

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* QIMENG CHEN,  
MEICHUN HSU,  
and UMESHWAR DAYAL

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Appeal No. 2007-1550  
Application No. 09/464,311  
Technology Center 3600

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Decided: March 17, 2008

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Before WILLIAM F. PATE, III, HUBERT C. LORIN, and  
ANTON W. FETTING, *Administrative Patent Judges*.

LORIN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Chen et al. (Appellants) seek our review under 35 U.S.C. § 134 of the final rejection of claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

## SUMMARY OF DECISION

We REVERSE.<sup>1</sup>

### THE INVENTION

The Appellant's claimed invention is directed to methods and apparatus for profiling customer telephone behavior through telephone call data pattern analysis. (Specification 1:2-4; 4:1-6). Referring to Fig. 1, the claimed apparatus (10) includes a data-warehouse server (12) and an OLAP server (14) implementing an On-Line Analytical Processing (OLAP) based, scalable and flexible profiling engine (16) in a data mining system (18). (See Specification 4:7-11 and 6:14-16). "OLAP server 14 implements decision support software 48 that allows a user to quickly analyze information that is summarized into multidimensional views and hierarchies." (Specification 7:28-30). "The profiling of customer behavior is carried out with the aim of extracting patterns of customer activities from transactional data." (Specification 6:5-6). The claimed invention profiles customer behavior by mining telephone call data. "OLAP technology within OLAP server 14 is used to analyze data maintained in data-warehouses ... One significant feature provided by Applicant's invention is the ability to use OLAP based customer behavior profiling and pattern analysis." (Specification 8:11-15).

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<sup>1</sup> Our decision will make reference to the Appellant's Appeal Brief ("Br.," filed Aug. 25, 2005) and the Examiner's Answer ("Answer," mailed May 18, 2006).

Claim 1 is illustrative of the claimed invention:

1. A customer profiling apparatus for conducting customer telephone behavior pattern analysis on telephone call records including telephone call data, comprising:

processing circuitry operative to process customer telephone call records;

a data warehouse coupled with the processing circuitry and configured to store the processed customer telephone call records;

an OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse; and

at least one computer program, performed by the profiling engine, and operative to define behavior profiles defined at least in part by probability distributions, using data from the telephone call records, as data cubes and derive similarity measures on patterns extracted from the behavior profiles;

wherein the behavior profiles are provided as two input calling pattern cubes, C1 and C2, and a similarity cube, Cs, is an output of a comparison between C1 and C2, wherein the similarity cube, Cs, represents a pair of corresponding sub-cubes of C1 and C2, and wherein C1 and C2 are count cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes

## THE REJECTIONS

The Examiner relies upon the following as evidence of unpatentability:

Murad	US 6,526,389	Feb. 25, 2003
McDonough	US 6,115,693	Sep. 5, 2000

The following rejection is before us for review:

Claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 are rejected under 35 U.S.C. §103(a) over Murad and McDonough.

### ISSUES

The issue is whether the Appellants have shown that the Examiner erred in rejecting claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 as unpatentable over Murad and McDonough. The issue turns on whether the prior art would have led one having ordinary skill in the art to implement an OLAP based profiling engine and at least one program performed by the engine to define behavior profiles provided as certain types of data cubes.

### FINDINGS OF FACT

We find that the following enumerated findings are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

#### *The scope and content of the prior art*

1. Murad is directed to data mining call data for customer behavior profiling.
2. Murad does not teach the use of OLAP and does not explicitly disclose data cubes.
3. McDonough involves a Quality Center that “assists in managing

the business of operating multiple customer access resources as a single Virtual Sales and Service Center.” Col. 3, ll. 39-44.

4. McDonough discloses the Quality Center performing analysis on call center statistics and “[c]apabilities for on-line analytical processing (OLAP) enable quality center executives to gather performance information and analyze trends and statistics for operational management of the virtual environment.” (Col. 12:45-55). McDonough does not explicitly disclose data cubes.

*Any differences between the claimed subject matter and the prior art*

5. The claimed subject matter is the combination of Murad’s behavior profiling and McDonough’s use of OLAP. A difference between the claimed subject matter and the prior art is that the behavior profiles for the claimed subject matter are provided as:
  - a. “two input calling pattern cubes,  $C_1$  and  $C_2$ , and a similarity cube,  $C_s$ , is an output of a comparison between  $C_1$  and  $C_2$ , wherein the similarity cube,  $C_s$ , represents a pair of corresponding sub-cubes of  $C_1$  and  $C_2$ , and wherein  $C_1$  and  $C_2$  are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, the count-cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes” (claim 1);
  - b. “calling pattern cubes from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap” (claim 11);
  - c. “calling pattern cubes from the updated profile cube [from merging a profile-snapshot cube and a profile

- cube] using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap” (claim 17);
- d. “calling pattern cubes comprising count-cubes from the profile cubes using a probability distribution-based calling pattern, treating a sub-cube as a bag, and summarizing cell-wise comparison results based on bag overlap using cell-to-subcube mapping, the count cubes having non-negative integer cell values, and the bag overlap enables comparison of corresponding sub-cubes of distinct count cubes” (claim 25); and,
  - e. “two input calling pattern cubes,  $C_1$  and  $C_2$ , and a similarity cube,  $C_s$ , is an output of a comparison between  $C_1$  and  $C_2$ , wherein the similarity cube,  $C_s$ , represents a pair of corresponding sub-cubes of  $C_1$  and  $C_2$ , and wherein  $C_1$  and  $C_2$  are count-cubes, a sub-cube is treated as a bag, and cell-wise comparison results are summarized based on bag overlap, wherein each cell of  $C_s$  represents the similarity of a pair of corresponding sub-cubes, a cube having a set of dimensions and each cell of the cube being identified by a value from each of the dimensions” (claim 28).

*The level of skill in the art*

6. Neither the Examiner nor the Appellants have addressed the level of ordinary skill in the pertinent art of business intelligence. We will therefore consider the cited prior art as representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (“[T]he absence of specific findings on the level of skill in the art does not give rise to reversible error ‘where the prior art itself reflects an appropriate

level and a need for testimony is not shown”) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985).

*Secondary considerations*

7. There is no evidence on record of secondary considerations of non-obviousness for our consideration.

PRINCIPLES OF LAW

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S.Ct. at 1734 (“While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”) The Court in *Graham* further noted that evidence of secondary considerations “might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.” 383 U.S. at 18.

## ANALYSIS

The Examiner found Murad discloses all the claimed limitations except for the use of OLAP. Answer 3-5. The Examiner found that “McDonough et al discloses: An On Line Analytical Processing (OLAP) based scalable profiling engine communicating with the data warehouse and operative to build and up data customer behavior profiles by mining the customer telephone call records that flow into the data warehouse, (Col. 11, lines 29-34 and Col. 12, lines 50-53, where the statistics represent the customer profiles).” Answer 5. The Examiner determined that “[i]t would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to incorporate OLAP into the Murad et al patent with the motivation of accurately analyzing trends in a telecommunications environment.” Answer 5.

Appellants argued that “[c]ontrary to the Examiner's assertion, *Murad* does not teach the use of data from telephone call records configured as data cubes.” Br. 9. The Examiner responded by arguing that [Murad] Fig. 2B shows “calls are represented by data cubes according to call duration versus time of day.” Answer 16-17.

The Appellants further argued that “*Murad* simply does not teach or suggest ... a data warehouse and OLAP server based profiling engine architecture. Br. 10. The Examiner responded by arguing that “the combination of the Murad and the McDonough et al reference [ ] teaches a

data warehouse and OLAP server based profiling engine architecture.”

Answer 17.

The Appellants further argued that, with respect to claim 1 (similar arguments are made with respect to claims 11, 17, 25, and 28), “*Murad* simply does not teach or suggest these features; namely, count-cubes, sub-cubes, and bag overlap. *Murad* does not teach efficient computation over data cubes. A distance factor is not the same as bag overlap (nor an obvious modification thereof).” Br. 11. The Examiner responded by arguing that

count cubes, are represented in Col. 7, lines 41-48. In this case, *Murad* shows that the distance between the qualitative profile and the nearest non-zero daily prototype does not exceed a predetermined threshold value. In this case, the non-negative integer cell value is represented by the non-zero daily prototype, and represents the count-cube value. ... With respect to bag overlap, in Col. 7, lines 41-48, *Murad* shows that the distance between the qualitative profile and the nearest non-zero daily prototype does not exceed a predetermined threshold value, in this case, the non-negative integer cell value is represented by the non-zero daily prototype and the comparison is represented by the distance. This comparison, showing the distance factor represents the bag overlap. ... In addition, *Murad* applies two input calling patterns in the above relationship as well. Specifically, Col. 8, lines 15-20, of *Murad* shows two input calling pattern cubes through disclosing two instances of the second level profile where the second level profile represents extracted call prototypes.

Answer 18-19.

Finally, the Appellants argued that “McDonough does not teach the implementation of an ‘...OnLine Analytical Processing (OLAP) based scalable profiling engine communicating with a data warehouse and operative to build and update customer behavior profiles by mining the customer telephone call records that flow into the data warehouse ...’.” Br. 11-12.

We have carefully reviewed the record. We will not sustain the rejection.

The claims require a program in the OLAP server to generate specific types of calling pattern data cubes. The Examiner takes the position that Fig. 2B of Murad shows data aggregated in a manner representing the generation of the types of data cubes claimed and that McDonough shows OLAP and that combining these teachings would lead one to the claimed invention.

However, Fig. 2B of Murad shows a set of four X-Y planes, where call duration values are plotted on the X-axis and start time values are plotted on the Y-axis, for each instance of a destination type attribute (e.g., local, international, premium rate services, toll-free, etc.). See col. 4, ll. 36-49. There is no evidence to support the assumption that the four X-Y planes represent three-dimensional data cubes or that this disclosure would lead one of ordinary skill in the art to the types of call pattern data cubes claimed.

The claimed invention is not simply the aggregation of data into data cubes but a method of using OLAP to accomplish an analysis using specific call pattern data cubes. McDonough discloses OLAP and, although it does

not explicitly disclose data cubes, OLAP does involve forming a three-dimensional array of data into data cubes. However, the inferences and creative steps that one of ordinary skill in the art would need to derive the claimed data cubes from Murad's aggregation of data into X-Y planes through the use of OLAP are not evident. Notwithstanding the fact that OLAP involves the generation of data cubes, given that there is no evidence supporting the assumption that Murad's data analysis could be accomplished by OLAP and that OLAP could transform Murad's aggregation of data into data cubes of the type claimed, we find that one of ordinary skill in the art would not be led to use OLAP to analyze customer profiles of Murad's call data in the manner claimed.

#### CONCLUSION OF LAW

On the record before us, Appellants have shown that the Examiner erred in rejecting the claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 under 35 U.S.C. §103(a) over Murad and McDonough.

#### DECISION

The decision of the Examiner rejecting claims 1, 3, 4, 6, 7, 9-11, 16-22, and 25-32 under 35 U.S.C. §103(a) over Murad and McDonough is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

REVERSED

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