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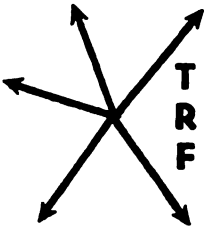

TRANSPORTATION RESEARCH FORUM

The Backgrounds and Value Systems of Transportation Modeling Project Participants and Their Effects on Project Success

*by Dr. John W. Drake**

SUMMARY

ROUGHLY 200 to 400 million dollars have been spent in the last 20 years on transportation modeling in the U.S. with relatively little to show for it in terms of actual applications which have stood the test of time. A diverse group of transportation modeling projects was studied to learn what factors in the process of project administration, especially interaction between decision makers and modelers, affect likelihood of useful modeling results from the decision makers' point of view. The year-long study involved observation of the process, detailed interviewing and comprehensive questionnaires. The major findings are that probability of usefulness is greatly enhanced by 1) clear recognition of roles of decision makers and analysts, 2) similarity of background and value systems between decision makers and modelers, and 3) keeping projects small. Similarity backgrounds of participants proved an especially interesting factor since it helped explain another somewhat surprising phenomenon—the greater success of European projects. This study was conducted under a grant from the Research Development and Demonstrations Branch of the Urban Mass Transportation Administration of the U.S. Department of Transportation.

THE PROBLEM

The problem concerning modeling in transportation is simple. Well informed people in the field have variously estimated for me that:

1) $8.5 million dollars was spent on transportation modeling by the U.S. Department of Transportation (DOT) in an 18 month period ending in 1970.

2) $800 million dollars was spent in transportation modeling by the U.S. government in the decade of the 1960's.

3) $200 million dollars have been spent on highway modeling (including repetitive applications) in the 1960's.

Anyway one looks at it, this means that including privately funded models by carriers, users and manufacturers, there must have been between $25,000,000 and $50,000,000 per year being spent in the late 1960's, in the U.S.

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alone. Why is there so little improvement in transportation to show as a result? The sums involved are the sorts of sums with which society has conquered diseases, developed new grains which have revolutionized world agriculture, and developed such revolutions in communications as radio, television, and communication satellites. Yet out of all these sums we have relatively little to show except what a colleague of mine once described as a $20,000,000 pencil—a device to write the letters and numbers on flight strips on a computer controlled terminal rather than by hand.

What is wrong? Is it bad work? Good work unrecognized? Elegant solutions of non-existent problems? Satisfactory work badly presented? Satisfactory work with documentation on the back of a stamp? Good work which never reached a conclusion? What? Why was so much money spent with so little to show for it? Are the relatively few true applications to such things as railroad classification yards, state highway planning and airline route simulation, worth 200 to 400 million dollars and 10 to 20 years of effort? Hardly.

WHAT WAS STUDIED

To learn what seemed to be going wrong with the transportation modeling process, a fourteen month study was undertaken under the auspices of the Research, Development and Demonstrations Branch of the Urban Mass Transportation Administration of the U.S. Department of Transportation. The objectives of the study were to look at the way modeling projects were *managed* not primarily at the particular techniques used.

Before going into details of the study, however, it would be wise to define what, in this context was meant by "model." For the purposes of this study a model is a computer-based simulation, optimization, or lengthy, simple computational exercise (a "spread sheet automator"), all of which involve a very substantial number of discrete steps. Basic prediction "models" consisting of a single or a few equations, regression "models," or similar powerful but brief statements of essential relationships were, by and large, excluded.

The types of problems addressed dealt with any and all modes of transportation, with all kinds of traffic, with both research and operational problems, and with problems which ranged from almost wholly technical to the almost wholly social, political and economic. Some models attempted merely to describe behavior of a transportation system or phenomenon while others were virtually pure optimization models.

The participants ranged from pure public to pure private, included clients who were both staff and line personnel, modelers who were very closely positioned organizationally to the decision makers to those who were entirely from outside organizations not previously acquainted with the client.

The projects selected were from all over the United States, northern Europe, and the United Kingdom.

Every effort was made to get projects which were *underway* at the time of the study rather than long since completed, on the grounds that it was better to study current behavior and feelings than do a series of post mortems

Naturally some compromises were necessary. Hardly a project studied met every test perfectly.

THE KINDS OF PROJECTS WHICH WERE INCLUDED

The projects included may best be described by means of the characteristics in Table I.

Fully satisfactory data for analysis was obtained from both clients and modelers of fifteen of these (1-9 and 11-16). The remainder were "one sided," and though some valuable insights were gained from certain of them, none figured in the formal statistical analysis. A fair number of the projects had to be disguised for the purposes of publication.

As may be seen, the projects were a very mixed group according to almost any criterion one would wish to judge them by.

WHAT WAS DONE

Basically the study involved the fairly detailed study of a group of 25 projects. This study included one or more interviews with the principles of the project; an initial and very detailed questionnaire; actual observation of the participants by joining in meetings where possible; a second much revised and improved questionnaire focusing more exclusively on the actual project conduct rather than preliminaries such as project conception, drafting statements of work, consultation with possible modelers, proposal writing, etc.; and finally analysis of the data from the interviews and questionnaires.

WHAT WERE THE HYPOTHESES?

What was being sought in all this? Simply stated it was evidence concerning how the actions, attitudes and values of the participants, the techniques employed, and character of a project affected its likelihood of success. Success was measured according to the clients perception of the usefulness of the model to him. Thus it was possible (though it did not happen) to have a model which was a "failure" but judged very useful (i.e., highly instructive) by the client. Similarly it was possible to have a model which was judged in one fashion at, or shortly after, completion but viewed differently after a longer time had passed. This latter possibility was checked by studying another sample of "older" models. It proved rare that a model "improved with age." Most, if they did anything at all, deteriorated—often precipitiously.

A number of questions were therefore framed, in each of ten areas. These had to do with the following:

1. Relationship of the Decision Maker(s) and the Modeling-Team Project Director (contact).
2. Degree of Contact Between Decision Maker(s) and Project Director (Communication).
3. Personal Motivation of Decision Maker(s) (Desire).
4. Size of Project (Size).

SUMMARY OF PROJECT CHARACTERISTICS

	Project	Mode of Transport	Client Organization (Pub.vs.Pvt.)	Client Type (Line vs. Staff)	Modeler Expertise (Tech.vs.Trans.)	Modeler Relationship to Client	Basic Nature* of Problem (Tech.vs.Soc.)	Treatment* of Problem (Tech.vs.Soc.)
1.	Met.Trans.vs.Urb	Mxd-Surf.	Mult.-Pub.	Staff	.80 Tech.	Consultant	.95 Social	.50 Social
2.	Urban Mgt.Wrkshp	Mxd-Surf.	Mult.-Pub.	.70 Staff	.60 Mgt.	Consultant	.90 Social	.90 Social
3.	Airline STOL	Air	Corp.	Line	.75 Trans.	In-house	.90 Social	.75 Social
4.	Airline Tac.Plan	Air	Corp.	Line	.75 Tech.	Consultant	.80 Social	.50 Social
5.	Trans.Veh.Mvt.Sm	-	US Govt.	Staff	.85 Tech.	Consultant	.75 Tech.	.95 Tech.
6.	Av. Forecasting	Air	Corp.	Staff	.80 Tech.	In-house	.80 Social	.50 Social
7.	Veh.Sim. Model	-	Corp.	Line	.80 Tech.	In-house	.85 Tech.	1.0 Tech.
8.	DOT Nat. Network	All	US Govt.	Staff	.50 Tech.	Ind.Agency	.90 Social	.75 Tech.
9.	Freight Modal Sp	All	Corp.	.75 Staff	.50 Tech.	Consultant	.90 Social	.75 Tech.
10.	Truck Linehaul	Truck	Mult.Corps	Line	.50 Trans.	Consultant	.75 Tech.	.75 Tech.
11.	Coventry Bus Net	Bus	Pub. Corp	Line	.70 Tech.	Cons.(found)	.75 Social	.75 Tech.
12.	Airline Crew Trn	Air	Corp.	Line	.60 Tech.	In-house	.60 Tech.	.90 Tech.
13.	Container Ship	Marine	Corp.	Line	.75 Trans.	Cons(univ)	.90 Tech.	.95 Tech.
14.	Rail Freight Pln	Rail	Pub. Corp	Staff	.60 Tech.	In-house	.50 Tech.	.80 Tech.
15.	Maj.Urban Trans.	Mixed	Major City	Staff	.50 Tech.	.5in-.5cons.	.90 Tech.	.95 Tech.
16.	Reg.Highway Plan	Highway	Multiple Pub	Staff	.60 Trans.	Consultant	.95 Social	.75 Tech.
17.	State"Hard Prob"	Mixed	State	Staff	.70 Tech.	.7 In-house	.95 Social	.60 Tech.
18.	Adv.Modal Split	Mixed	US Govt.	Staff	.60 Tech.	Consultant	.85 Social	.60 Social
19.	City Transit Mod	Mixed	Major City	Staff	.80 Trans.	In-house	.95 Social	.40 Social
20.	Nat.Trans.Netwrk	Mixed	For.Govt.	Staff	.70 Trans.	Ind.Agencies	.20 Social	.50 Social
21.	STOL Airports Lo	Mixed	For. Govt.	Staff	.60 Trans.	Cons(univ)	.90 Social	.60 Social
22.	LCL Rail Shpmnts	Rail	Pub. Corp	.5 Line	.60 Tech.	In-house	.80 Social	.60 Social
23.	3rd London Airpt	Air	For:Govt.	Line	.60 Tech.	Special-In	.90 Social	.50 Social
24.	City Streetsweep	Surface	City Dept.	Line	.90 Tech.	Univ-Stud.	.70 Social	.90 Tech.
25.	Air Traf. Contrl	Air	-	Staff	.60 Tech.	Consultant	.50 Tech.	.90 Tech.

TABLE I

SUMMARY OF PROJECT CHARACTERISTICS (continued)

Project	Techniques Used In Model	Size of Project	Degree of User Interaction	Est.Freq. of Model Use	Location of Project	Degree of Usefulness To DM
1. Met.Trans.vs.Urb	Complex	Medium	Low	0	US	Low
2. Urban Mgt.Wrkshp	Simple	Med-Sm	Very-Large	3-10	US	Good
3. Airline STOL	Med.Complex	Medium	Medium	1	US	Good
4. Airline Tac.Plan	Complex	Medium	Medium	20-200	US	Good
5. Trans.Veh.Mvt.Sm	Medium	Medium	Med.-Low	0-1	US	Low
6. Av. Forecasting	Medium	Medium	Low	10	US	Low
7. Veh.Sim. Model	Med.Simple	Medium	Low	50	US	Low
8. DOT Nat. Network	Med.Complex	Large	Low	5	US	Fair
9. Frieght Modal Sp	Med.Simple	Med-Sm	Low	0-1	US	Low
10. Truck Linehaul	Complex	Large	Med.-Low	10-200	US	Good
11. Coventry Bus Net	Med.Complex	Small	Medium	1-2	Britain	Good
12. Airline Crew Trn	Medium	Small	Med.-Low	2-20	Europe	Good
13. Container Ship	Complex	Medium	Med.-Low	20-1000+	Europe	High
14. Rail Freight Pln	Med.Complex	Large	Medium	5-20	Europe	Good
15. Maj.Urban Trans.	Med.Complex	Very Large	Low	1	Europe	Fair
16. Reg.Highway Plan	Medium	Med.Large	Med.-Low	1	Europe	Fair
17. State"Hard Prob"	Med.Simple	Medium	Low	1-2	US State	Low
18. Adv.Modal Split	Complex	Medium	Low	1-5	US	Good
19. City Transit Mod	Medium	Large	Very Low	1	Europe	Low
20. Nat.Trans.Netwrk	Med.Complex	Very Large	Very Low	1-2	Europe	Fair
21. STOL Airports Lo	Simple	Medium	Great	1	Europe	Good
22. LCL Rail Shpmnts	Complex	Medium	Low	1-2	Europe	Fair
23. 3rd London Airpt	Medium	Very Large	None	0-1	Britain	Low
24. City Streetsweep	Complex	Small	Low	0	US City	Low
25. Air Traf. Contrl	Med.Complex	Medium	Low	1	US	Fair

TABLE I (continued)

5. Technical versus Social and Political Content of Model (Balance).
6. Public versus Private Nature of Decision Maker's Environment (Bureaucracy).
7. Complexity of Study (Complexity).
8. Degree of Formality of Project Planning (Formality).
9. Correspondence of Backgrounds of Decision Makers and Modelers (Backgrounds).
10. Usefulness of the work done (Decision Makers Final Reaction).[1]

In addition the participants were asked what they would do differently another time, based on their experience in this project.

There were a number of questions in each subject area, each on a qualitative scale which was subsequently reduced to a scale of 0-10. Examples of these questions are given below. The answers to the questions in each area cluster were then averaged for each project. Another factor, termed Role Recognition was introduced based on the interviews and observation above. Basically it measured the degree to which the participants recognized the distinctions between the role of decision maker and analyst in *their* case. In addition the differences in the responses, both absolute and net, between the participants in each project were noted (Correspondence of Response: Absolute and Net. Finally all were asked how they had felt about the prospect for useful results early in the project (avg. early). The results of the responses and their summarization is presented in Table III.

MAJOR CONCLUSIONS

First it may be said that there are no simple answers to the question of why some modeling projects produce results perceived as useful while others do not. It is *not* as simple as saying (as is often done):

"The modelers are just a bunch of God damned academics who don't know beans about transportation!"

"The clients are all incompetents who couldn't tell a good model from a bad one and don't want to learn!"

"All we need is the right hardware so the mayor can come in and look at the multi-color, multi-image, multi-media, multi-processed displays, and with his hands on the levers, vary the parameters for life in his city and we'll be home free!"

"The trouble is the managers don't understand what the real problems are!" or

"You never see those guys. They take your money, disappear for 6 months and then come back with a solution to some problem you never heard of!"

Things are more complicated. Virtually every one of the projects which failed, failed, for a *combination* of reasons while almost every one which succeeded did so in spite of one or more individual factors which were against it.

1 These one word short titles are used subsequently to refer to these areas.

EXAMPLES OF QUESTIONS ON SECOND QUESTIONNAIRE

1. To what extent did Decision Maker delegate his role in controling the progress of the study as opposed to personally attending to monitoring of study?

DM delegated all matters concerning project	DM wanted only major problems brought to him. His representative was major modeler contact	Decision Maker delegated some matters but was always reachable and informed	Decision Maker delegated little. His representative dealt only in DM's absence	DM didn't delegate. He read all memos, saw modelers on request, attended all meetings

13. To what extent did contacts during the study's progress involve the same individuals as opposed to different people? (BOTH scales please.)

	never the same people	sometimes the same key people but often different individuals	much of the time the same key people but often others	all meetings involved the same people
DM side				
PD side	never the same people	sometimes the same key people but often different individuals	much of the time the same key people but often others	all meetings involved the same people

24. Degree to which client organization is public in character.

indv. prop.	closely held corp.	small publicly held corp.	large publicly held corp.	top 10 publicly held	quasi-public corp.	govt. corp.	major indep. govt. agency	direct govt. agency

30. To what extent were the project's objectives spelled out in advance? (By "operational terms" is meant terms which are very concrete, permitting clear subsequent evaluation as to whether objectives were met.)

not at all	general objectives given in a few sentences	moderately complete statement of overall goals	fairly completely and in moderately operational terms	completely, in great detail and in very specific operational terms

35. How would you characterize the similarity or difference in backgrounds of the DM's and PD specifically?

complete contrast	few similarities	some similarities	fairly similar	virtually identical

TABLE II

SUMMARY OF INDIVIDUAL PROJECT RESPONSES

	DMFINAL.	ROLE.	CONTACT.	COMMUN.	DESIRE.	SIZE.	BALANCE.	BUREAUCRACY.	COMPLEXITY.	FORMALITY.	BACKGROUND.	EUROPEANESS.	USEFULNESS DM	USEFULNESS AVG.	CORRESPONDENCE OF RESPONSE NE	CORRESPONDENCE OF RESPONSE AE
1. MET. TRANS. VS. URBAN AMENITIES	0	2	2	6	5	5	5	10	6	3	2	0	0	2	25	47
9. FREIGHT MODAL SPLIT MODEL	1	2	2	6	6	5	6	5	5	5	4	0	1	5	-3	47
6. AVIATION FORECASTING PACKAGE	2	1	3	3	2	5	2	4	5	4	5	0	2	5	-122	127
7. VEHICLE SIMULATION MODEL	2	2	4	6	6	5	2	4	6	6	5	0	2	8	-24	70
3. AIRLINE STOL MODELING STUDY	5	4	4	5	5	3	4	4	3	4	5	0	5	7	4	34
15. MAJOR URBAN TRANSPORTATION PROJ.	6	4	4	6	3	6	3	10	8	4	7	1	6	5	-39	72
14. PLANNING MODELS FOR RAIL FREIGHT	6	4	4	6	8	5	3	8	5	5	4	1	6	7	-16	41
5. TRANS. FACILITY VEH. MVTS. SIM.	6	2	1	6	2	5	1	10	5	5	6	0	6	7	-32	58
11. COVENTRY BUS NETWORK STUDY	6	5	3	6	6	5	5	7	7	6	4	1	6	7	-41	75
2. URBAN MANAGEMENT WORKSHOP	7	4	2	7	4	4	6	10	4	5	6	0	7	6	-2	34
16. REGIONAL HIGHWAY PLANNING STUDY	7	4	1	4	4	7	2	10	5	3	5	1	7	7	34	50
4. AIRLINE TACTICAL PLANNING MODEL	7	4	2	6	4	5	3	4	6	7	4	0	7	5	8	32
12. AIRLINE CREW TRAINING SCHED MOD.	7	4	3	7	6	3	6	1	3	4	4	1	7	7	-11	11
8. D.O.T. NATIONAL NETWORK MODEL	7	3	2	6	6	5	3	10	5	4	7	0	7	7	-22	46
13. CONTAINERSHIP LOADING MODEL	10	4	3	7	7	4	2	1	5	4	6	1	10	6	1	23

TABLE III

With that as a basis it may nevertheless be said that a detailed qualitative and quantitative analysis indicated that in general:

- Role recognition was the strongest favorable factor.[2]
- Correspondence of backgrounds was the next strongest favorable factor.
- Complexity of the project was the strongest negative factor.[3]
- "Europeaness" of the project was a third strong factor.
- Formality, desire, and bureaucracy did not appear to bear significantly in a direct way on project success.
- Balance and contact were inconclusive since the questions concerning the former appeared to have been frequently misunderstood while the latter exhibited a definite negative sign.[4]

Thus on the scale of 10 used, 0 being totally useless and 10 completely useful, the most representative relationship in terms of regression results was:

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2 This factor is moderately, positively correlated with communication (r = .8584) thus subsuming some of its effect.

3 This factor is positively correlated with size of project (r = .6722) thus subsuming it to a great extent.

4 A plausible but untested explanation is that the decision makers who do not delegate are nonetheless not readily accessible to modelers, thus compounding the problems of project administration rather than reducing them.

Decision Makers Final Reaction	=	— 2.829	
		+ 1.628	Degree of Role Recognition
		+ .964	Correspondence of Backgrounds
		— .380	Complexity
	R^2 =	.714	
	=	1.479	

Thus one would conclude that, in effect, projects start out with a handicap (the intercept of nearly –3 on the scale of 10) which must be overcome. If these important variables are half-way decently represented (say their means of except 0 or 1 for Europe) one has:

	— 2.829	(due to the Intercept)
	+ 5.317	(due to Role Recognition)
	+ 4.756	(due to Correspondence of Backgrounds)
	— 1.976	(due to Complexity)
DM's Final Reaction =	5.268	

Thus one may see that in general for these modeling projects, if people have a modest understanding of who is to do what for whom, have moderately similar backgrounds, and avoid more than moderate complexity, they have a good prospect of producing results that the decision makers view as slightly more useful than not.

WHAT IS REALLY MEANT BY "DIFFERENCES IN BACKGROUNDS?"

Statistically the "Backgrounds" variable proved very important. Qualitatively, however, it was also very significant. This was not only in the more commonly thought of ways. It is often said, for example, that a man will do a better job and have greater rapport with a carrier executive, a government official or a professor if he has worked at some time in the past as a full fledged employee of a carrier, some government agency or some university. I believe this to be true and certainly nothing I encountered in my research contradicts it. The similarities and differences which I observed are much more like those mentioned by Bauer and Greyser [1967]. The dialogue they speak of is that between the government critic or consumer advocate and the businessman or marketer. They argue that such a dialogue never happens because these groups have fundamentally different views of the consumer world. They persist in talking past each other because of fundamentally different views of the world—different "models" of how the world works. They attach entirely, in fact, almost opposite meanings to such words as "Competition," "Product," "Consumer Needs," "Rationality," and "Information."

Precisely the same thing happens with decision-maker/clients and modeler/analysts. Because of great diversity of backgrounds, aptitudes, training,

and experience they tend to talk past each other in exactly the same way because they have basicly different models of the world of the traveller/shipper. Just as in the former case this misunderstanding grows from fundamentally different conceptions about a number of key words.

The first word is "regulation." To the federal regulator "regulation" means almost exclusively the prevention of destructive competition. To the modeler (and to the businessman) it means almost exclusively the elimination of rational pricing and other management functions.

Some of the perplexity between these two views of regulation has to do with the question of the word "service," i.e., the question of what's being regulated. The modeler views this very simply as the movement of people or things from A to B (usually as cheaply as possible). The government employee in lower levels of agencies takes a similar view. The businessman views the service offered by transportation as being a complex mixture of movement, speed, price, reliability, custom, administrative ease, friendship, favors, prestige, etc., which together go to fulfill his customers needs. The senior government man at the political level tends to fall in between.

The concepts of customers needs, just as in the marketing man's case are very much at variance between the two groups also. The modelers and less senior government people view customer needs almost exclusively in terms of the primary function—pure transportation. The businessman tends to view needs as any attribute which he can use to differentiate his product, be it more buxom stewardesses, piano bars, or the conviviality of a railroad freight salesman. If it will tip the scales of mode choice or carrier choice it is a "need" to the businessman.

This leads to the question of "rationality." The modeler, and to a lesser extent the government official with fixed ideas about "service" and "needs," views rationality as service which fits needs. The businessman has no such black and white world. He views any choice the customer makes which he is happy with as rational. It's up to the customer.

Lastly there is a question of "information." The modelers view once again is a fairly black and white one. To him almost without exception, information is quantitative data. Subjective expressions or mushy criteria ("It shouldn't have too great an impact on the state's scenery.") are no information at all. To the businessman and government decision maker any inputs which he will use in making his decision are information, quantitative or not.

As Bauer and Greyser pointed out, a review of the above vocabulary of double entendres reveals that the modeler and usually the lower level government officials' views of the world are very black and white, based on the conviction that they can figure out what "should be," while the businessman, and to a lesser extent the senior government official, have long since abandoned concepts of "good" and "bad" and are quite willing to be pragmatic on a case by case basis, providing whatever the user wants.

EXAMPLES OF DIFFERENCES IN BACKGROUNDS AND VALUES IN SPECIFIC PROJECT SITUATIONS

During my research, much before the statistical results were in, it became abundantly clear that backgrounds and value systems were of vital im-

portance. This was suggested in a number of ways. One was the suggestion, confirmed by my own observation, that European models tend to be more successful than American ones. Are backgrounds more similar in Europe? There is reason to believe they are. Another was my own experience in dealing with a wide variety of European, Asian, South American and American clients. There are great similarities among these and at the same time great differences (in all cases managers need and should get highly condensed formatted output in a form directly meaningful to them. On the other hand the assumptions need to be gone over for reasonableness *much* more with say a Burmese than an Englishman since the former will agree to anything at first as a matter of politeness, while our cultural rapport, i.e., ability to "read," an Englishman is much greater, though by no means complete.)

Specific projects studied provide virtual prototypes of various kinds of effects of backgrounds and value systems on project success.

The most successful project of all studied, the Containership Loading Model, was an example of nearly perfect correspondence of value systems and backgrounds. The shipping company executives had experience at sea. The modeling project director, though now a university professor, had 20 years experience at sea and a master's ticket. He knew immediately what the executives and the ship's captains were worried about. These, it must be emphasized, were in many cases *not* the central questions of how you load a containership efficiently but such questions as where you put the computer to minimize labor problems, etc.

The least successful model in the complete sample is a perfect case in the opposite sense. The clients were a group of people from various federal agencies and a highly progressive city planning agency. The contracting firm was a mathematically oriented firm. The modelers in this case were an American who had worked in the government in a broad conceptual role but not in a highly applied sense and a mathematician from a British dominion. The consortium of clients made prospects almost completely hopeless in the beginning since they ranged from highly theoretical economists to pragmatic bureaucrats.

However, the modelers and their clients proved able to talk past each other concerning almost every fundamental objective, assumption, and milestone of the study to a degree one would not have believed possible. This went on for 9 months until such time as when a more or less chance question finally elicited a completely unexpected response. The divergence of views which was exposed was so total that the project was cancelled. This project involved the modeling of complex socio-economic-transportation phenomena in an urban environment.

Many other examples exist. The most amusing perhaps is that which I call the city street sweeping model.[5] In this a group of students at a well-known eastern university worked for months with the managers of a city street department on how to most efficiently route street sweepers to most economically sweep the streets, without ever becoming aware of the fact that their "clients" (the job was not for pay) had an entirely different orien-

5 Many projects are disguised for obvious reasons.

tation, and thus objective function. Because the blue collar area of the city in question was, the mayor felt, under pressure from students looking for cheap housing, his administration's primary desire was to make the neighborhood unattractive to students without alienating the residents. Thus he wanted, not to get the streets as clean as possible subject to a budgetary limit, but *rather* to maximize the visibility of street sweepers (by re-traversing densely populated streets if need be) subject to *not* getting the neighborhood too clean. The brush could, indeed should, be raised much of the time—the object was to make the residents, the mayor's power base, see that they were getting their city services.

CONCLUSIONS

Any number of other examples may be cited. Some generalizations are possible, however. These include:

1) European managers and modelers tend to come from a much thinner social stratum than is the case in the U.S. and thus tend to be much more similar culturally.

2) European administrators, if they once had technical training, tend to have remained in the technical sphere much longer and have made the switch to administration much later in life than American managers with technical backgrounds. The Europeans thus retain, to a greater extent, their technical skills and prove easier for the modelers to gain rapport with.

3) The employment of an inside or outside "coordinator" to act as a catalyst, translator, moderator and system giving "early warning" of misunderstanding can be extremely effective.

4) It appears that one of the best ways of overcoming these problems is to employ modelers in as close as possible a relationship (i.e., a personal assistant or "vest pocket" approach) rather than from an outside firm one doesn't know.

5) It appears preferable to employ modelers who know the business as opposed to modelers whose primary expertise is in modeling.

6) If it appears to either side at some point that a major misunderstanding has occurred, it is very wise to halt the project until it can be confronted and resolved rather than sweep it under a rug of politeness.

FUTURE RESEARCH

Clearly backgrounds and value systems are matters which may be investigated. This raises the possibility that clients and modelers could develop a profile of themselves and by mutual comparison avoid the worst mismatches or at least be made specifically aware that a serious potential problem existed.

Current research is in just this direction. The Allport-Vernon-Lindzey Study of Values (3rd edition) is being used. This brief 45 question test ap-

pears to be ideal for the purpose since it is quick, interesting to the respondent, standardized, and parses "values" along 6 useful dimensions: Theoretical, Economic, Aesthetic, Social, Political, and Religious, by sex. Based on limited use it appears that the test is useful as a device for measuring value systems and thus could serve as an early warning device for people who are about to be in a position of dealing with some opposite number or colleague in a modeling project. One could imagine, for example, that as a standard part of the response to any request for proposal that the bidders would be required to submit the test results as part of their individual's resumes, and that in the evaluation process points would be awarded for extra good "fit" or taken away for large mismatches.

It is not yet possible to say exactly which of the Allport-Vernon-Lindzey Tests value dimensions (or combination) are most significant. Likewise, it is not yet possible to say whether this test is satisfactory when administered to Europeans, since it contains a number of references to specific American institutions, such as the Supreme Court, The New York Times, and Abraham Lincoln. Similarly, it is entirely likely that the test will not be satisfactory for use with Europeans because of its problem of language, especially Europeans who do not speak English and for whom it must be translated.

CONCLUSIONS

In conclusion it may be said that the similarities or differences in backgrounds and value systems among participants in transportation modeling projects, is much more important than previously recognized. There are a number of steps which may be taken to ameliorate the problem. Finally it appears perfectly feasible to develop measurement techniques, capable of everyday implementation to further aid in detecting and avoiding the great expense, grief, and loss of time which the frequent misunderstandings and conflicts between individuals on projects may cause.

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