United States District Court,
N.D. Ohio, Eastern Division.

ROSENBLUTH INTERNATIONAL, INC,
Plaintiff.
v.
TRAVEL ANALYTICS, INC,
Defendant.

July 27, 2001.

Owner of patent for software designed to help organizations lower their overall travel costs sued competitor for infringement. Construing claims, the District Court, Wells, J., held that: (1) several terms were directed to art of linear programming, and would be construed accordingly; (2) term "travel information" had to include any predetermined goals organization might have with respect to particular carrier, though such predetermined goals did not have to be expressed numerically; and (3) term "constraints" meant mathematical expressions that were constructed from travel information and that restricted objective function.

Claims construed.

5,832,453. Construed.

Bruce O. Baumgartner, Thomas H. Shunk, Wade A. Mitchell, Baker & Hostetler, Cleveland, OH, Joel Goldhammer, Akin, Gump, Strauss, Hauer & Field, Philadelphia, PA, for Plaintiff.

Michael J. Garvin, Deborah A. Coleman, Hahn, Loeser & Parks, Cleveland, OH, for Defendant.

MEMORANDUM OF OPINION CONSTRUING UNITED STATES PATENT NO. 5,832,453

WELLS**, District Judge.**

On 17 March 2000, plaintiff Rosenbluth International, Inc. ("Rosenbluth") filed suit in this Court against defendant Travel Analytics, Inc. ("TA"). The complaint alleged, and TA does not contest, that Rosenbluth is the owner, by assignment, of "the entire right, title, and interest" in United States Patent No. 5,832,453 ("the '453 Patent"), a patent covering software designed to help organizations lower their overall travel costs. According to the complaint, TA has "deliberately used, offered to sell, sold, licensed and/or otherwise distribute[d] ... software which infringes" the '453 Patent. (Cplt.para.para. 3, 4). On 19 April 2000, TA filed both an amended answer and a counterclaim against Rosenbluth, seeking a declaratory judgment of non-infringement.

On 21 May 2001, the parties appeared before this Court for a hearing regarding claim interpretation pursuant to Markman v. Westview Instruments, Inc., 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). At that hearing, the parties made brief oral arguments and presented testimonyregarding the scope of the claims in the '453 Patent. However, because the parties appeared to be close to reaching agreement on some of the disputed terms, the hearing was continued over until 15 June 2001 at which time the parties presented more extensive oral argument.

I. *Background and Claims*

Both Rosenbluth and TA operate in the field of travel management services, and both utilize computer software to aid their clients, some of whom may spend as much as one hundred million dollars a year in travel. TA relies on "Tango" software to help corporate travel managers negotiate discount contracts with airlines. Rosenbluth employs "DACODA" software to help organizations save money on their overall travel costs. DACODA was developed in accordance with the claims of the '453 Patent.

The '453 Patent describes the covered software and the problems it was designed to solve as follows:

The present invention relates to a computer system and a method for determining the distribution of transportation carrier support that will result in the lowest total travel cost for an organization. More particularly, the invention relates to a computer system and method for developing a model to represent an organization's travel requirements in order to maximize and leverage benefits obtained from individual transportation carriers.

Typically, a larger size organization will tend to purchase a significant amount of travel services from a number of travel carriers.... Such an organization typically negotiates special incentive arrangements with one or more travel carriers in order to obtain a discount for supporting the travel carriers.

. . . . .

... Inevitably, the lack of an organized travel scheme causes the organization to incur significant additional total travel costs. Thus, it would be highly advantageous to have a system and method for organizing a coherent travel scheme based on the organization's travel demands, the negotiated travel incentives the organization has with particular travel carriers, and the service each travel carrier provides between particular travel locations, as well as several other factors, in order to minimize the total travel cost incurred by the organization.

The present invention is directed to a computer system and a method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links.

(Col 1, II. 7-54). The '453 Patent is thus designed to allow users to process large amounts of disparate and at times conflicting data concerning their travel requirements and then to choose the most cost-effective method.

The '453 Patent is entitled "Computer System and Method for Determining a Travel Scheme Minimizing Travel Costs for an Organization." It sets forth, as it must, an abstract, drawings, the background of the invention, a summary of the invention, a brief description of the drawings, and a detailed description of a preferred embodiment. The section discussing the preferred embodiment describes in detail a single process beginning with the various types of computer systems capable of performing the necessary functions and ending with how the resulting travel scheme can be implemented "in order to realize the benefits thereof." (Col.12, II.1-2).

As described in the specification, the '453 Patent teaches a multi-step processdesigned to "minimize" an organization's travel cost. First, the system gathers "travel information" about, for instance, the number of flights a given carrier has to a given destination, the cost of each leg of that trip, how many trips a particular organization typically makes to that destination, and whether the organization has negotiated any incentive agreements with the carrier. The system then "uses the information to construct a matrix or table" comprised of "travel cost information," "demand and supply information," and "carrier goal information." ('453 Patent,

col. 6, II. 19-20; col. 9, II. 14-15; Fig. 4). Once the matrix has been completed, "the computer system constructs an objective function" which "represents the total travel cost to the organization for purchasing travel trips for travelers." (Col.9, II.14-18). That objective function is then "minimized." "In order to do so, the computer system 12 constructs constraints ... and applies the constraints to the objective function ... in order to determine a solution of the objective function that satisfies the constraints and minimizes the travel costs of the organization." (Col.9, II.38-44).

The process described above is set forth in four independent claims-Claims 1, 18, 35, and 54-and in sixty-six dependent claims. Claim 1 is representative.

1. In a computer system having a data input device, a data storage device, and a processor, a method for determining a travel scheme for minimizing travel costs for an organization where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps of:

obtaining travel information relating to the carriers and the links via the data input device;

storing the travel information via the data storage device;

constructing an objective function from the travel information via the processor, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of predetermined links;

constructing a set of constraints from the travel information via the processor, the constraints comprising restrictions relating to the objective function;

applying the constraints to the objective function via the processor to determine a solution of the objective function that satisfies the constraints and minimizes the travel costs of the organization; and

applying the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.

(Col.12, I.45-col.3, I.5).

II. ***Law Regarding Claim Construction***

[1] [2] Courts have the "power and obligation to construe as a matter of law the meaning of language used in patent claims." Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed.Cir.1995). In construing a patent claim, a court must look first to the language of the claim itself, Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996), since its words are "of paramount importance," Electro Medical Sys. v. Cooper Life Sciences, Inc., 34 F.3d 1048, 1054 (Fed.Cir.1994). However, the claim cannot be considered in isolation. *See* Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 620 (Fed.Cir.1995). "It is equally fundamental that claims are to be construed in the light of the specifications and both are to be read with a view to ascertaining the invention." Bell Communications, 55 F.3d at 620 (internal quotes and citations omitted); *see also* Markman, 52 F.3d at 979.

The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. As we have repeatedly stated, "[c]laims must be read in view of the specification, of which they are a part." The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.

Vitronics, 90 F.3d at 1582 (internal citations omitted). Finally, the court may consider the prosecution history, including any express representations the patentee might have made regarding the scope of the claims and any changes to the claim the patentee might have made to distinguish her or his claim from the prior art. *Id*. Together, these three forms of intrinsic evidence comprise "the most significant source of the legally operative meaning of disputed claim language." *Id*.

[3] When intrinsic evidence does not resolve an ambiguity, a court may consider extrinsic evidence- *i.e.*, all evidence external to the patent and to its prosecution history, including expert testimony, dictionaries, and treatises. *See* Vitronics, 90 F.3d at 1583. For instance, a "trial court, when construing a term of art, must define the term in a manner consistent with the scientific and technical context in which it is used in the patent." AFG Industries, Inc. v. Cardinal IG Company, Inc. 239 F.3d 1239, 1248 (Fed.Cir.2001). In doing so, "it is entirely appropriate, perhaps even preferable, for a court to consult trustworthy extrinsic evidence to ensure the claim construction it is tending to from the patent file is not inconsistent with clearly expressed, plainly apposite, and widely held understandings in the pertinent technical field." Id. at 1249 (quoting Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1309 (Fed.Cir.1999)).

[4] Throughout the process of claim construction, the court must take care not to focus on "the subjective intent of the parties to the patent contract when they used a particular term. Rather, the focus is on the objective test of what one of ordinary skill in the art at the time of the invention would have understood the term to mean." Markman, 52 F.3d at 986. As the *Markman* Court explained, "competitors are entitled to review the public record, apply the established rules of claim construction, ascertain the scope of the patentee's claimed invention and, thus, design around the claimed invention." Id. at 978-79.

III. *Claim Construction*

The parties dispute ten terms in the '453 Patent: (1) "constructing an objective function;" (2) "constructing constraints;" (3) "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints;" (4) "minimize;" (5) "optimum;" (6) "objective function;" (7) "constraints;" (8) "travel information;" (9) "solution of the objective function;" and (10) "applying the solution." FN1

FN1. The word "optimum" appears only in independent Claim 54 which reads as follows:
A method for determining an *optimum* travel scheme for minimizing travel costs for traveling a plurality of travel links being served by a plurality of travel carriers by selectively allocating travel trips on each link to the carriers serving the link, comprising the steps of:

(a) determining *travel information* representative of the links and the carriers serving the links;
(b) determining *constraints* on allocating the trips to the carriers;
(c) prospectively allocating the trips among the carriers in accordance with the *travel information* and the *constraints* to provide a travel scheme;
(d) determining a cost of the travel scheme of step (c);
(e) ascertaining whether any of the *travel information* or *constraints* have changed;
(f) if any of the *travel information* or *constraints* have changed, then repeating steps (c), (d), and (e) until the *optimum* travel scheme *minimizing* the travel costs in accordance with the travel information and the constraints is determined; and
(g) *applying the optimum travel scheme* to *minimize* travel costs by purchasing travel trips in accordance with such optimum travel scheme.

A. *The First Six Disputed Terms-The Context of Linear Programming*

The dispute surrounding the first six terms listed above-"constructing an objective function," "constructing constraints," "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints," "minimize," "optimum," and "objective function"-hinges on whether these terms should be interpreted as being directed to the application of linear programming. The parties agree that linear programming is a subset of the larger field of mathematical programming-a field comprised of, among other things, nonlinear programming, integer programming, and goal programming. (Tr. of 5/21/01 Hring at 36). Linear programming is "concerned with the efficient allocation of limited resources to known activities with the objective of meeting a desired goal, such as maximizing profit or minimizing cost." (Docket 44, Ex. F). In both mathematical programming generally and linear programming in particular, a mathematical model of a given problem is created. The model is comprised in part of an "objective function" (an organization's goal expressed in mathematical terms) and "constraints" (restrictions governing the objective function). (Tr. of 5/21/01 Hring. at 36-37, 43). The model- *i.e.,* the problem-is "solved" when the "optimum" value of the objective function is found subject to the constraints. In linear programming, the relations among the variables are linear.

In the parties' original joint claim construction chart, TA contended generally that "[e]ach claim of the '453 Patent requires the application of linear programming." (Docket No. 36 at 1). In the proposed order attached to its claim construction brief, TA focused its argument more narrowly, asking this Court to construe specific terms in the '453 Patent as being directed to the use of linear programming-namely, "constructing an objective function," "constructing constraints," "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints," "minimize," "optimum," and "objective function." As it explained during the 15 June 2001 hearing,

in one form or another, this patent tells us that you solve the problem with linear programming .... There's no suggestion in the patent anywhere that linear programming is not the appropriate way to solve the problem articulated by the patent.... In fact ... the summary of the invention tells us and in as plain language as this patent can tell us, the constraints are applied to the objective function to determine a solution of the objective function that satisfies the constraintsand minimizes the travel cost of the organization.

(Tr. of 6/15/01 Hring at 38).

[5] Rosenbluth contends the '453 Patent cannot be limited to linear programming.FN2 Although Rosenbluth concedes linear programming is a key element in the patented process, (Tr. of 5/21/01 Hring at 9; Tr. of 6/15/01 Hring at 7-8), it asserts that linear programming is merely one step in that process and that all remaining steps can be read broadly enough to encompass mathematical programming in general. As counsel for Rosenbluth explained at the 15 June 2001 hearing,

FN2. In its original claim construction brief, Rosenbluth argued all terms in the '453 Patent must be construed according to their "ordinary and customary meaning" and that this Court should thus look no further than the claims themselves when defining them. (Docket No. 38 at 10). During the hearing, however, Rosenbluth conceded that extrinsic evidence is necessary in this case given its arguments that the claims call on one's knowledge of, at least, mathematical programming, goal programming, and piecewise linear programming.

[t]he '453 Patent discloses a computer system [to] minimize the travel cost to an organization. And it does that within the general subject matter [which] I've explained earlier as mathematical programming. And in particular, what the patent describes is formulating a travel scheme or taking a travel scheme problem, then converting it and making it into a goal programming and then that goal programming may be solved by-may be linearized and solved by using linear programming.
(Tr. of 6/15/01 Hring at 18-19). Second, Rosenbluth argues that the doctrine of claim differentiation requires a broad reading of the '453 Patent. As it points out, linear programming is not a limitation in any of the

independent claims (Claims 1, 18, 35, and 54), but it is a limitation in dependent claims 12 and 17 (depending from Claim 1), 29 and 34 (depending from Claim 18), 47 and 53 (depending from claim 35), and 65 and 70 (depending from claim 54). Under the doctrine of claim differentiation, "[t]here is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims. To the extent that the absence of such difference in meaning and scope would make a claim superfluous, the doctrine of claim differentiation states the presumption that the difference between claims is significant." Tandon Corp. v. U.S. Int'l Trade Comm'n, 831 F.2d 1017, 1023-24 (Fed.Cir.1987). In this case, Rosenbluth concludes, claim differentiation creates a presumption that the independent claims are not limited to linear programming.
[6] [7] However, the doctrine of claim differentiation must give way before contrary evidence. *See* Autogiro Co. of America v. United States, 181 Ct.Cl. 55, 384 F.2d 391, 404 (1967). Even if, as Rosenbluth argues, the '453 Patent as a whole is not directed to the use of linear programming, this Court concurs with TA concerning the six terms now under discussion. As will be discussed more fully below, the '453 Patent itself, along with its prosecution history and the extrinsic evidence before this Court reveal that one skilled in the art would understand these six terms-"constructing an objective function," "constructing constraints," "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints," "minimize," "optimum," and "objective function"-to be directed to the art of linear programming.

First, both the specification and the claims repeatedly invoke linear programming when discussing the terms such as objective function and constraints. In one sense, they do so implicitly by repeating the phrases "constructing an objective function," "constructing constraints," "applying the constraints to the objective function," "minimize," and "optimize." (*See, e.g.,* '453 Patent, col. 1, I. 61-col. 2, I. 4; col. 9, II. 14-48; col. 12, I. 45-col. 13, I. 4). According to TA's expert, "[t]he rare collective use of these terms either in colloquial or formal American English signifies ... the application of a linear programming formulation." (Docket 44, Ex. G). Moreover, the Patent explicitly teaches the use of linear programming for constructing constraints and the objective function and for applying the constraints to the objective function in order to determine a solution- *i.e.,* to minimize the objective function.

Preferably, the table as seen in FIG. 5 is embodied in a computer spreadsheet. Also preferably, the computer system 10 includes software for extracting information from the spreadsheet to construct the objective function and the set of constraints, and linear programming software for applying the constraints to the objective function to determine a solution. Preferably, the linear programming software includes the software for extracting the information.

As may be recognized, linear programming represents a technique for solving multi-variable systems in terms of a set of best values for maximizing or minimizing the system....

Preferably, the linear programming software determines the solution according to a transportation algorithm....

Preferably, the solution determined by the linear programming software is organized by the software in a table ....

('453 Patent, col. 10, I. 8-col. 11, I. 11). Rosenbluth points out that the above quote describes the preferred embodiment and contends the preferred embodiment cannot be used to limit the claims. But when, as in this case, "the preferred embodiment is described in the specification as the invention itself, the claims are not necessarily entitled to a scope broader than that embodiment." Modine Mfg. Co. v. United States I.T.C., 75 F.3d 1545, 1551 (Fed.Cir.1996); *see also,* Wang Labs. v. America Online, Inc., 197 F.3d 1377, 1383 (Fed.Cir.1999).

The centrality of linear programming to the six terms at issue is revealed, moreover, in the prosecution

history. The patent examiner initially objected to the '453 Patent because, among other things, Rosenbluth had failed to adequately disclose linear programming software.

Further, with regard to the extraction of information from the spreadsheet, the construction of the objective function and constraints from the extracted information and the use of "linear programming" for applying the constraints to the objective function to determine a solution, applicant only presents this as desired results without providing the necessary processing or flow charts needed to teach such operations. Note page 19, lines 12+ of the instant specification which only generally describe the operations. The specification repeatedly mentions "the linear programming software" but provides no specific disclosure of the content thereof. While applicant references "What's Best!" linear programming software, applicant does not indicate if this is already configured to do the specific travel related operations described out of the box, and does not indicate how this program was utilized to achieve the described results if not so configured. Moreover, as the linear programming software appears to be essential material to the disclosed and claimed invention, *i.e.,* it is required for the system or method to perform as stated, and as applicant is not relying on patent documents for support, such subject matter cannot be incorporated by reference.

In light of the above, the specification does not provide a full and clear specification. As a result, those in the art would be faced with guesswork and/or undue experimentation when attempting to make or use the disclosed invention.

(Docket 44, Ex. D at 5-6).

In response to the patent examiner's objections, Rosenbluth argued that it was not necessary to refer explicitly to linear programming because anyone skilled in the art would recognize its importance to the patented process. In Rosenbluth's words:

The Examiner also notes that the use of linear programming is only mentioned and is not discussed in detail. *However, Applicant respectfully submits that linear programming is a well-known technique for constructing objective functions and constraints and applying the constraints against the objective function to minimize or maximize a desired value*. Accordingly, the detailed description of how linear programming is performed is not necessary in the present application.

Moreover, Applicant respectfully points out that the application of linear programming is merely one step or part of the present invention, and *that the claims of the present invention are directed toward the application of linear programming to the problem of minimizing travel costs for an organization and* to a particular arrangement of elements and steps that facilitate the employment of the linear programming. Since linear programming is generally well known, Applicant respectfully submits that one skilled in the art would *not* be faced with guesswork and/or undue experimentation when attempting to make or use the disclosed invention.

(Def's Br., Ex. D at 5-6) (first and second emphases added).FN3 As these paragraphs make clear, Rosenbluth informed the patent examiner that the '453 Patent presumes linear programming will be used to construct an objective function, to construct a constraint, and to apply the constraints to the objective function to reach a solution that minimizes travel costs.

FN3. Although Rosenbluth initially argued its attorney had made an erroneous statement to the patent examiner, it has since conceded its attorney was correct. (Tr. of 6/15/01 Hring at 15).

Rosenbluth made similar statements about the importance of linear programming to this Court. During the 21 May 2001 hearing, for instance, Rosenbluth's expert testified as follows on cross-examination:

Q. The problem that the patent represents is a linear programming problem, isn't it?

A. What the specific objectives in here are linear programming. However, even these have subjective values in them, and they have goals which can't be met.

Q. But they are expressed as a linear programming?

A. Because you can't use a linear programming solver, linear programming package to solve the problem, that's correct.

Q. And so in order to make this patent work in the real world, they make the model in linear programming model, right?

A. The model actually submitted to the computer is certainly a linear programming model.

Q. Right. And that's what we are concerned here about, not just modeling in the abstract, but modeling to solve the problem articulated by the patent, correct?

A. The model articulated in the patent, you would expect it to be solved by a linear programming solution technique.

(Tr. of 5/21/01 Hring at 56). Rosenbluth stated likewise during the 15 June 2001 hearing that "the patent refers to the use of linear programming to solve the objective functions with constraints that [are] set up." (Tr. of 6/15/01 Hring at 8).

Together, then, the claims and specification, the prosecution history, Rosenbluth's statements to the Court, and the expert testimony provided by both parties reveal that a person skilled in the art would understand the terms under discussion to be directed to the art of linear programming. According to the specification, the patented system preferably "includes software for extracting information ... to construct the objective function and the set of constraints, and linear programming software for applying the constraints to the objective function to determine a solution." (Col.10, II.58-62). During the prosecution history, Rosenbluth's attorney informed the patent examiner "that the claims of the present invention are directed toward the application of linear programming to the problem of minimizing travel costs for an organization." (Docket No. 44, Ex. D at 5-6). During the 21 May 2001 hearing before this Court, Rosenbluth's expert stated that "[t]he model actually submitted to the computer is certainly a linear programming model." (Tr. at 56). And TA's expert opined that "the rare collective use" of the terms "constructing an objective function," "constructing constraints," "applying the constraints to the objective function," "minimize," and "optimize," all signify to one skilled in the art "the application of a linear programming formulation." (Docket No. 44, Ex. G).

Therefore:

-> The terms "constructing an objective function," "constructing constraints," and "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints," shall be construed to have the meaning they have in the field of linear programming, as applied to the problem of minimizing an organization's travel costs.

-> The term "minimize" shall be construed to have the meaning it has in the field of linear programming: to achieve the lowest value for the objective function subject to given restraints.

-> The term "optimum" shall be construed to have the meaning it has in the field of linear programming: the least solution of the objective function that satisfies the constraints.

-> The term "objective function" shall be construed in part to have the meaning it has in the field of linear programming. Because the parties dispute other elements of this term, it shall be discussed more fully below.

B. ***The Remaining Terms***

The parties also dispute the following five terms: "objective function," FN4 "travel information," "constraints," "solution of the objective function," and "applying the solution."

FN4. This term is defined in part above.

[8] **1.** "***Objective Function.***" Apart from the dispute surrounding linear programming, the parties disagree as to whether the phrase "objective function" represents simply "a travel cost to the organization" or "the total travel cost." FN5 Rosenbluth contends the phrase should be construed to mean "a mathematical expression representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links." (Docket 53 at 5). In support of its position, Rosenbluth points to columns 6 and 7 of the specification where the patent discusses how the computer system will gather the different costs of traveling a given leg of a trip on different carriers and how the system will ultimately "determine[ ] for each carrier serving each link a weighted value 68 representative of the actual cost of traveling the link using the carrier." (Col.7, II.42-45). Rosenbluth contends this discussion shows that "what you're talking about here is a weighted represented value. It is not the total cost." (Tr. of 6/15/01 Hring at 28).

FN5. The '453 Patent initially refers to the phrase "objective function" as "a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links." ('453 Patent, col. 1, II. 62-65).

However, after discussing how to construct the various weighted travel costs, the '453 Patent goes on to explain that the computer system will use these weighted costs along with other relevant information to construct the objective function. It then defines the "objective function" as "represent[ing] the *total travel cost* to the organization ..." (Col.9, II.17-21) (emphasis added). Therefore, the term "objective function" shall be construed to mean a linear function representing the total travel cost to an organization, which one seeks to minimize subject to constraints. *See* Markman, 52 F.3d at 979 ("The specification acts as a dictionary when it expressly defines terms used in the claims.").

[9] **2.** "***Travel Information.***" The parties dispute whether the term "travel information" must include any carrier goals- *i.e.*, any predetermined goals an organization may have with respect to a carrier-and, if so, whether those predetermined goals must be expressed numerically.FN6

FN6. "Carrier goal information" is defined in the specification as information pertaining "to any predetermined goal the organization may have with respect to the carrier" or "a goal on the part of the organization to heavily support one carrier, or lightly support another." (Col.8, II.50-51, 60-61).

a. ***Carrier Goal Information.*** Rosenbluth argues "travel information" need not include carrier goal information, contending the term "travel information" must be given its "ordinary and customary meaning" because "the term is not expressly defined in the specification." (Docket No. 38 at 18-19). As TA points out, however, the term is in fact defined three times in the patent, and every definition includes carrier goal information. In column 6, for instance, the specification states clearly that "travel information" is comprised

of "travel cost information 72, demand and supply information 74, *and* carrier goal information 76." (Col. 6, II. 22-24 (emphasis added); *see also* Abstract; Col. 2, II. 5-11). "In such a case, the definition selected by the patent application controls." Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1249 (Fed.Cir.1998); *see also* Markman, 52 F.3d at 979 ("The specification acts as a dictionary when it expressly defines terms used in the claims.").

Moreover, both the specification and the prosecution history together support TA's argument that carrier goal information must be included in "travel information." The Federal Circuit has explained that "the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim." Renishaw, 158 F.3d at 1250. As a result, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Id*. With respect to the '453 Patent, and as discussed more fully below, both the prosecution history and the specification state the invention was intended to help organizations make effective use of any goals they may have established or may have negotiated with a particular carrier- *i.e.*, it allows organizations to "maximize and leverage benefits obtained from individual transportation carriers." ('453 Patent, col. 1, II. 13-14).

During the prosecution, for instance, the patent examiner stated that "it is not clear from the method how travel costs are necessarily minimized as recited since the application of constraints can lead to the selection of more costly options." (Docket No. 44, Ex. D at 2). In response, Rosenbluth stated that the "apparent paradox" noted by the examiner "is central to the benefit obtained by the present invention." (Docket No. 44, Ex. E at 6).

More specifically, the present invention realizes that the *overall* cost of a *plurality* of travel transactions may be *decreased* if the *individual* cost of one or more *particular* travel transactions is *increased*.

Although this is counter-intuitive, it should be realized that in the travel industry, travel carriers routinely grant large organizational customers volume discounts, but *only* if, for example, a certain dollar amount of travel is purchased, or a certain number of seats are purchased. Accordingly, it may be worthwhile to pay an increased travel cost to a particular travel carrier (as compared with a competing carrier) so that the dollar goal necessary to obtain the discount from that carrier is achieved. Correspondingly, it may be worthwhile to purchase a more expensive seat from a particular travel carrier (as compared with a competing carrier) so that the seat goal necessary to obtain the discount from that carrier is achieved. Of course, this assumes that the higher cost is more than offset by the gain achieved from the discount. Accordingly, it is indeed possible to minimize an organization's *overall* travel cost by selecting *particular* travel options that are more costly when compared to the competition for that particular travel option.

(Docket No. 44, E. E at 6-7). As Rosenbluth informed the patent examiner, in other words, a key "benefit" of the proposed patent was not its ability to find the lowest-priced individual ticket, but its ability to minimize an organization's overall travel costs by capitalizing on that organization's previously-negotiated arrangements with particular carriers.

The '453 Patent itself likewise states that it is useful because it can solve the problems presented by an organization's arrangements with particular carriers or its desire to support one carrier over another. In the section entitled "Background of the Invention," the patent first notes that "large size organizations will tend to purchase a significant amount of travel services from a number of travel carriers" and will thus "negotiate[ ] special incentive arrangements with [them] in order to obtain a discount for supporting [them]." (Col.1, II.15-17). However, "a particular incentive arrangement" may ultimately cost the organization more money than it saves because a given carrier may not provide convenient service to a frequently-traveled location or because, "in supporting the one carrier, another less costly alternative may be ignored." (Col.1, II.26-38). "Thus," the '453 Patent concludes, "it would be highly advantageous to have a system and method for organizing a coherent travel scheme based on the organization's travel demands, the

negotiated travel incentives the organization has with particular carriers ..., as well as several other factors, in order to minimize the total travel cost incurred by the organization." (Col.1, II.41-47).

In this case, then, the invention's primary benefit-as stated in both the prosecution history and the patent itself-is to help organizations "leverage" their goals regarding a given carrier and their contracts with a given carrier into lower overall travel costs. As such, an organization's carrier goals are a necessary element of "travel information." If they were not, the claims would be inconsistent with both a clear definition set forth in the specification and the expressed object of the invention. *See* Renishaw, 158 F.3d at 1250; Minnesota Mining & Manufacturing Co. v. Johnson & Johnson Orthopaedics, Inc., 976 F.2d 1559, 1565-67 (Fed.Cir.1992) (resting claim interpretation on "[t]he fundamental purpose and significance of the ... invention" as set forth in the specification).

b. ***Whether The Information Must Be Expressed Numerically.*** TA contends all carrier goal information must be expressed numerically because such information is derived from numeric sources, it is used to construct carrier goal constraints, and "the invention taught by the '453 patent is the use of a computer system to perform *calculations*." (Docket No. 44 at 20-21). According to the four independent claims, however, the act of gathering "travel information" (including carrier goal information) is the first step in the patented process. In Claim 1, for instance, the system first "obtain[s] travel information relating to the carriers and the links via the data input device." (Col.12, II.55-56). In Claim 54, the system "determin[es] travel information representative of the links and the carriers serving the links." (Col.17, II.55-56). Although all carrier goal information will be translated into mathematical terms at later stages in the process, the claims do not require it to be in numeric form at the time it is gathered.

c. ***Conclusion.*** Therefore, the term "travel information" shall be construed to require any predetermined goals the organization may have with respect to any carrier, including the requirements of an organization's previously negotiated travel incentives with any carrier. It shall not be construed to require that "travel information" be in numeric form.

[10] **3.** "***Constraints.***" The parties agree on the essential meaning of this term- *i.e.*, that "constraints" are "mathematical expressions that are constructed from the travel information, and that restrict the objective function." TA further contends that "constraints" are mathematical expressions of equality or inequality and that "constraints must include constraints derived [from] carrier goals, that is, from any predetermined goals the organization may have with respect to any carrier, including the requirements of an organization's previously negotiated travel incentives with any carrier." (Docket No. 52).

With respect to whether constraints must be defined as expressions of equality and inequality, TA has offered no evidence that linear programming requires constraints to be so defined. To the contrary, one of the sources on which TA relies states that "[l]inear programming deals with the problem of minimizing or maximizing a linear function in the presence of linear *equality and/or* inequality constraints." (Docket No. 44, Ex. F (emphasis added)). The term "constraints" shall thus not be construed as mathematical expressions of equality or inequality.

Turning to the question of whether the term "constraints" must include constraints derived from carrier goals, Rosenbluth does not dispute TA's definition of the phrase "carrier goals." Rather, it argues the patent does not require the constraints to be derived from those goals. To the contrary, it contends, the patent assumes carrier goal information and carrier supply information are, to some degree, interchangeable. For instance, the patent allows carrier supply information to be replaced with carrier goal information, and the patent refers at several points to "carrier supply constraints *and/or* carrier goal constraints." (Col. 8, II. 49-61; col. 9, I. 66-col. 10, I. 3; col. 10, II. 22, 41 (emphasis added)). Figures 5 and 6 show a column entitled "Airline Supply *or* Hurdle" in which "hurdle" represents the organization's goals with respect to a carrier and "airline supply" represents the relative capacity of each carrier serving a particular link. (Figs 5 & 6 (emphasis added)). Given such statements, Rosenbluth concludes, the '453 Patent does not require the

constraints to contain carrier goal information.

However, Rosenbluth's proposed reading of the term "constraints" conflicts with the definition set forth in the specification. When the specification refers to carrier goal information in the alternative, it is discussing only the information that will be included in individual cells of the matrix set forth in Figures 5 and 6, and not the information necessary to the constraints.FN7 When the patent defines the constraints themselves, moreover, it requires carrier goal information. In Figure 4, the patent illustrates three types of constraints: "link demand constraints 78," "carrier supply constraints 80," and "carrier goal constraints 82." At column 9, the patent makes clear that these three "constraints *must* be produced from the demand and supply information 74 and the carrier goal information 76." FN8 (Col. 9, I. 45 (emphasis added)). The word "must" indicates that carrier goal information is necessary to the construction of the carrier goal constraints and, hence, to the solution of the objective function.

FN7. The specification explains that once the travel information has been constructed, it is used to construct a matrix, one "with each column 64 having information representative of a particular travel link and each row 66 having information representative of a particular travel carrier." (Col.6, II.32-35). The question of what, if anything, appears in a given cell depends in whole or in part on whether the organization has goals with respect to a particular carrier. For instance, some cells will show "for each carrier serving each link a weighted value 68 representative of the actual cost of traveling the link using the carrier." (Col.7, II.42-44). However, a cell will be unoccupied if the carrier in the relevant row does not serve a particular link or if the "carrier for other reasons should not be considered. Such a reason may be that the organization refuses to allow the carrier to serve its employees." (Col.7, II.48-50). Likewise, if an organization has no goals with respect to a given carrier, the relevant row in the furthest right-hand column will contain only supply information. If an organization has goals, then the system allows "carrier supply information for a particular carrier [to] be replaced by carrier goal information." (Col.8, II.49-50). Regardless of the information in a particular cell, however, the system requires access to the entire matrix-and thus to the information in all cells-in order to construct the constraints and to minimize the travel costs for the organization. As such, it requires access to any carrier goal information an organization may have established or may have negotiated with a particular carrier.

FN8. Specifically, the link demand constraints 78 and the carrier supply constraints 80 are derived from "demand and supply information 74." The "carrier goal constraints" are derived from "any predetermined goal the organization may have with respect to [a] carrier" or from "a goal on the part of the organization to heavily support one carrier or lightly support another." (Col.8, II.51-52, 60-61).

The term "constraints" will thus be construed to mean mathematical expressions that are constructed from travel information and that restrict the objective function. Constraints must include constraints derived from carrier goals, that is, from any predetermined goals the organization may have with respect to any carrier, includingthe requirements of an organization's previously negotiated travel incentives with any carrier.

[11] **4.** "***Solution of the Objective Function.***" As with the term "constraints," the parties agree on the essential meaning of this term. They disagree, however, on whether it means "a single solution of the objective function" or "a solution of the objective function." TA contends it means a single solution. Rosenbluth contends the '453 Patent presumes the system will be required to create a series of possible solutions until "an optimum travel scheme minimizing the travel costs in accordance with the travel information and the constraints is determined." ('453 Patent, col. 11, II. 6-9). As such, it concludes, the term "solution of the objective function" must leave room for "alternate optimal solutions." (Tr. of 6/15/01 Hring at 33-34).

However, even if the system must create several possible interim solutions, the '453 Patent teaches that it

must ultimately find "the solution" to the problem. (Col.11, II.20, 27, 39). Once it "determines the solution of the objective function that satisfies the constraints," moreover, the system creates a single report "representative of the solution." (Col.11, I.42). Although that report may be changed in response to new information, it is changed only until the system reaches a solution "wherein the travel costs of the organization are minimized to the greatest extent possible." (Col.11, II.66-67). In other words, it is changed until the single best solution has been found.

Therefore, the term "solution of the objective function" shall be construed to mean a single solution of the objective function that satisfies the constraints and minimizes the organization's travel costs.

[12] **5.** "***Applying the Solution.***" Rosenbluth argues the term "applying the solution" means "using the solution as the travel scheme of the organization." Although TA does not quarrel with this definition as such, it contends the term requires more specificity- *i.e.,* "(1) the solution must be expressed in a way that defines the volume and price range within which tickets between a certain city pair on a certain carrier must be purchased; (2) it must be communicated to the entity responsible for purchasing the organization's travel tickets; (3) it must be used to purchase tickets for travel trips."

Nothing in either the claim or the specification requires the solution to be expressed in a way that defines the volume and price range. The specification states broadly that "one skilled in the art will recognize that the report may present the solution in any of a plurality of ways using some or all of the obtained information, the solution values 88, the upper and lower limits 90, 92, and other information." (Col.11, II.48-53). Therefore, the term "solution of the objective function" will not be construed to mean that the solution must be expressed in a particular way.

However, the specification does require that the information be communicated and that a purchase be made. Once a travel scheme is developed, the specification states, "the scheme must be implemented." The specification then adds that "implementation of the travel scheme requires that the travel department or travel agency be aware of the travel scheme, or at least the relevant portion." (Col.12, II.1-9). For the department or agency to "be aware," the scheme must necessarily be communicated to it. Moreover, the claims themselves require a purchase. Independent claims 1, 18, and 35 all state that the final step in the patented process is to "apply[ ] the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution."Under independent claim 54, the final step is to "apply[ ] the optimum travel scheme to minimize travel costs by purchasing travel trips in accordance with such optimum travel scheme." Given these unambiguous statements, Rosenbluth's expert agreed with TA's counsel that the '453 Patent "purports to tell you how to figure out the number of tickets you need to purchase from the variety of carriers in order to minimize your travel costs." (Tr. of 5/21/01 Hring at 58).

Therefore, the term "applying the solution" shall be construed to mean using the solution as the travel scheme of the organization by (1) communicating the travel scheme to the entity responsible for purchasing the organization's travel and (2) purchasing travel trips.

IV. *Conclusion*

Therefore, for the reasons set forth above, the ten terms of the '453 Patent disputed by the parties are construed as follows:

-> The terms "constructing an objective function," "constructing constraints," and "applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints" are construed to have the meaning they have in the field of linear programming, as applied to the problem of minimizing an organization's travel costs.

-> The term "minimize" is construed to have the meaning it has in the field of linear programming: to

achieve the lowest value for the objective function subject to given restraints.

-> The term "optimum" is construed to have the meaning it has in the field of linear programming: the least solution of the objective function that satisfies the constraints.

-> The term "objective function" is construed to mean a linear function representing the total travel cost to an organization, which one seeks to minimize subject to constraints.

-> The term "travel information" is construed to require any predetermined goals the organization may have with respect to any carrier, including the requirements of an organization's previously negotiated travel incentives with any carrier. "Travel information" need not be in numeric form.

-> The term "constraints" is construed to mean mathematical expressions that are constructed from travel information and that restrict the objective function. Constraints must include constraints derived from carrier goals, that is, from any predetermined goals the organization may have with respect to any carrier, including the requirements of an organization's previously negotiated travel incentives with any carrier.

-> The term "solution of the objective function" is construed to mean a single solution of the objective function that satisfies the constraints and minimizes the organization's travel costs.

-> The term "applying the solution" is construed to mean using the solution as the travel scheme of the organization by (1) communicating the travel scheme to the entity responsible for purchasing the organization's travel and (2) purchasing travel trips.

IT IS SO ORDERED.

N.D.Ohio,2001.
Rosenbluth International, Inc. v. Travel Analytics, Inc.

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