8-15-1997

Using an Executive Information System to AnalyzeGroup Support Systems: A Preliminary Implementation

Jerry Fjermestad
New Jersey Institute of Technology, jerry-fjermestad@worldnet.att.net

Thiam S. Seah
New Jersey Institute of Technology

Using an Executive Information System to Analyze Group Support Systems: A Preliminary Implementation

Jerry Fjermestad
School of Management & NJCMR
New Jersey Institute of Technology
Newark, New Jersey 07102
jerry-fjermestad@worldnet.att.net
Thiam S. Seah
School of Management
New Jersey Institute of Technology
Newark, New Jersey 07102

Introduction

The objective of this paper is to propose a new approach to help in the analysis of Group Support Systems (GSS) research. We will present a preliminary data model which incorporates the methodology and results of 140 empirical GSS papers in a multidimensional database. This data model will be compared to a traditional relational database.

Problem

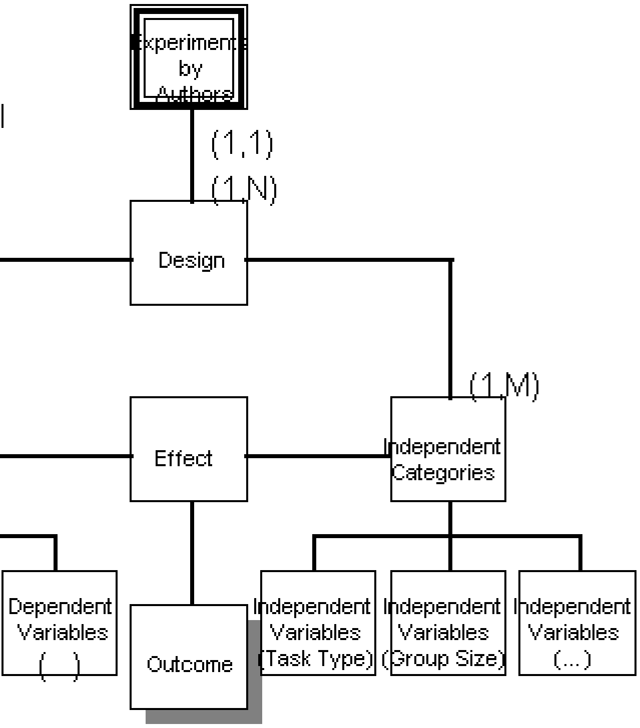
Several meta-analysis (Benbasat and Lim, 1993; McLeod, 1992) suggest that group support systems (GSS) increase decision quality, equality of participation, decision time, the number of alternatives, and the degree of task focus while showing decreases in consensus and satisfaction. A more recent analysis (Dennis, Haley, and Vandenberg, 1996) agrees with these observations and adds that larger groups benefit from GSS use versus smaller groups. Furthermore, they also suggest that if the GSS process matches the task, the groups benefit from the technology.

However, none of these meta-analyses included more than 35 studies in their analysis and they compared only GSS to non-GSS conditions. In addition, they did not use a comprehensive framework to organize their data. Fjermestad and Hiltz (1997) presented a four factor framework consisting of contextual, intervening, adaptation, and outcome factors and mapped 140 studies to it. Their results highlight what has been done and more importantly, what needs to be done. This is the next step.

Multidimensional Data Model

The multidimensional data model is shown in Figure 1.

Figure 1
Multi-Dimensional
Model



Experiments by author: A superkey consisting of an author number and experiment number.

Design: Experimental design type (i.e. 2 X 1).

Independent Category: Represent 7 categories of independent variables (context; group; method; process structure; task; task support; and technology).

Independent variables: Represents 38 independent variables.

Dependent Category: Represents 11 categories of dependent variables (consensus; effectiveness; effic-iency; process gain, loss, & variables; roles; satisfaction; structuration; and usability).

Dependent variables: Representing 295 dependent variables.

Effect: Represent 4 categories of results (0- no effects; 1- technology effects i.e. GSS > FtF; 2- no-technology effects i.e. FtF > GSS; 3- no measures; 4- other effects i.e. interaction effects.

Outcome: Represents 141 different outcomes from the experiments.

Executive Information Systems

Executive Information Systems (EIS) have been used to aid decision makers maker better decision since the early 1970's (Rockart and Delong, 1988). EIS can be defined as a computerized system that provides the decision maker with easy access to the information that is critical to the decision at hand (Watson, Rainer, and Koh, 1991). Several researchers have suggested that the characteristics of such systems should include:

tailorablility
drill-down capabilities
user friendly
combine graphical, tabular, and textual information
multidimensional data base (MDD) view or on-line analytical processing (OLAP).

The key characteristic for this implementation is the MDD view which is designed for live ad-hoc access and analysis (Pilot Software, 1995). MDDs store data as an n-dimensional cube and lets the analysts deal simultaneously with data views defined by such combinations of qualities as experiments by author, design, independent category, etc. MDDs have several major advantages over relational data bases such as Microsoft's Access (Gray and Watson, 1996):

time is a dimension in MDDs

MDDs are optimized for speed

MDDs have ease of query response

Implementation using Pilot Software

Our MDD data model was implemented using Pilot Software's Lightship Server 2.0 and Lightship SMIS 2.0.

Figure 2 shows the full model for all eleven of the dependent category of variables (Dv_cat). There are a total of 1171 independent/dependent variable crosses. 506 pairings had no significant effects; 140 pairing resulted in effects for technology (GSS > FtF); 89 pairing resulted the reverse effects (FtF > GSS); 155 pairings consisted of no measures; and 281 pairing had other effects (e.g. interactions).

Figure 3 is the result of clicking on the Iv column and selecting communication as the independent variable.

Comparison Implementation using Microsoft Access 7.0

Figures 4 and 5 shown a comparison with Access 7.0. Both reports are a crosstab query. With the exception of the dummy variables required for the Lightship implementation the results are exactly the same. The major advantage with the MDD implementation is the capability to drill down on the different variables without having to re-run a crosstab query.

Conclusion

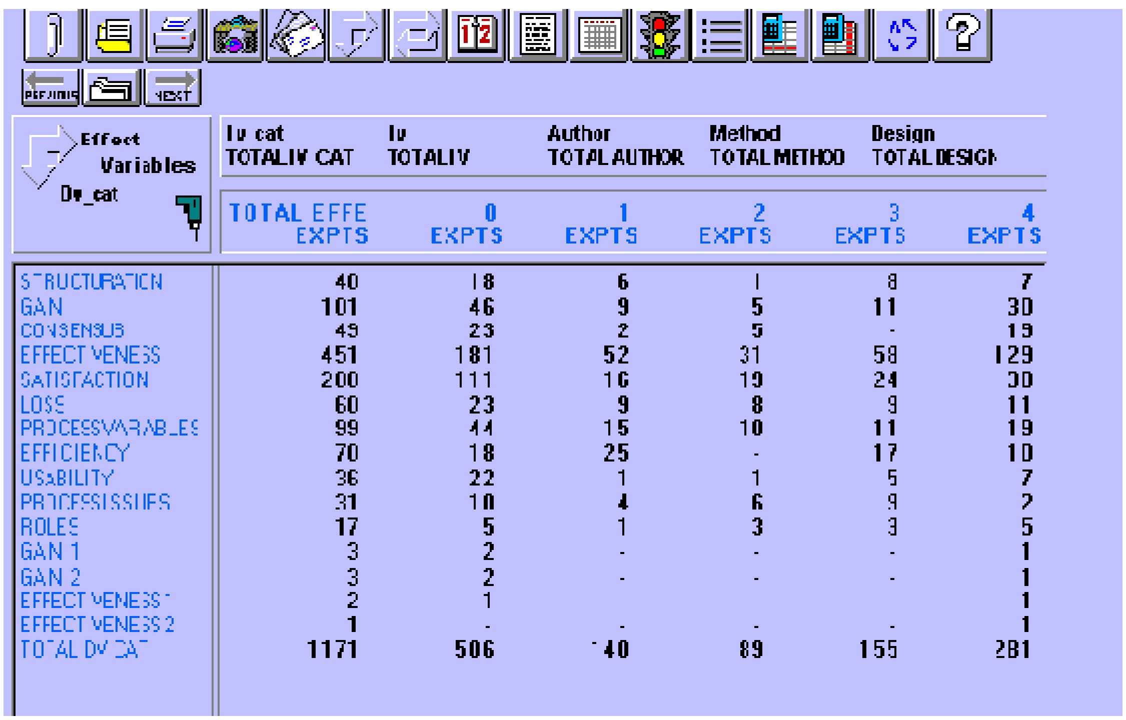
The objective of this paper was to present a new approach to understanding GSS systems research. With this MDD data model it is now possible to run ad-hoc analysis to determine which combinations of independent and dependent variables lead to the desired outcomes. For example, we will be able do drill-down on any independent and design variable simultaneously and determine the effect on each dependent variable category. Drilling-down to one of the 295 dependent variables from the Dv_cat is possible.

This is a preliminary proof-of-concept implementation. Further work is in-process to build the complete MDD model.

Acknowledgments

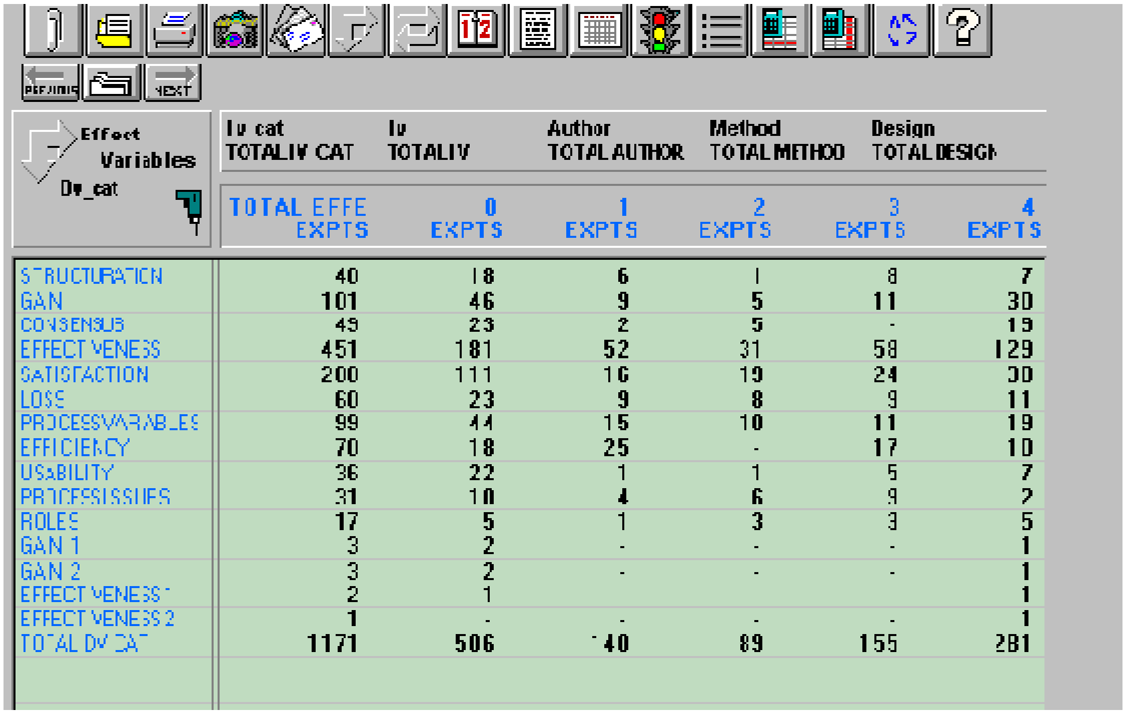
This research was supported by a grant from the NSF (NSF-IRI-9408805), from NJIT (SBR-421090) and from Pilot Software. Special thanks are extended to Robert Stroebel of Pilot Software for all of his help.

References are available upon request from first author.



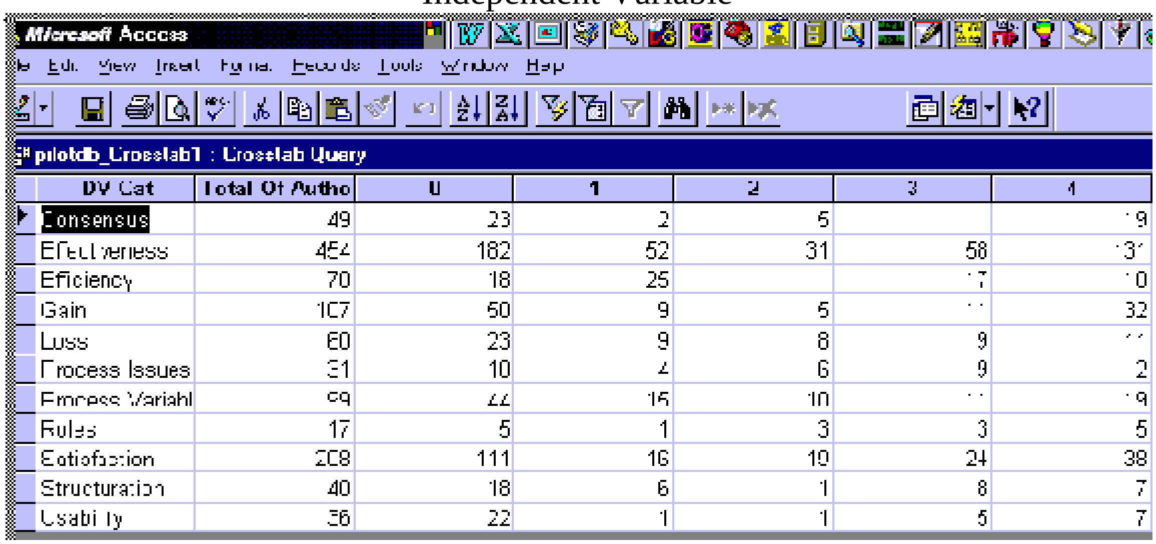
Effect Variables / Dv_cat	TOTAL EFFE EXPTS	0 EXPTS	1 EXPTS	2 EXPTS	3 EXPTS	4 EXPTS
STRUCTURATION	40	18	6	1	8	7
GAN	101	46	9	5	11	30
CONSENSUS	49	23	2	5	-	19
EFFECTIVENESS	451	181	52	31	58	129
SATISFACTION	200	111	16	19	24	30
LOSS	60	23	9	8	9	11
PROCESSVARIABLES	99	44	15	10	11	19
EFFICIENCY	70	18	25	-	17	10
USABILITY	36	22	1	1	5	7
PROCESSISSUES	31	10	4	6	9	2
ROLES	17	5	1	3	3	5
GAN 1	3	2	-	-	-	1
GAN 2	3	2	-	-	-	1
EFFECTIVENESS 1	2	1				1
EFFECTIVENESS 2	1	-	-	-	-	1
TOTAL DV CAT	1171	506	140	89	155	281

Figure 2
The Full MDD Model



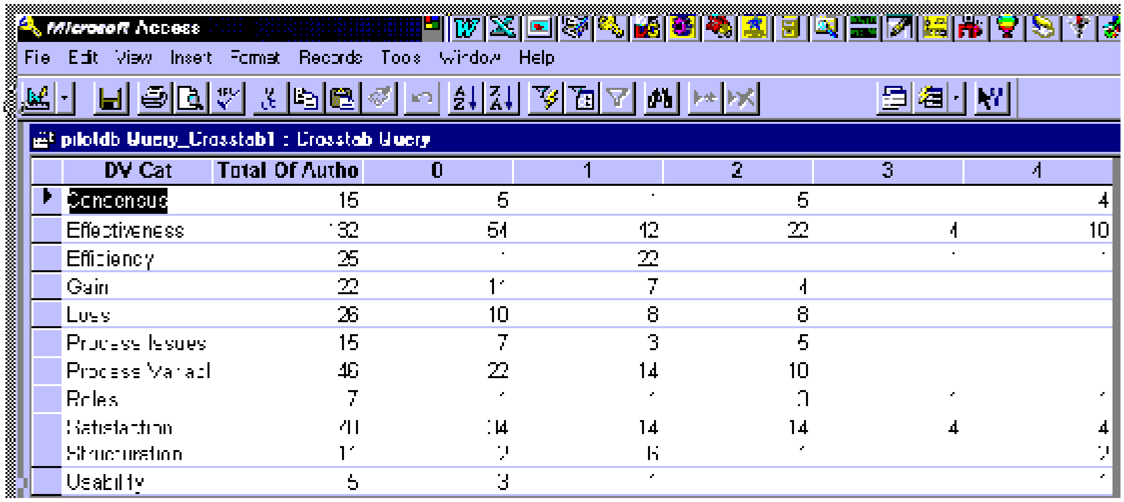
Effect Variables Dv_cat	Iv cat TOTALIV CAT TOTAL EFFE EXPTS	Iv TOTALIV 0 EXPTS	Author TOTAL AUTHOR 1 EXPTS	Method TOTAL METHOD 2 EXPTS	Design TOTAL DESIGN 3 EXPTS	4 EXPTS
STRUCTURATION	40	18	6	1	8	7
GAN	101	46	9	5	11	30
CONSENSUS	49	23	2	5	-	19
EFFECTVENESS	451	181	52	31	58	129
SATISFACTION	200	111	16	19	24	30
LOSS	60	23	9	8	9	11
PROCESSVARIABLES	99	44	15	10	11	19
EFFICIENCY	70	18	25	-	17	10
USABILITY	36	22	1	1	5	7
PROCESSISSUES	31	10	4	6	9	2
ROLES	17	5	1	3	3	5
GAN 1	3	2	-	-	-	1
GAN 2	3	2	-	-	-	1
EFFECTVENESS 1	2	1				1
EFFECTVENESS 2	1	-	-	-	-	1
TOTAL DV CAT	1171	506	140	89	155	281

Figure 3
Communication
Independent Variable



DV Cat	Total Of Autho	0	1	2	3	4
Consensus	49	23	2	5		19
Effectiveness	454	182	52	31	58	131
Efficiency	70	18	25		17	10
Gain	107	50	9	5	11	32
Loss	60	23	9	8	9	11
Process Issues	31	10	4	6	9	2
Process Variabl	99	44	15	10	11	19
Roles	17	5	1	3	3	5
Satisfaction	208	111	16	10	24	38
Structuration	40	18	6	1	8	7
Usability	36	22	1	1	5	7

Figure 4
Access: Full Model



DV Cat	Total Of Autho	0	1	2	3	4
Consensus	15	5	[illegible]	5		4
Effectiveness	132	54	12	22	4	10
Efficiency	25	[illegible]	22		[illegible]	[illegible]
Gain	22	[illegible]	7	4		
Loss	26	10	8	8		
Process Issues	15	7	3	5		
Process Variabl	46	22	14	10		
Roles	7	[illegible]	[illegible]	3	[illegible]	[illegible]
Satisfaction	[illegible]	14	14	14	4	4
Structuration	[illegible]	2	6	[illegible]		2
Usability	5	3	[illegible]			[illegible]

Figure 5
Access:
Communication Independent Variable