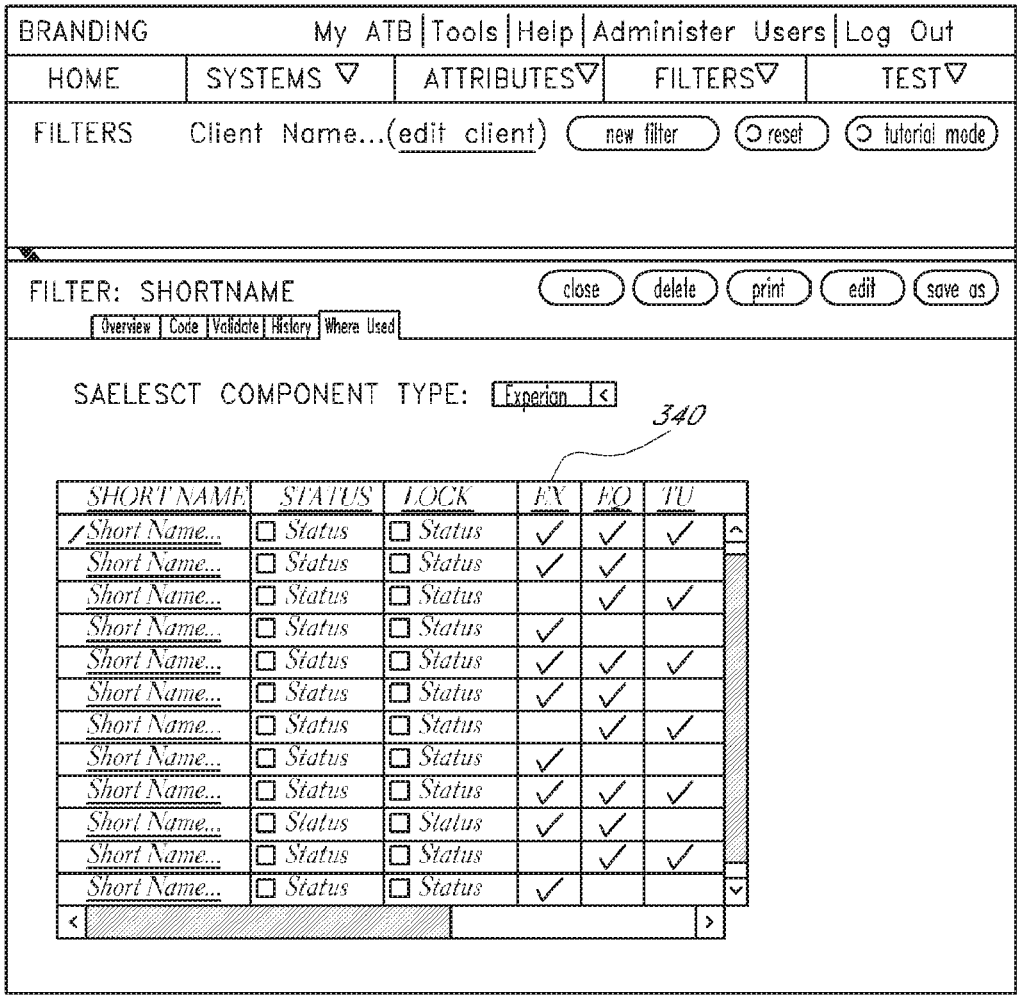
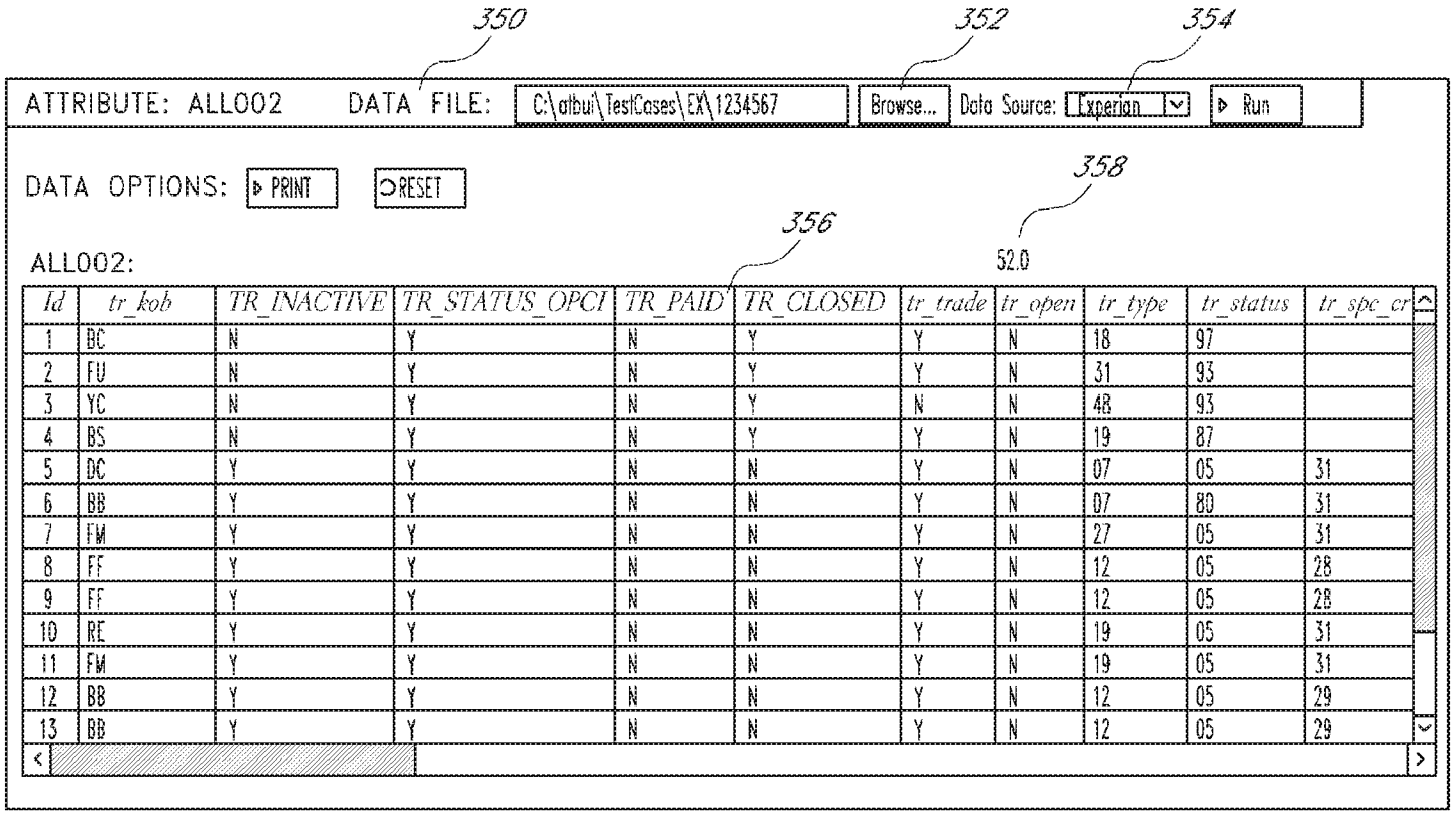

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
FILTERS
Client Name...(edit client)
new filter
reset
tutorial mode
FILTER: SHORTNAME
close
delete
print
edit
save as
Overview
Code
Validate
History
Where Used
SAELESCT COMPONENT TYPE:
Experian
340
SHORT NAME
STATUS
LOCK
FX
FQ
TU
Short Name...
Status

FIG. 6C




| Id | tr_kob | TR_INACTIVE | TR_STATUS_OPCI | TR_PAID | TR_CLOSED | tr_trade | tr_open | tr_type | tr_status | tr_spc_cr |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BC | N | Y | N | Y | Y | N | 18 | 97 | |
| 2 | FU | N | Y | N | Y | Y | N | 31 | 93 | |
| 3 | YC | N | Y | N | Y | N | N | 48 | 93 | |
| 4 | BS | N | Y | N | Y | Y | N | 19 | 87 | |
| 5 | DC | Y | Y | N | N | Y | N | 07 | 05 | 31 |
| 6 | BB | Y | Y | N | N | Y | N | 07 | 80 | 31 |
| 7 | FM | Y | Y | N | N | Y | N | 27 | 05 | 31 |
| 8 | FF | Y | Y | N | N | Y | N | 12 | 05 | 28 |
| 9 | FF | Y | Y | N | N | Y | N | 12 | 05 | 28 |
| 10 | RE | Y | Y | N | N | Y | N | 19 | 05 | 31 |
| 11 | FM | Y | Y | N | N | Y | N | 19 | 05 | 31 |
| 12 | BB | Y | Y | N | N | Y | N | 12 | 05 | 29 |
| 13 | BB | Y | Y | N | N | Y | N | 12 | 05 | 29 |

FIG. 7

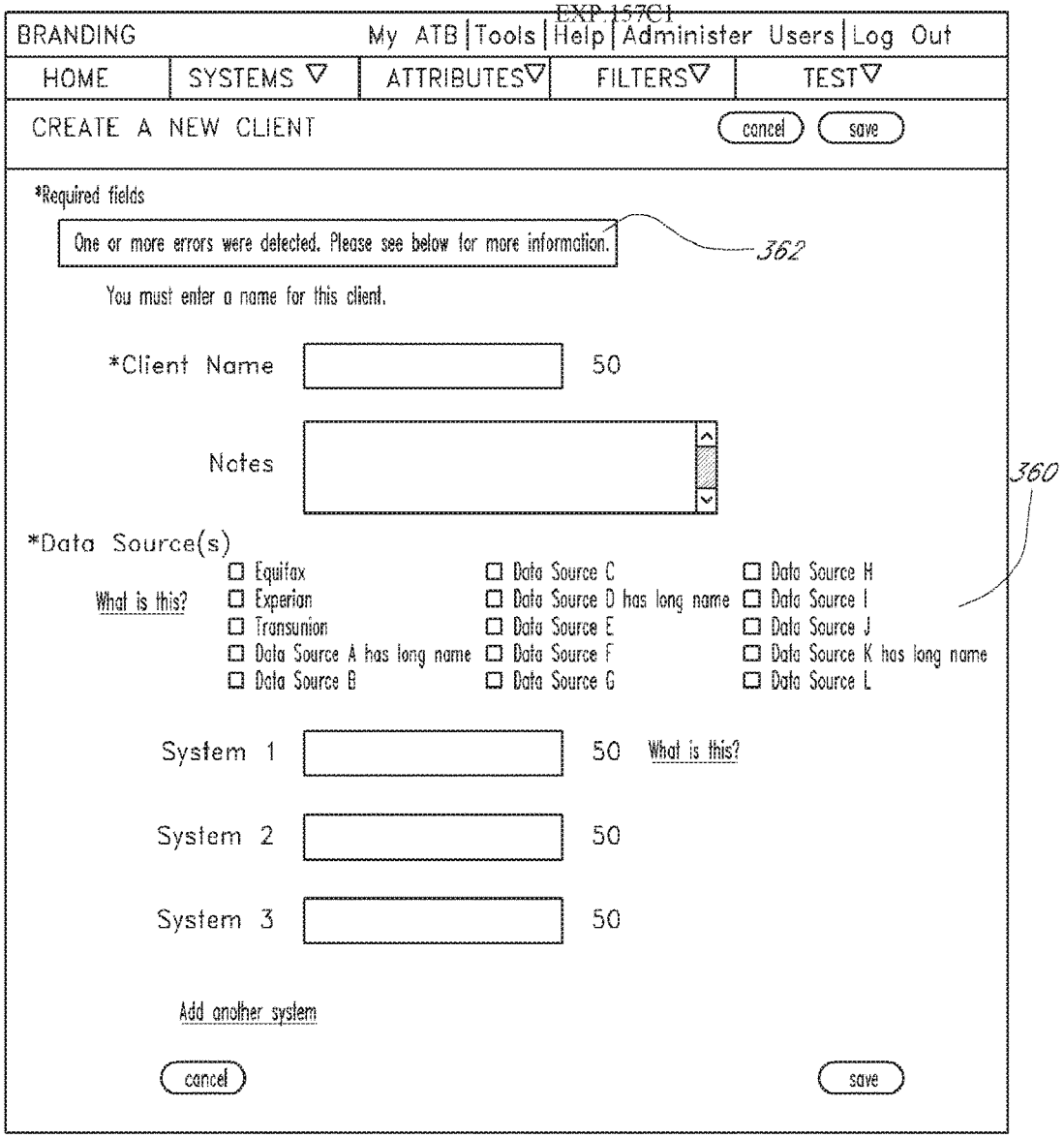

EXP.157C1
BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
CREATE A NEW CLIENT
cancel
save
*Required fields
One or more errors were detected. Please see below for more information.
362
You must enter a name for this client.
*Client Name
50
Notes
360
*Data Source(s)
What is this?
Equifax
Experian
Transunion
Data Source A has long name
Data Source B
Data Source C
Data Source D has long name
Data Source E
Data Source F
Data Source G
Data Source H
Data Source I
Data Source J
Data Source K has long name
Data Source L
System 1
50
What is this?
System 2
50
System 3
50
Add another system
cancel
save

FIG. 8A

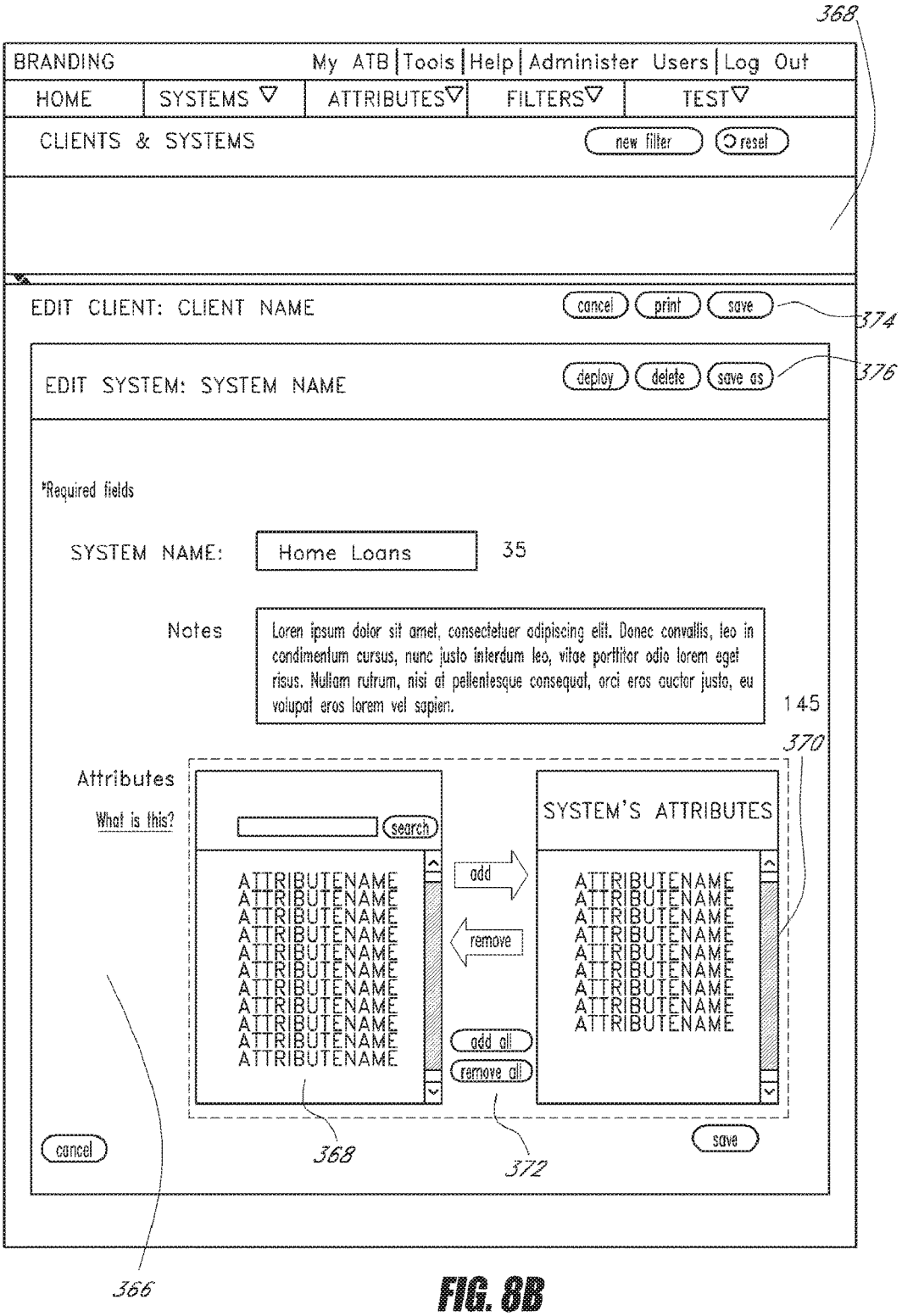

368
BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
CLIENTS & SYSTEMS
new filter
reset
EDIT CLIENT: CLIENT NAME
cancel
print
save
374
EDIT SYSTEM: SYSTEM NAME
deploy
delete
save as
376
*Required fields
SYSTEM NAME:
Home Loans
35
Notes
Loren ipsum dolor sit amet, consectetuer adipiscing elit. Donec convallis, leo in condimentum cursus, nunc justo interdum leo, vitae portitor odio lorem eget risus. Nullam rutrum, nisi at pellentesque consequat, orci eros auctor justo, eu volupat eros lorem vel sapien.
145
370
Attributes
What is this?
search
ATTRIBUTENAME
add
remove
add all
remove all
SYSTEM'S ATTRIBUTES
cancel
save
368
372
366

FIG. 8B

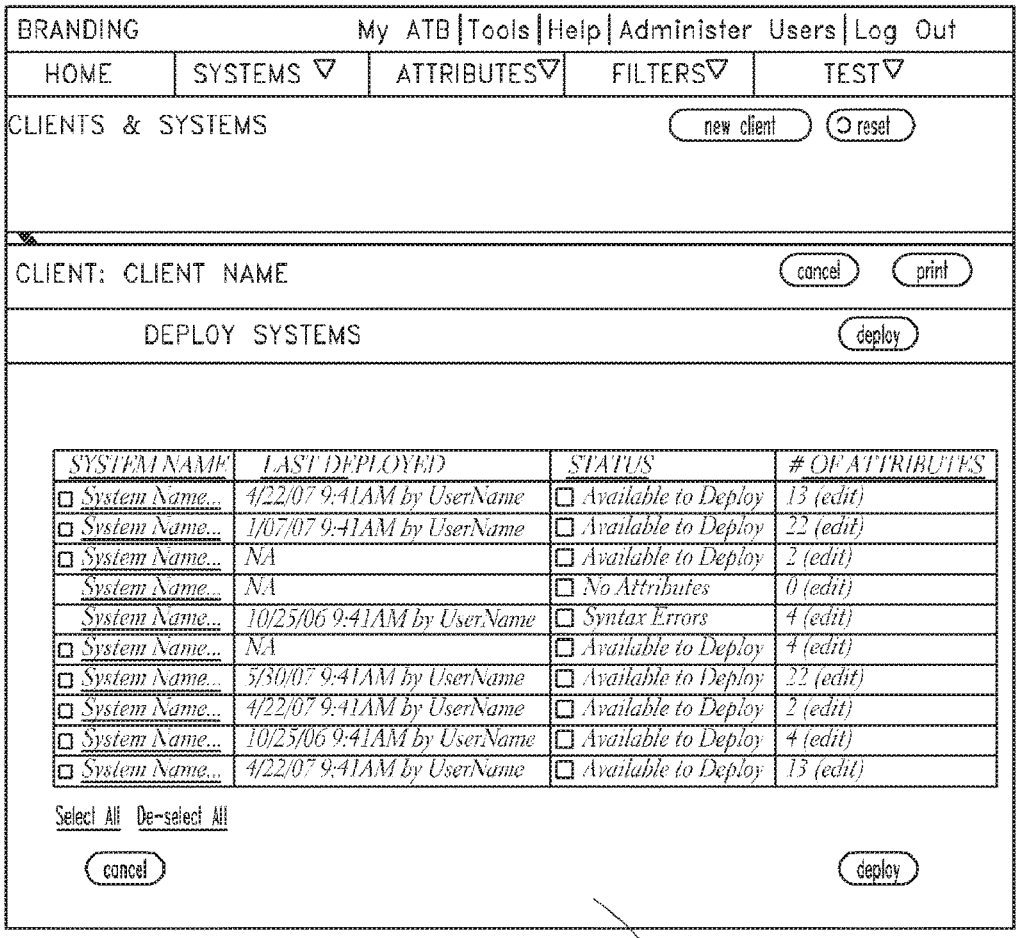

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
CLIENTS & SYSTEMS
new client
reset
CLIENT: CLIENT NAME
cancel
print
DEPLOY SYSTEMS
deploy
SYSTEM NAME
LAST DEPLOYED
STATUS
# OF ATTRIBUTES
System Name... 4/22/07 9:41AM by UserName Available to Deploy 13 (edit)
System Name... 1/07/07 9:41AM by UserName Available to Deploy 22 (edit)
System Name... NA Available to Deploy 2 (edit)
System Name... NA No Attributes 0 (edit)
System Name... 10/25/06 9:41AM by UserName Syntax Errors 4 (edit)
System Name... NA Available to Deploy 4 (edit)
System Name... 5/30/07 9:41AM by UserName Available to Deploy 22 (edit)
System Name... 4/22/07 9:41AM by UserName Available to Deploy 2 (edit)
System Name... 10/25/06 9:41AM by UserName Available to Deploy 4 (edit)
System Name... 4/22/07 9:41AM by UserName Available to Deploy 13 (edit)
Select All
De-select All
cancel
deploy
380

FIG. 8C

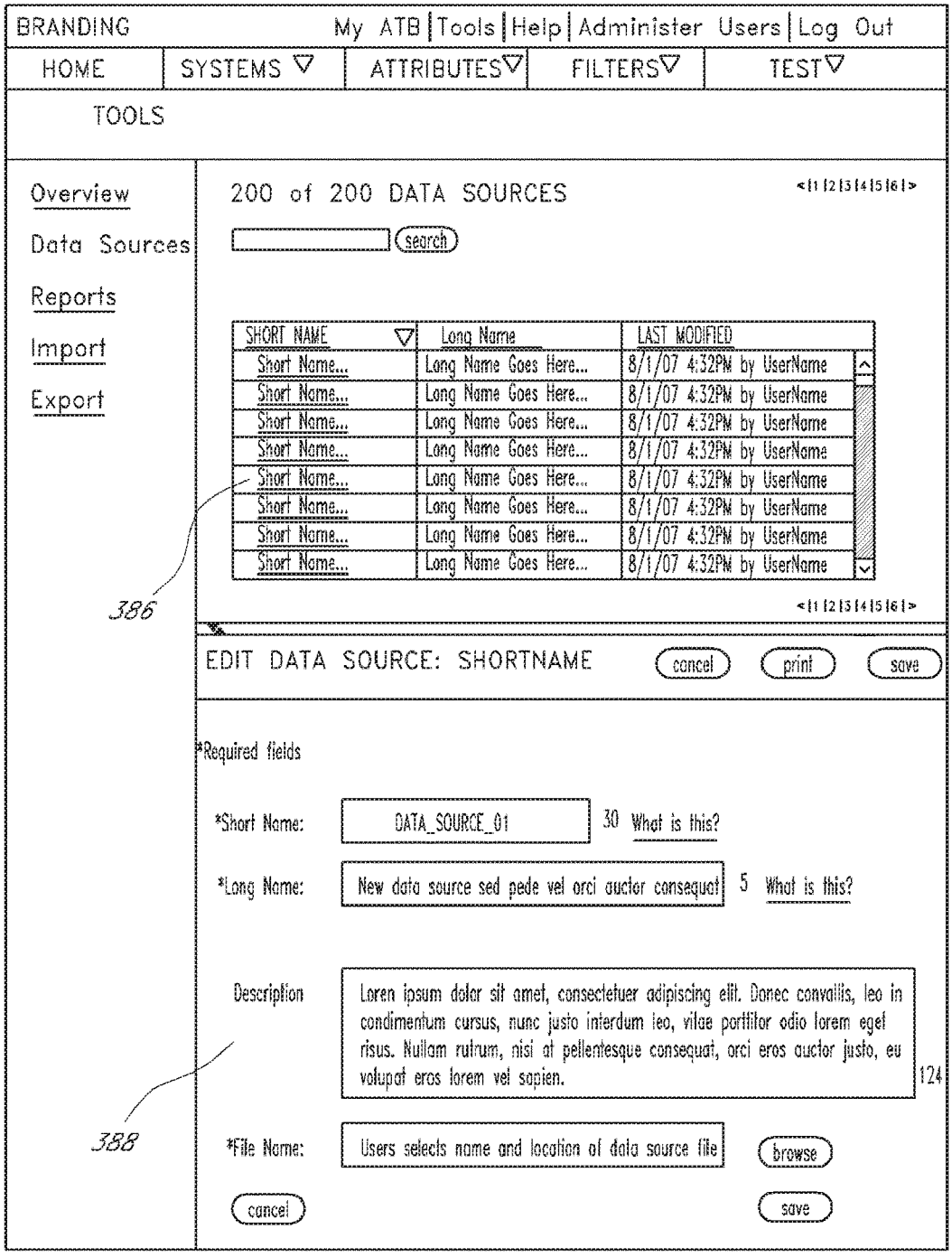

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
TOOLS
Overview
Data Sources
Reports
Import
Export
200 of 200 DATA SOURCES
<1 | 2 | 3 | 4 | 5 | 6 |>
search
SHORT NAME
Long Name
LAST MODIFIED
Short Name...
Long Name Goes Here...
8/1/07 4:32PM by UserName
386
EDIT DATA SOURCE: SHORTNAME
cancel
print
save
*Required fields
*Short Name:
DATA_SOURCE_01
30
What is this?
*Long Name:
New data source sed pede vel orci auctor consequat
5
What is this?
Description
Loren ipsum dolor sit amet, consectetuer adipiscing elit. Donec convallis, leo in condimentum cursus, nunc justo interdum leo, vitae porttitor odio lorem eget risus. Nullam rutrum, nisi at pellentesque consequat, orci eros auctor justo, eu volupat eros lorem vel sapien.
124
388
*File Name:
Users selects name and location of data source file
browse
cancel
save

FIG. 9A

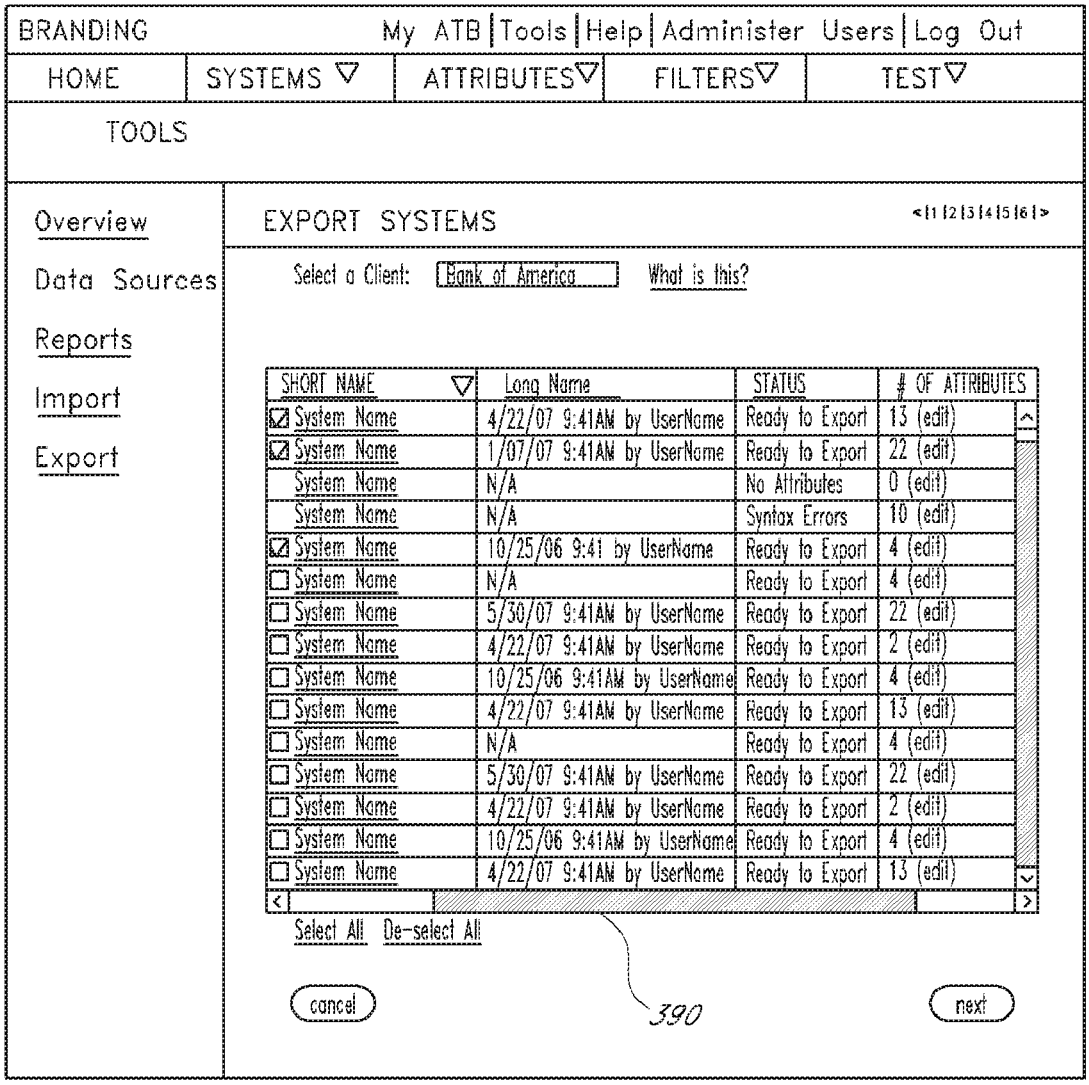

BRANDING
My ATB | Tools | Help | Administer Users | Log Out
HOME
SYSTEMS
ATTRIBUTES
FILTERS
TEST
TOOLS
Overview
Data Sources
Reports
Import
Export
EXPORT SYSTEMS
<|1|2|3|4|5|6|>
Select a Client: Bank of America
What is this?
SHORT NAME
Long Name
STATUS
# OF ATTRIBUTES
System Name | 4/22/07 9:41AM by UserName | Ready to Export | 13 (edit)
System Name | 1/07/07 9:41AM by UserName | Ready to Export | 22 (edit)
System Name | N/A | No Attributes | 0 (edit)
System Name | N/A | Syntax Errors | 10 (edit)
System Name | 10/25/06 9:41 by UserName | Ready to Export | 4 (edit)
System Name | N/A | Ready to Export | 4 (edit)
System Name | 5/30/07 9:41AM by UserName | Ready to Export | 22 (edit)
System Name | 4/22/07 9:41AM by UserName | Ready to Export | 2 (edit)
System Name | 10/25/06 9:41AM by UserName | Ready to Export | 4 (edit)
System Name | 4/22/07 9:41AM by UserName | Ready to Export | 13 (edit)
System Name | N/A | Ready to Export | 4 (edit)
System Name | 5/30/07 9:41AM by UserName | Ready to Export | 22 (edit)
System Name | 4/22/07 9:41AM by UserName | Ready to Export | 2 (edit)
System Name | 10/25/06 9:41AM by UserName | Ready to Export | 4 (edit)
System Name | 4/22/07 9:41AM by UserName | Ready to Export | 13 (edit)
Select All
De-select All
cancel
390
next

FIG. 9B

# SYSTEM AND METHOD FOR PROVIDING AN AGGREGATION TOOL

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 15/464,089, filed Mar. 20, 2017, entitled "SYSTEM AND METHOD FOR PROVIDING AN AGGREGATION TOOL", which is a continuation of U.S. patent application Ser. No. 14/091,174 filed on Nov. 26, 2013, entitled "SYSTEM AND METHOD FOR PROVIDING AN AGGREGATION TOOL", which is a continuation of U.S. patent application Ser. No. 12/022,954 filed on Jan. 30, 2008, and which issued as U.S. Pat. No. 8,606,666, entitled "SYSTEM AND METHOD FOR PROVIDING AN AGGREGATION TOOL," which claims the benefit of priority under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 60/887,523 filed on Jan. 31, 2007, the entire contents of which are each hereby incorporated by reference in their entirety herein and should be considered a part of this application. All publications and patent applications mentioned in this specification are herein incorporated by reference in their entirety and made a part of this specification to the same extent as if each individual publication or patent application was specifically and individually indicated to be wholly incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

The disclosure relates generally to the field of scoring and prediction and to tools to improve the flexibility and efficiency in generating and evaluating aggregated attributes.

### Description of the Related Art

There exists significant interest in information indicative of the relative financial risk or profitability of potential business transactions with individuals or other entities. For example, a lending institution is interested in the relative likelihood of a loan recipient timely and reliably making mutually agreed loan payments. An insurance company is interested in the relative likelihood of claims arising from an existing or potential client. Such predictive information is a factor in deciding whether to engage in a particular business transaction and/or the terms under which a transaction takes place.

A large variety of public records and privately developed databases can be utilized to inform such risk/benefit determinations. For example, credit reporting agencies (CRAs) collect and maintain information on a person's individual credit history. This information can include a total credit line on one or more accounts, current credit balance, credit ratios, satisfactorily paid accounts, any late payments or delinquencies, depth of credit history, total outstanding credit balance, and/or records of recent and/or historical inquiries into the person's credit. Governmental motor vehicle agencies generally maintain records of any vehicle code violations by a person as well as histories of reported accidents. Courts will generally maintain records of pending or disposed cases associated with a person, such as small claims filings, bankruptcy filings, and/or any criminal charges. Similar information also exists for large and small businesses, such as length of the business's existence, reported income, profits, outstanding accounts receivable, payment history, market share, and so forth.



The extensive amount of data available for any given person or entity makes the task of evaluating a business decision regarding the person or entity very difficult. Accordingly, such raw data is frequently processed to facilitate more convenient and rapid financial decisions. For example, a person's raw financial data can be processed to produce a "score" indicative of their relative credit worthiness. Such a score can be utilized in decisions to extend the person or entity further credit and/or as a factor in determining an interest rate to be charged. The evaluation of the relative risk/benefit of a given decision is even more complex when considering multiple persons simultaneously, such as spouses, partnerships, sole proprietorships, joint ventures, LLCs or other entities. When considering multiple persons, raw data from multiple sources about each of the individuals may need to be evaluated.

Attributes can be used to calculate various types of scores and in many instances may be used on their own to guide business decisions as well. Attributes can be aggregated to target various aspects of credit histories, bankruptcy data, and other types of non-credit-based data. For example, a simple attribute could be "consumers who have opened a new credit line in the last 12 months." The results of the attribute would be a set of consumers who meets both the criteria of having opened a new credit line and having done so in the last 12 months. Therefore, attributes are important in facilitating the use of raw data for a variety of decisions that financial institutions and other entities may need to make.

## SUMMARY OF THE DISCLOSURE

Embodiments of the present invention provide systems and methods for creating, managing, and calculating attributes and filters for multiple data sources. One embodiment is an attribute toolbox (ATB) architecture that comprises an ATB user interface (ATB UI) and an ATB engine system.

One embodiment of the present invention is a system for creating and using credit data attributes, comprising an attribute repository for storing a plurality of credit data attributes, a first application server executing a platform-independent user interface application, a credit data repository, and a second application server executing an attribute calculation engine system, wherein the attribute calculation engine system is configured to retrieve credit data from the credit data repository and performs calculations on the credit data in accordance to the attributes in a deployment package generated by the user interface application. In one embodiment, the user interface application further comprises a development interface for editing credit data attributes, wherein the development interface is configured to retrieve the credit data attributes from the attribute repository for editing and return edited credit data attributes or newly created credit data attributes for saving in the attribute repository, a validation interface for testing credit data attributes, wherein the user interface application is configured to execute a validation engine to calculate credit data attributes on test credit data and display the results on the validation interface, and a management interface for managing the deployment of the credit data attributes, wherein the credit data attributes are saved into a deployment package.

Another embodiment is a system for creating of data attributes, comprising an attribute repository and a user interface application configured to receive a plurality of

requests from users. The attribute repository stores a plurality of data attribute elements, including attributes, filters, functions, operators, and data definitions. The user interface application further comprises a development interface for editing attribute elements, wherein the development interface is configured to retrieve attribute elements from the attribute repository for editing and return edited attribute elements or newly created attribute elements for saving in the attribute repository, and a validation interface for testing data attributes, wherein the user interface application is configured to execute a validation processing engine to calculate data attributes on test credit data and display the calculation results of the individual attribute elements on the validation interface.

One embodiment is a system for calculating credit data attributes, comprising at least one credit data repository, a first plurality of application servers executing a plurality of attribute calculation engines, a second plurality of application servers executing a plurality of data access engines, wherein the data access engines are configured to access data from the at least one credit data repository, and a third plurality of application servers executing a plurality of façade applications, wherein the façade applications are configured to receive a plurality of attribute calculation requests from a plurality of calling applications, send corresponding requests to the attribute calculation engines and data access engines, and return calculation results from the attribute calculation engines to the calling applications.

One embodiment is a method for building attributes for data from multiple data sources, comprising the steps of defining a plurality of filters, wherein each filter takes into account the format of a data source among a plurality of data sources, defining a plurality of data source-independent attributes, wherein the attributes operate on data selected by the plurality of filters, and creating a deployment package based on the plurality of attributes.

One embodiment is a method for calculating data scores based on data from multiple data sources, comprising the steps of selecting a plurality of data sets from a plurality of data sources, wherein each of the plurality of data sources stores its data in a different format, defining a plurality sets of filters, wherein each set of filters takes into account the format of each of the plurality of data sources, defining a plurality of data source-independent attributes, extracting a subset of data from each of the selected data sets in accordance to the filters, calculating the attributes based on the subset of data, and aggregating the results obtained from the step of calculating to create data scores.

One embodiment of the present invention is a system for creating and using data attributes, comprising an attribute repository for storing a plurality of data attributes, a first application server executing a platform-independent user interface application, a data repository, and a second application server executing an attribute calculation engine system, wherein the attribute calculation engine system is configured to retrieve data from the data repository and performs calculations on the data in accordance to the attributes in a deployment package generated by the user interface application. In one embodiment, the user interface application further comprises a development interface for editing data attributes, wherein the development interface is configured to retrieve the data attributes from the attribute repository for editing and return edited data attributes or newly created data attributes for saving in the attribute repository, a validation interface for testing data attributes, wherein the user interface application is configured to execute a validation engine to calculate data attributes on test data and display the results on the validation interface, and a management interface for managing the deployment of the data attributes, wherein the data attributes are saved into a deployment package.

## BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention will now be described with reference to the following drawings, which are intended to illustrate embodiments of the invention, but not limit the invention:

FIG. **1** illustrates the architecture of the ATB architecture according to an embodiment;

FIG. **2** illustrates the hierarchy and the dependencies of systems, clients, attributes, filters, functions and raw data as used in one embodiment;

FIG. **3**A illustrates an example deployment configuration of the ATB UI according to an embodiment;

FIG. **3**B illustrates an example deployment configuration of the ATB engine system according to an embodiment;

FIG. **4**A is a schematic diagram showing the implementation of the ATB UI according to one embodiment;

FIG. **4**B is a schematic diagram showing the implementation of the ATB engine system according to one embodiment;

FIG. **5**A is an example computer screen showing how attributes are located and managed in the ATB UI according to one embodiment;

FIG. **5**B is an example computer screen showing the attribute development interface according to one embodiment;

FIG. **5**C is an example computer screen showing how functions and operators can be added to attributes according to one embodiment;

FIG. **6**A is an example computer screen showing the filter development interface according to one embodiment;

FIG. **6**B is an example computer screen showing how details of a selected data source are displayed in the filter development interface according to one embodiment;

FIG. **6**C is a computer screen showing a search and browse interface displaying how filters are used according to one embodiment;

FIG. **7** is an example computer screen of the validation interface showing the results of the validation engine according to one embodiment;

FIG. **8**A is an example computer screen showing how a client system can be created in the ATB UI according to one embodiment;

FIG. **8**B is an example computer screen showing how attributes can be associated with a client system for deployment according to one embodiment;

FIG. **8**C is an example computer screen showing how multiple clients and systems are managed in the ATB UI according to one embodiment;

FIG. **9**A is an example computer screen showing how multiple data sources are managed in the ATB UI according to one embodiment; and

FIG. **9**B is an example computer screen showing show attributes and filters can be exported according to one embodiment.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Embodiments of the ATB UI system architecture solve many problems associated with developing, managing, and deploying attributes. First, many common aggregated attri-

butes are often complex, referencing other attributes as well as filters that are data format dependent. The filters themselves have to be coded to access specific fields within a data source. For example, since each of the main CRAs in the United States maintains data in a different format, a separate filter is often used for each CRA. Therefore, the development of filters and attributes is often a tedious process and syntax errors frequently occur. Those skilled in the art will recognize that attributes can be developed for non-credit data sources, and the challenge of accounting for the individual formats of non-credit data sources exist as well. In one embodiment, the ATB UI includes a development interface that allows for filters and attributes to be moved via the UI, for example, into a coding area in which an attribute or a filter is being edited. In another embodiment, the ATB UI provides a filter development interface that presents data fields to the user. The interface simplifies the task of developing filters for multiple data sources that have different formats by presenting the data fields of the data sources in a graphical user interface. The fields can be moved into coding area as well, ensuring that proper data field references are included.

Second, the development of efficient and accurate attributes relies on extensive testing on raw data and constant revisions are made based on test results. Attributes often reference other attribute elements in a long chain of dependencies, including other attributes that may in turn reference numerous filters. For example, in developing an attribute that uses five other attributes, a developer may have to run numerous tests in order to arrive at the proper weight that should be accorded to each of the five attributes. In one embodiment, the ATB UI includes a validation interface that advantageously allows the user to see results returned by each attribute element that is referenced by the attribute that is currently being tested. One embodiment displays the results of each filter and each attribute that is referenced by the attribute that is being validated. This enables the user to quickly determining any errors or performance problems hidden in the chain of dependencies. The user can, for example, quickly determine that a filter is selecting a wrong field or that an attribute calculation is returning erroneous or undesirable results. The interface is particularly helpful in the development of aggregation attributes, which often reference a large number attributes and filters. The ability to trace the results of the individual elements is invaluable to the development of such attributes.

Third, institutions often require the use hundreds of attributes in multiple combinations to handle complex analysis and modeling on credit-based and non-credit based data. As a result, both the creation and maintenance of filters and attributes can require significant time and effort. Finally, the ability to effectively calculate attributes and scores on data from multiple data sources also presents significant challenges as well.

Embodiments of the ATB UI and ATB engine system architectures facilitate the management of the attributes and remove some of the difficulties that come with having to manually configure the deployment of attributes in system files. In one embodiment, the ATB UI allows users to associate groups of attributes into a system through a graphical user interface. The ATB UI also provides a comprehensive view of how attributes are deployed in various systems. Users can quickly and easily view the dependencies between attributes and the associated systems and determine how editing an attribute will affect the systems in their deployment scheme. In one embodiment, upon user request the ATB UI will automatically output a single deployment package including all of the user's systems, along with the proper associations of attributes, filters, and other configuration information. The deployment package can then be used in the ATB engine system, a system that performs attribute calculations.

In one embodiment, the ATB engine system is configured to dynamically access multiple data sources and automatically performs attribute calculations based on the attributes included in the deployment package. In another embodiment, the ATB engine system can calculate the attributes on credit data for a related set of individuals or entities. In one embodiment, both the ATB UI and the ATB engine system are implemented in a component-based architecture with a high degree of flexibility, maintainability, and scalability. In one embodiment, multiple components can be hosted in a single environment. In another embodiment, the components can be distributed across a network with a load balancing server to manage and distribute requests among the components.

FIG. **1** depicts the architecture of an embodiment of the present invention. Attribute Toolbox (ATB) architecture **100** includes two main components: an ATB User Interface (ATB UI) module **102** and an ATB engine system **104**. The ATB UI **102** presents a comprehensive user interface through which users can view, edit, validate, and simulate filters and attributes. The ATB engine system **104** takes the attributes created by the ATB UI **102**, fetches data from the appropriate data sources, and performs calculations on the fetched data based on those attributes.

ATB UI

As shown in FIG. **1**, the ATB UI **102** includes a presentation component **110**, a business logic abstraction **112**, an attribute/filter management business logic **114**, and a data access layer **116**.

Attribute Development

The presentation component **110** presents various user interfaces to assist in the development of filters and attributes and the management of their deployment to various systems. In one embodiment, the presentation component **110** further comprises filter and attribute development interfaces **150**, a search/browse interface **152**, a management interface **154**, and a validation interface **156**. The filter and attribute development interfaces **150** enable users to drag and drop existing data definitions, filters, functions, and attributes into a coding area and thereby substantially reducing the time and effort required to locate the proper elements that need to be added into new filters and attributes. The search interface **152** enables user to search for and browse filters, attributes, and clients/systems. The management interface **154** allows user to configure clients and systems and provides an interface through which attributes can be associated to systems for deployment. These user interfaces will be further described in conjunction with FIGS. **5A-9B**. In one embodiment, the ATB UI **102** accepts requests from client computers **122** and responds by presenting the appropriate user interfaces to the client computers **122**.

These user interfaces access objects and methods within the business logic abstraction **112** layer, which is an abstraction layer of the attribute/filter management business logic **114**. Hence, any future changes in the implementation in the attribute/filter management business logic **114** will not necessarily necessitate recoding or reconfiguring the presentation component **110**. The ATB UI **102** retrieves attributes and filters from the attribute/filter repository **118** through the data access layer **116**. Likewise, new or edited filters and attributes are saved back to the repository **118**. The attributes

can be standardized attributes such as standard aggregation (STAGG) attributes created by Experian, custom-made attributes, or both.

In one embodiment, the repository **118** implements a version control feature so that users of the ATB UI **102** can retrieve previous versions of attributes and filters. Furthermore, the ATB UI **102** provides a locking mechanism by which users can lock the attributes and filters that they are currently editing to prevent other users from changing them. The locking mechanism and the version control feature enable multiple users to collaborate on the development of attributes and filters.

In addition, one embodiment of the ATB UI **102** has user access control. For example, some users may be given rights to execute but not view attributes. Other users may have full rights to view and edit the attributes. In one embodiment, the user access rights are controlled by special serial numbers or passcodes, though it is recognized that a variety of security procedures and methods may be used. A user presents the proper serial number or passcode in order to view and edit attributes. The modularity of various interfaces, in addition to the user control feature of ATB UI **102**, allows users with various roles to collaborate on a project. For example, developers of attributes and filters may be granted full rights to view and modify attributes and filters, while business analysts may be granted limited rights to deploy the attributes to various systems. In another example, a company that specializes in developing attributes and filters may have full access rights while its customers who purchase the attributes and filters may be given limited rights to use but not view the attributes and filters.

Testing, Validation and Simulation

One main difficulty with attribute and filter development is the significant effort required for validation. Often attribute and filter developers have to test the attributes and filters on sample data and modify them repeatedly to improve performance and accuracy. In addition to this iterative process, developers have to account for the large number of dependencies that can potentially be in any attributes and filters. FIG. **2** illustrates the potential dependencies as used in one embodiment. Hierarchy **170** shows that clients are dependent on systems, which in turn are dependent on attributes. An example client may be a credit card company, and the company may have a number of systems for its credit card products. For example, one system may be used to screen commercial card applicants and another may be used to screen consumer card applicants. As such, the two systems have different attributes because the screening criteria for these two groups of applicants are different.

Retuning to the hierarchy, attributes are further dependent on filters, which in turn are dependent on the raw data definitions. This is because attributes are data-independent and filters are data dependent. In one embodiment, a filter must be defined for each data source. As shown in the hierarchy **170**, each filter can also reference other filters, functions and data definitions. Each attribute, in turn, can reference a number of filters, functions and other attributes. Thus, an error in a data definition in a single filter can adversely affect all filters that that reference that single filter, and in turn all attributes that reference those affected filters will be affected as well, and so on.

One embodiment of the ATB UI **102** addresses this difficulty by providing a validation engine **160** that allows for dependency tracing. In one example, an attribute A includes three other attributes B, C, D, and attributes B, C and D each additionally has three filters B**1**, B**2**, B**3** and so on. When the user decides to test attribute A on a test data set in the validation engine **160**, the validation interface **156** shows the user the results of applying filters B**1**, B**2**, B**3**, C**1**, C**2**, C**3**, D**1**, D**2**, and D**3** to the sample data, as well as the results of calculating attributes B, C, and D. In addition, the validation interface **156** displays the raw data used in testing. Because each result in the chain of dependency for attribute A is displayed, the user can quickly locate any problem within the chain of dependency. For example, the user can see that attribute B is returning undesirable results, determine that filter B**1** is incorrect, and adjust filter B**1** to correct the problem. Because the dependencies can often be far more numerous and complex than this simple example, the validation interface **156** provides a powerful tracing tool for developers of attributes and filters for multiple data sources.

In addition to the validation engine **160**, embodiments also provide a simulation configuration wherein the user can utilize the ATB UI **102** to simulate the performance of their filters and attributes to see how they affect attribute and score calculations. In one embodiment, the ATB UI **102** provides an interface by which a user may connect a custom application so the user may simulate the attributes and filters created in the ATB UI **102** in the custom application.

ATB Viewer

Embodiments of the invention also include an ATB Viewer component. The ATB Viewer is a user interface that allows users to "view" parsed raw data, calculated filter or attribute results. Attributes and filters can be created and generated and the results can be stored. The results can further be returned to a custom/calling application selected by the user. If the user wishes to view the results immediately, he/she can access the ATB Viewer to have a general formatted overview of the results for a specific test case.

Management and Deployment

The ATB UI **102** allows users to manage the collections of filters and attributes that are slated for deployment in the ATB engine system **104**. Users can quickly create attributes and associate a group of attributes for deployment. For example, a bank user may create twenty attributes for its credit card operations and another fifty attributes for its home loan operations. The bank may then associate the twenty attributes to a "Credit Cards" system and the fifty attributes to a "Home Loans" systems by using the ATB UI **102**. The ATB UI **102** then outputs a deployment package **120** to be used by the ATB UI engine system **104**, which performs calculations based on these associated attributes included with the deployment package **120**. In one embodiment, the deployment package **120** is generated with the proper dependencies among the attributes and filters. Furthermore, the deployment package **120** can accommodate multiple systems, each with its own associated attributes. This one-step deployment function of this embodiment substantially eliminates the cost of having to code the dependencies of the attributes manually and enables rapid deployment of multiple systems with a single request sent to the ATB UI **102**.

ATB Engine System

The ATB engine system **104** retrieves and parses raw data, calculates attributes, and returns results. In the illustrated embodiment, the ATB engine system **104** comprises an ATB engine **106** and a data access engine **108**. In other embodiments, they can be combined into one engine. The ATB engine **106** calculates attributes or scores using data received from the data access engine **108**. In one embodiment, the ATB engine **106** comprises a parser **162**, which reads and parses data. In other embodiments, during calculation, the ATB engine **106** reads instructions in a manually created file

or a deployment file produced by the ATB UI **102**. The ATB engine **106** then instructs a business rules component **164**, which performs the actual calculations.

In one embodiment, the data access engine **108** accesses the external data source(s) **140** or reads the data from one or several files (for example, an automatic response format (ARF) file), parses the data, and sends it to the ATB engine **106** for calculation. The data access engine **108** comprises a mapper **166** and a communication module **168**. The mapper **166** handles the mapping of data fields in data sources **140** to objects within ATB engine system **104**. The communication module **168** handles the tasks of communicating with various data sources **140**. Because data access engine **108** accepts a wide variety of data input, it can be configured to access data from credit data sources **402** as well as data from non-credit data sources **404**, such as a local data source **406**. In one embodiment, the local data source **406** is a batch XML input. For example, a bank running an instance of the ATB engine **104** may configure the ATB engine **104** to perform attribute calculations on data from a credit bureau, a third-party data source, and/or its own internal customer data. In one embodiment, the results of the calculations are sent to a repository **148** so the calling application **124** may access them.

Because the ATB engine system **104** can handle multiple data sources, it can dynamically calculate the attributes across data sources as needed. Embodiments of the ATB engine system **104** can be configured to automatically calculate attributes across multiple data sources, whether in response to requests from a plurality of calling applications or a large volume of batch requests from batch files. The ability to handle calculations across multiple data sources in accordance to the incoming requests greatly assist in the evaluation of the relative risk/benefit of a given financial decision that involve multiple persons at the same time, such as spouses, partnerships, sole proprietorships, joint ventures, LLCs or other entities. Thus, unlike prior systems, users of the ATB engine system **104** will not have to access the data sources individually and perform attribute calculation for each source and then combine the results of their calculations. Similarly, the ATB engine system **104** will not have to perform an analysis on individuals separately and then combine the results.

Profile

Embodiments of the ATB engine system **104** additionally includes a profile component. In one embodiment the profile component is part of the façade **130**. A profile provides the ability to handle simple work flows. For example, one work flow may be a decision of call one data source versus another that depends on the results coming from a previous service request. For example, one profile can include instructions to the ATB engine system **104** to access an alternative data source in case a first request does not return the desired data. The profile workflow logic can include a variety of instructions and requests that can be executed based on the occurrence or non-occurrence of various conditions. Embodiments of ATB engine system include profiles that can handle roll-over logic, ZIP code tables and any other type of logic driven by one or several attribute calculations.

ATB UI Architecture

FIG. **3**A depicts an embodiment of the ATB UI web server architecture. The illustrated ATB UI architecture **200** includes an ATB UI web server **202** configured to receive requests from a plurality of workstations or other remote computing devices **204**. In one embodiment, workstations or remote computing devices **204** send requests and receive responses via the HTTP or HTTPS protocols, and use web browsers to solicit inputs and display the information to the end users. For example, an end user may be a bank that regularly extends credit to its customers. The bank may be able to use its computers to remotely interact with the ATB UI web server **202** in order to view, edit, validate, and test its own attributes and filters stored in relational databases **206**. In one embodiment, the ATB UI web server **202** is a self-contained Ruby on Rails application that acts as a web server. It communicates via the HTTP or HTTPS protocol in one embodiment. Syntax checking of attribute codes is accomplished through java-script on the client computers. It is recognized that other applications, protocols, and languages may be used.

ATB Engine Architecture

FIG. **3**B illustrates an embodiment of the ATB engine system architecture. The illustrated ATB engine system architecture **220** includes a calling application **222**, a load balancer **224**, one or more façade web services **226**, data access engines **228**, ATB engines **230**, and a data storage **232**. In one embodiment, the calling application **222** is an application that sends calculation requests to the load balancer **224**. In other embodiments, the calling application **222** directly sends requests to the façade web service **226**. These requests include requests to calculate attributes and scores. For example, a bank may have a calling application that sends a request to calculate the number of customers who have the attribute of recently opening a credit line within the last twelve months. In one embodiment, the calling application is a custom-coded application. For example, a mortgage company may have a custom-coded application to process its loan applicants. In another embodiment, the calling application is a commercially available application such as Transact by Experian Decision Analytics. It is recognized that other applications may be used.

In one embodiment, the load balancer **224** receives requests from a plurality of calling applications **222** and distributes those requests to a plurality of the façade web services **226** in order to improve the efficiency of the overall architecture. Each façade web service **226** publishes objects and methods available for attribute calculation. Upon receipt of an incoming request from the calling application **224**, the façade web service **226** initiates the appropriate remote procedural calls (RPC) over the TCP/IP protocol to either the data access engine **228** or the ATB engine **230**. For example, the façade web service **226** may initiate a first RPC to the data access engine **228** to retrieve the requested data from the data storage **232** and then initiate a second RPC to the ATB engine **230** for calculation. The ATB engine **230** then calculates the results by applying attributes within the deployment package **120** to the retrieved data sets. In one embodiment, a user can use the ATB UI **102** to create the deployment package **120**. The final results are sent back to the calling application **222**. In the recently opened credit line example mentioned above, the results would be a list of customers who have opened a recent credit line.

The configuration depicted in FIGS. **3**A and **3**B is for illustrative purposes only and those skilled in the art will recognize that any number of components of the architecture can be used. In one embodiment, the architecture is designed to be scalable. For example, although not depicted, a plurality of calling applications and a plurality of credit bureau data sources can be used in the architecture. Moreover, the components can reside in a single computer environment or distributed across multiple computer environments.

FIG. **4**A provides a more detailed depiction of the architecture of the ATB UI **102** according to one embodiment. As previously shown in FIG. **1**, client computers **122** access the

ATB UI **102** over one or more communication networks. The presentation component **110** presents a user interface by which users can interact with the ATB UI **102**. Except for the web browsers located on client computers **122**, no installed code base of ATB UI needs to reside on client computers **122**. Communications from the browser interface to the presentation component **110** occur through URL navigation or HTTP requests.

The business logic abstraction layer **112** is an abstraction layer of the attribute/filter management business logic **114**. The abstraction layer **110** further comprises a filter manager **132**, an attribute manager **134**, and a client manager **136**. These managers present objects, systems and methods for viewing, editing, and managing filters, attributes, and systems to which the filters and attributes will employ. The managers have their corresponding counterparts within the business logic **114**, namely, a filter business component **142**, an attribute business component **144**, and a client business component **146**. The three business components work with a repository object **120** within the data access layer **116** for transactions involving the repository **118**. In this example embodiment, the repository **118** comprises a SQLite database server, but those skilled in the art will recognized that other database servers such as Oracle, mySQL, Microsoft SQL Server, and IBM DB2 can be used as well.

The abstraction layer **112** serves as a liaison between the presentation component **110** and the business logic **114**. The abstraction layer **112** also provides security enforcement functions in one embodiment. For example, it ensures that attributes are only displayed for the users who have the proper access rights to view them. In one embodiment, the abstraction layer **112**, the business logic **114** and the data access layer **116** are implemented in a Ruby on Rails environment, which has the advantages of providing ease of maintenance and a modular programming construct, though other environments may be used.

As shown in FIG. **4**A, the ATB UI **102** further includes a core services component **254** and a support service component **256**. In one embodiment, the core services component **254** is a Rails framework comprising a security component **260**, an exception component **262**, an export/import component **264**, and a logger component **266**. The security component **260** provides the logic for security enforcement, which limits access to the attributes and filters to those users who have the proper levels of access rights. The exception component **262** handles exceptions generated by any component within the ATB UI **102**. The export/import component **264** is a data interchange service that supports and provides the capability to export and import ATB entities (for example, attributes) from and into the ATB UI **102**. The logger component **266** is served by the Ruby log 4r library in one embodiment. It provides the functionality to publish messages to external log stores and to control the type and volume of data logged. The support service component **256** comprises a reporting component **268**, which provides a set of pre-defined reports that can be run. In one embodiment, the generated reports are templates for specification documents and include attributes and related results.

FIG. **4**B is a schematic diagram showing the implementation of the ATB engine system **104** according to one embodiment. The façade **130** includes two methods of accepting requests. It has a web service component **270** and a batch component **272**. In one embodiment, the web service component **270** is supported by a SOAP4R component **294** within technical services **288**. SOAP4R is a Simple Object Access Protocol (SOAP) implementation in the Ruby programming language. The web service component **270** thus accepts SOAP requests from calling applications. Alternatively, the batch component **272** reads batched requests in a repository **298**. In one embodiment, the repository **298** is a hard drive.

In either case, once an incoming request has been received, the façade **130** begins the process of managing the request and performs the necessary work in order to return a response to the request. First, the façade **130** has a message publisher **276** that will publish a message to either the ATB engine **106** or the data access engine **108**. In one embodiment, the message is a RPC sent via the TCP/IP protocol. The façade **130** includes managing logic that will handle the sequence in which RPCs are sent. The façade **130** additionally includes a profile component that handles a variety of work-flow logic as described earlier.

Both the ATB engine **106** and the data access engine **108** have a message subscriber component that subscribes to the message publisher **276**. In the ATB engine **106**, once the message subscriber **278** receives a message from the message publisher **276**, it will instruct business component **280** to perform calculations. In one embodiment, business component **280** further comprises the parser **162** and the business rules component **164**. The business rules component **164** performs calculations based on the attributes and filters within deployment package **120**, using data parsed by the parser **162**. In one embodiment, the business component **280** is implemented in the Lua scripting language, which provides fast execution times and increased performance. This is particularly important in some embodiments because the ATB engine system may be configured to receive a high volume of requests from the batch component **272** and to accept a large number of requests from calling applications through the web service **270**. The façade **130** and the access engine **108** are implemented in the Ruby programming language in one embodiment.

Access engine **108** also includes the aforementioned message subscriber **282** and a data source access framework **284**. After the message subscriber **282** receives a message from the message publisher **276**, it will instruct the data source access framework **284** to access the requested data. The data source access framework reads a data source definition file **286** in order to determine the data formats of the various data sources that are being accessed. Finally, technical services **288** include a log 4r component that provides logging capability for debugging purposes.

Attribute Interfaces

FIG. **5**A is an example computer screen showing the attribute search/browse interface **152** in the ATB UI **102** according to one embodiment. As shown, a search panel **302** is provided so users can search for attributes by various parameters such as name/keyword, system, and format. In response, the ATB UI **102** displays a sortable list **304** of attributes stored in the repository **118** that match the search parameters. For each attribute, the ATB UI **102** shows the system in which the attribute is being deployed, as well as whether the attribute is locked by another user who is viewing or editing it.

The ATB UI **102** facilitates the management of the attributes and removes some of the difficulties of having to manually configure the deployment of attributes. Because the UI provides a comprehensive view of how attributes are deployed in various systems, users can quickly and easily view the dependencies between attributes and the associated systems and determine how editing an attribute will affect the systems in their deployment scheme. In addition, because the name of each attribute listed is a link to the attribute development interface with that selected attribute

shown in a coding area, the users can quickly launch into the development environment from the list **304**.

FIG. **5**B is an example computer screen showing how attributes can be edited in the attribute development interface **150** according to one embodiment. As shown, an example attribute is being edited or created in a coding area **314**. Because attributes often reference numerous other attributes, filters, functions, and operators, the development interface **150** provides a panel **312** that lists other attributes, filters, functions, and operators that can be inserted into the coding area **314**. This ensures that the newly created attribute or the edited attribute will have the proper dependencies. In one embodiment, the list is populated by the attributes and filters retrieved from the repository **118**. Any attribute or filter listed can be moved (for example, dragged and dropped) into the coding area **314**, and a proper reference to that attribute or filter automatically appears within the coding area **314**.

In addition, the panel **312** has a tab area **316**, which has two other tabs "filters" and "functions & operators" as shown. A user can select one of the other tabs and brings up either the filters or the functions and operators that are available. Likewise, these elements can be dragged and dropped into the coding area **314** and the proper references are automatically created. FIG. **5**C shows an example of the panel **312** after a user selects the "functions &operators" tab within the tab area **316**. Any of the functions and operators shown can be moved (for example, dragged and dropped) into the coding area **314**. Therefore, the development interface **150** enables users to rapidly code new attributes or modify existing attributes with accurate references to other attributes, filters, functions, and operators.

Filter Interfaces

FIG. **6**A is one embodiment of an example computer screen of the filter development interface **150**. Similar to the attribute development interface shown in FIG. **5**B, the filter development interface presents other filters, functions, and operators in a panel **322** that can be dragged and dropped into a coding area **324**.

Coding Filters for Various Data Sources

Because of the complexities of database definitions, the task of developing filters on raw data is often left to programmers. To overcome this problem, the filter development interface **150** simplifies the task of developing filters for various data sources by showing the data fields within segments of the data sources. Therefore, in addition to filters, functions, and operators, the filter development interface has a "raw data" tab in the tab area **326**. As shown in FIG. **6**A, the available data segments in the data source "Experian" are listed in the panel **322**. The fields within the segments are available to be dragged and dropped into the coding area **324**. As shown, the coding area **324** shows the codes the filter that is being developed.

FIG. **6**B is an example computer screen showing how filters can be developed for different data sources in the ATB UI. As shown in FIG. **6**B, data fields for a selected segment within a selected data source are listed in the panel **322**. Drop down boxes **320** include a data source drop-down box, a segment drop-down box, and an argument drop-down box. The data source is selected at the data source drop-down box, and the data segment is selected at the segment drop-down box and so on. In this example, the "Experian" data source has been selected and a segment has also been selected. In one embodiment, all available valid segments associated with the selected data source are listed in the segment drop-down box.

In one embodiment, once a segment is selected, all the available data fields are shown within the panel **322**. The user can drag and drop a field into the coding area **324**. Through the filter development interface **150**, a user can easily scan through the available fields within the segments in a data source and quickly and accurately add the necessary fields to a filter that is currently being edited in the coding area **324**. This interface minimizes errors and speeds up the development of filters for multiple data sources with different data formats.

FIG. **6**C is a computer screen showing the filter search/browse interface **152**. Much like the interface shown FIG. **5**A for attributes, users can search for filters and the search results will be displayed in a listing **340**. Each filter is listed with status information, whether it has been locked by another user for editing, and whether it has been encoded for a particular data source (as indicated by the check marks). Clicking on the name of the filter will launch a development interface similar to the one shown in FIG. **6**A, where the user can edit the selected filter.

Syntax Checking and Validation

In one embodiment, ATB UI provides a syntax checking engine that checks the syntax of a filter or an attribute within a current coding area if requested by the user. As shown in FIG. **6**A, once the user selects a "Check Syntax" button **330**, the ATB UI will run a syntax check on either the filter or attribute that is currently being edited. For example, FIG. **6**A shows the syntax check window **328** displaying a message indicating that the syntax check engine has discovered a syntax error on line **13** of the example filter. The syntax check engine can likewise check for syntax errors within an attribute. Thus users of the ATB UI can avoid saving invalid filters or attributes. In other embodiments, a syntax check is automatically performed when a user attempts to save a filter or an attribute to the repository **118**, or save changes to an existing filter or attribute.

Besides a syntax checking engine, embodiments of ATB UI also provide the validation interface **156** and the validation engine **160** (shown in FIG. **1**) through which users can validate attributes against test data. FIG. **7** shows an example computer screen of the validation interface **156**. The validation interface **156** includes an information/selection area **350**, which further includes a data file selector **352** and a data source selector **354**. Using the data file selector **354**, the user can select a sample test file including test data for the data source that the user selects in the data source selector **354**. In the example shown, the user has selected a file including sample data from the data source "Experian" to be sent to the validation engine **160**. In one embodiment, the validation engine **160** accepts test files for in the ARF format.

In the example shown in FIG. **7**, the validation engine **160**, through the validation interface **156**, provides a result **358** for the selected attribute "ALL002." The validation engine **160** has calculated the attribute "ALL002" against the test data and has determined that the result is 52.0. More importantly, the validation interface **156** further includes a validation table **356** in which a user can examine the raw data and the dependencies within the attribute that is undergoing validation. The column headings of the validation table **356** show all the depending filters and attributes referenced in the code of attribute "ALL002." The rows of the validation table **356** show raw data from the test file.

The validation interface **156** advantageously allows the user to see exact results returned by each filter or attribute referenced by the attribute that is being validated. This enables the user to quickly determining any errors or per-

formance problems hidden in the chain of dependencies. The user can, for example, quickly determine that a filter is selecting a wrong field or that an attribute calculation is returning erroneous or undesirable results. The validation interface **156** is particularly helpful in the development of aggregation attributes, which often reference a large number attributes and filters.

System Management

FIG. **8**A is one embodiment of an example computer screen showing how a client can be created in the ATB UI. An input interface **360** solicits configuration information that is needed to create a new client. The input interface **360** includes a listing of data sources that the new client will access, as well as a listing of systems that will be associated with this new client. When the user attempts to save the client configuration information, the ATB UI will check for errors and display an error message **362** (as shown) if needed.

FIG. **8**B is one embodiment of an example computer screen showing how attributes can be associated with a client system for deployment. As an example, a client who is a bank may wish to deploy various systems associated with its needs. The bank may thus have one system that screens potential home loan applicants and another system for finding prospective commercial credit card applicants. Because each system requires different data and calculations, the bank client may wish to configure each one differently. The ATB UI provides an interface **366** to allow a client user to associate various attributes to a system for deployment. The interface **366** includes an available attribute listing **368** and a deployment attribute listing **370**. The user can search for and browse attributes that are available deployment in the listing **368** and then add the attributes to the deployment listing **370** by using an arrow selector **372**. The attributes will then be slated for deployment for the particular system.

FIG. **8**C is one embodiment of an example computer screen showing how multiple client system deployments are managed in the ATB UI. A system listing **380** lists systems that are available for deployment. Each system is listed with a name, a historical data entry including the date of last deployment, status, and the number of associated attributes. Under the status column, the ATB UI may indicate whether a system is ready or not ready for deployment. Some systems may not be ready to be deployed because they may have attributes with syntax errors or no attributes at all. The system listing **380** provides a way for the user to browse through the available systems and quickly determine which are ready for deployment. Furthermore, the ATB UI provides a link to the attributes so the user can quickly view or edit the attributes associated with the systems. The user is also given the option to select multiple systems from the listing **380** and deploy all of them at the same time. The deployment package **120** is then automatically created and can be used in ATB engine system **104**.

Managing Data Sources and Attribute Exports

FIG. **9**A is one embodiment of an example computer screen showing how multiple data sources are managed in the ATB UI **102**. The ATB UI **102** provides a data source listing **386** that lists the available data sources. Each entry lists the short and long names of the data source as well as the time when the data source was last modified. The ATB UI **102** also provides a data source area **388** that displays the detail information of a data source that has been selected. The user can then view or edit the details of a particular data source, including the location of the file from which data can be obtained.

FIG. **9**B is one embodiment of an example computer screen shot showing how attributes can be exported to a file. A system listing **390** provides a listing of systems that can be exported. Once exported, the file will include all attributes associated with the selected system. The export function allows multiple users from various sites to collaborate on a project. In one embodiment, users at remote sites without access to the centralized repository can run their own copies of the ATB UI **102**. For example, a first user may be developing attributes and filters on a laptop while traveling. The export function enables the first user to export the attributes and filters and send the export file to a second user who runs a different instance of the ATB UI **102** that has a connection to a centralized repository. The second user will then be able to import the attributes created by the first user and save the attributes to the centralized repository. In one embodiment, the ATB UI **102** checks the import file against the repository, so that duplicate attributes are shown to the user. The second user will then have the option of overwriting the attributes that are in the repository with the imported version. In this manner, numerous users from various remote locations, even those without connection to a centralized attribute repository, can independently develop attributes and filters and merge their work later.

Various Embodiments of System and Method Implementations

In one embodiment, the systems and methods for generating and calculating attributes may be embodied in part or in whole in software that is running on one or more computing devices. The functionality provided for in the components and modules of the computing device(s) may comprise one or more components and/or modules. For example, the computing device(s) may comprise multiple central processing units (CPUs) and one or more mass storage device(s), such as may be implemented in an array of servers.

In general, the word "module," "application", or "engine," as used herein, refers to logic embodied in hardware and/or firmware, and/or to a collection of software instructions, possibly having entry and exit points, written in a programming language, such as, for example, Java, Ruby, Ruby on Rails, Lua, C and/or C++. These may be compiled and linked into an executable program, installed in a dynamic link library, or may be written in an interpreted programming language such as, for example, BASIC, Perl, or Python. It will be appreciated that modules, applications, and engines may be callable from others and/or from themselves, and/or may be invoked in response to detected events or interrupts. Instructions may be embedded in firmware, such as an EPROM.

It will be further appreciated that hardware may be comprised of connected logic units, such as gates and flip-flops, and/or may be comprised of programmable units, such as programmable gate arrays or processors. The modules, applications, and engines described herein are in certain applications preferably implemented as software modules, but may be represented in hardware or firmware in other implementations. Generally, the modules, applications, and engines described herein refer to logical modules that may be combined with other modules and/or divided into sub-modules despite their physical organization or storage.

In some embodiments, the computing device(s) communicates with one or more databases that store information, including credit data and/or non-credit data. This database or databases may be implemented using a relational database, such as SQLite, Sybase, Oracle, CodeBase, mySQL, and

Microsoft® SQL Server as well as other types of databases such as, for example, a flat file database, an entity-relationship database, and object-oriented database, and/or a record-based database.

In one embodiment, the computing device is IBM, Macintosh, and/or Linux/Unix compatible. In another embodiment, the computing device comprises a server, a laptop computer, a cell phone, a Blackberry, a personal digital assistant, a kiosk, or an audio player, for example. In one embodiment, the computing device includes one or more CPUs, which may each include microprocessors. The computing device may further include one or more memory devices, such as random access memory (RAM) for temporary storage of information and read only memory (ROM) for permanent storage of information, and one or more mass storage devices, such as hard drives, diskettes, or optical media storage devices. In one embodiment, the modules of the computing are in communication via a standards based bus system, such as bus systems using Peripheral Component Interconnect (PCI), Microchannel, SCSI, Industrial Standard Architecture (ISA) and Extended ISA (EISA) architectures, for example. In certain embodiments, components of the computing device communicate via a network, such as a local area network that may be secured.

The computing is generally controlled and coordinated by operating system software, such as the Windows 95, Windows 98, Windows NT, Windows 2000, Windows XP, Windows Vista, Linux, SunOS, Solaris, PalmOS, Blackberry OS, or other compatible operating systems. In Macintosh systems, the operating system may be any available operating system, such as MAC OS X. In other embodiments, the computing device may be controlled by a proprietary operating system. Conventional operating systems control and schedule computer processes for execution, perform memory management, provide file system, networking, and I/O services, and provide a user interface, such as a graphical user interface (GUI), among other things.

The computing device may include one or more commonly available input/output (I/O) devices and interfaces, such as a keyboard, mouse, touchpad, microphone, and printer. Thus, in one embodiment the computing device may be controlled using the keyboard and mouse input devices, while in another embodiment the user may provide voice commands to the computing device via a microphone. In one embodiment, the I/O devices and interfaces include one or more display device, such as a monitor, that allows the visual presentation of data to a user. More particularly, a display device provides for the presentation of GUIs, application software data, and multimedia presentations, for example. The computing device may also include one or more multimedia devices, such as speakers, video cards, graphics accelerators, and microphones, for example.

In one embodiment, the I/O devices and interfaces provide a communication interface to various external devices. For example, the computing device may be configured to communicate with one or more networks, such as any combination of one or more LANs, WANs, or the Internet, for example, via a wired, wireless, or combination of wired and wireless, communication links. The network communicates with various computing devices and/or other electronic devices via wired or wireless communication links.

Although the foregoing invention has been described in terms of certain embodiments, other embodiments will be apparent to those of ordinary skill in the art from the disclosure herein. Moreover, the described embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel methods and systems described herein may be embodied in a variety of other forms without departing from the spirit thereof. Accordingly, other combinations, omissions, substitutions and modifications will be apparent to the skilled artisan in view of the disclosure herein. For purposes of discussing the invention, certain aspects, advantages and novel features of the invention have been described herein. Of course, it is to be understood that not necessarily all such aspects, advantages or features will be embodied in any particular embodiment of the invention.

What is claimed is:

**1**. A computer-implemented method for generating attributes, the computer-implemented method comprising:

receiving, via a validation user interface that includes options that enable a user to define and deploy filters and attributes associated with different data sources having different data formats, a user selection of an attribute, wherein the attribute relates to a type of credit data;

identifying a credit data attribute formula expression based on the received user selection of the attribute;

displaying, via the validation user interface, dependencies between the attribute and a plurality of filters, wherein a first filter of the plurality of filters is configured to extract data from a first data source having a first data format by mapping one or more data fields in the first data source to the type of credit data and a second filter of the plurality of filters is configured to extract data from a second data source having a second data format by mapping one or more data fields in the second data source to the type of credit data;

generating a deployment package by compiling the credit data attribute formula expression into computer executable code; and

deploying the deployment package to a computing system, wherein the deployment package includes one or more computer instructions that when executed, generates an attribute value by at least:

extracting a subset of data associated with the attribute from the first data source in accordance with the first filter; and

applying the subset of data associated with the attribute from the first data source to the credit data attribute formula expression.

**2**. The computer-implemented method of claim **1** further comprising:

accessing a dependency tracing indicative of a dependency between the attribute, and an operator; and

displaying a result of applying the data associated with the attribute to at least a portion of the computer executable code of the credit data attribute formula expression.

**3**. The computer-implemented method of claim **1**, further comprising:

receiving, from the validation user interface, user information associated with a user;

generating a user profile;

adding the received user information to data fields of the user profile; and

storing the identified credit data attribute formula expression in the user profile.

**4**. The computer-implemented method of claim **3**, further comprising:

receiving, from the validation user interface, user information associated with a client of the user;

adding the received user information to data fields of the user profile; and

associating the identified credit data attribute formula expression with the received user information in the user profile.

5. The computer-implemented method of claim 1, further comprising retrieving, from the validation user interface, a user selection of a version command to store the credit data attribute formula expression as one version of a plurality of versions of the credit data attribute formula expression.

6. The computer-implemented method of claim 1, further comprising retrieving, from the validation user interface, a user selection of other user access authorization, wherein the user selection includes at least authorization to use the credit data attribute formula expression without authorization to edit the credit data attribute formula expression.

7. The computer-implemented method of claim 1, further comprising determining at least one weighting to be applied to the attribute.

8. The computer-implemented method of claim 1, further comprising causing display of dependencies between the attribute, and an operator.

9. A system for generating attributes, the system comprising:

one or more processors; and

non-transitory computer storage comprising code executable by the one or more processors, the executable code causing the one or more processors to perform operations including:

receiving, via a validation user interface that includes options that enable a user to define and deploy filters and attributes associated with different data sources having different data formats, a user selection of an attribute, wherein the attribute relates to a type of credit data;

identifying a credit data attribute formula expression based on the received user selection of the attribute;

displaying, via the validation user interface, dependencies between the attribute and a plurality of filters, wherein a first filter of the plurality of filters is configured to extract data from a first data source having a first data format by mapping one or more data fields in the first data source to the type of credit data and a second filter of the plurality of filters is configured to extract data from a second data source having a second data format by mapping one or more data fields in the second data source to the type of credit data;

generating a deployment package by compiling the credit data attribute formula expression into computer executable code; and

deploying the deployment package to a computing system, wherein the deployment package includes one or more computer instructions that when executed, generates an attribute value by at least:

extracting a subset of data associated with the attribute from the first data source in accordance with the first filter; and

applying the subset of data associated with the attribute from the first data source to the credit data attribute formula expression.

10. The system of claim 9 wherein the operations further include:

accessing a dependency tracing indicative of a dependency between the attribute, and at least one function or operator; and

displaying a result of applying the data associated with the attribute to at least a portion of the credit data attribute formula expression.

11. The system of claim 9 wherein the operations further include:

receiving, from the validation user interface, user information associated with a user;

generating a user profile;

adding the received user information to data fields of the user profile; and

storing the identified credit data attribute formula expression in the user profile.

12. The system of claim 11, wherein operations further include:

receiving, from the validation user interface, client information associated with a client of the user;

adding the received user information to data fields of the user profile; and

associatinng the identified credit data attribute formula expression to the received user information in the user profile.

13. The system of claim 9, wherein the operations further include retrieving, from the validation user interface, a user selection of a version command to store the credit data attribute formula expression as one version of the credit data attribute formula expression.

14. The system of claim 9, wherein the operations further include retrieving, from the validation user interface, a user selection of a lock command to lock the identified credit data attribute formula expression.

15. A non-transitory computer storage medium which stores a client application comprising executable code, the executable code causing a computing device to perform operations that comprise at least:

receiving, via a validation user interface that includes options that enable a user to define and deploy filters and attributes associated with different data sources having different data formats, a user selection of an attribute, wherein the attribute relates to a type of credit data;

identifying a credit data attribute formula expression based on the received user selection of the attribute;

displaying, via the validation user interface, dependencies between the attribute and a plurality of filters, wherein a first filter of the plurality of filters is configured to extract data from a first data source having a first data format by mapping one or more data fields in the first data source to the type of credit data and a second filter of the plurality of filters is configured to extract data from a second data source having a second data format by mapping one or more data fields in the second data source to the type of credit data;

generating a deployment package by compiling the credit data attribute formula expression into computer executable code; and

deploying the deployment package to a computing system, wherein the deployment package includes one or more computer instructions that when executed, generates an attribute value by at least:

extracting a subset of data associated with the attribute from the first data source in accordance with the first filter; and

applying the subset of data associated with the attribute from the first data source to the credit data attribute formula expression.

16. The non-transitory computer storage medium of claim 15, wherein the operations further comprise:

accessing a dependency tracing indicative of a dependency between the attribute, and at least one function or operator; and

displaying a result of applying the data associated with the attribute to the at least one function or operator.

**17**. The non-transitory computer storage medium of claim **15**, wherein the operations further comprise:

receiving, from the validation user interface, user information associated with a user;

generating a user profile;

adding the received user information to data fields of the user profile;

storing the attribute, and at least one function or operator in the user profile;

receiving, from the validation user interface, client information associated with a client of the user;

adding the received client information to data fields of the user profile; and

associating the attribute, and the at least one function or operator with the received client information in the user profile.

**18**. The non-transitory computer storage medium of claim **15**, wherein generating the attribute value for the attribute includes generating the attribute value using a simulation file, and wherein the first data source is a simulated data source.

**19**. The non-transitory computer storage medium of claim **15**, wherein the executable code is configured to be executed in response to a calling function.

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