

## Appendix D: Complete ANOVA tables

### Group Process

#### Multivariate Analysis of Variance

Criterion	Test Statistic	df	F	P
Wilk's	0.00746	(7,1)	19.014	0.175
Lawley-Hotelling	133.09946	(7,1)	19.014	0.175
Pillai's	0.99254	(7,1)	19.014	0.175

\* shows a significant effect

Table D-1a: Multivariate analysis of variance of the effect of technological support for the decision making process on group process variables.

Criterion	Test Statistic	df	F	P
Wilk's	0.05736	(4,4)	16.432	0.009*
Lawley-Hotelling	16.43248	(4,4)	16.432	0.009*
Pillai's	0.94264	(4,4)	16.432	0.009*

\* shows a significant effect

Table D-1b: Multivariate analysis of variance of the effect of technological support for the decision making process on objective group process variables.

Criterion	Test Statistic	df	F	P
Wilk's	0.36832	(3, 5)	2.858	0.144
Lawley-Hotelling	1.71506	(3, 5)	2.858	0.144
Pillai's	0.63168	(3, 5)	2.858	0.144

\* shows a significant effect

Table D-1c: Multivariate analysis of variance of the effect of technological support for the decision making process on subjective group process variables.

## Individual Analysis of Variance

<b>Effect</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	1.1947	0.1707	0.33	0.916
Decision Support	1	4.0200	4.0200	1.17	<b>0.316</b>
Error	7	3.6107	0.5158		
Total	15	8.8254			

\* shows a significant effect

Table D-2: Analysis of variance of the effect of technological support for the decision making process on perceived consensus.

<b>Effect</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	1.1947	0.1707	0.33	0.916
Decision Support	1	4.0200	4.0200	7.79	0.027*
Error	7	3.6107	0.5158		
Total	15	8.8254			

\* shows a significant effect

Table D-3: Analysis of variance of the effect of technological support for the decision making process on measured concensus.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	343.00	49.00	3.06	0.081
Decision Support	1	1600.00	1600.00	100.00	0.001*
Error	7	112.00	16.00		
Total	15	2055.00			

\* shows a significant effect

Table D-4: Analysis of variance of the effect of technological support for the decision making process on decision making time.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	0.21680	0.03097	2.85	0.095
Decision Support	1	1.05062	1.05062	3.72	0.095
Error	7	0.07618	0.01088		
Total	15	1.34360			

\* shows a significant effect

Table D-5: Analysis of variance of the effect of technological support for the decision making process on information exchange.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	0.21680	0.03097	2.85	0.095
Decision Support	1	1.05062	1.05062	96.55	0.001*
Error	7	0.07618	0.01088		
Total	15	1.34360			

\* shows a significant effect

Table D-6: Analysis of variance of the effect of technological support for the decision making process on communication efficiency.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	7.3112	1.0445	2.49	0.126
Decision Support	1	3.6864	3.6864	0.05	0.823
Error	7	2.9392	0.4199		
Total	15	13.9368			

\* shows a significant effect

Table D-7: Analysis of variance of the effect of technological support for the decision making process on perceived degree of cooperation.

<b>Source</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>	<b>P</b>
Team (random)	7	7.3112	1.0445	2.49	0.126
Decision Support	1	3.6864	3.6864	8.78	0.021*
Error	7	2.9392	0.4199		
Total	15	13.9368			

\* shows a significant effect

Table D-8: Analysis of variance of the effect of technological support for the decision making process on perceived structure of the group process.

## Task-related outcomes

### Multivariate Analysis of Variance

Criterion	Test Statistic	df	F	P
Wilk's	0.36832	(3, 5)	2.858	0.144
Lawley-Hotelling	1.71506	(3, 5)	2.858	0.144
Pillai's	0.63168	(3, 5)	2.858	0.144

\* shows a significant effect

Table D-9: Multivariate analysis of variance of the effect of technological support for the decision making process on task-related outcomes variables.

### Individual Analysis of Variance

Source	DF	SS	MS	F	P
Team (random)	7	0.13139	0.01877	0.81	0.605
Decision Support	1	0.46036	0.46036	19.90	0.003*
Error	7	0.16196	0.02314		
Total	15	0.75372			

\* shows a significant effect

Table D-10: Analysis of variance for the effect of technological support for the decision making process on decision making accuracy.

Source	DF	SS	MS	F	P
Team (random)	7	0.13754	0.01965	0.84	0.587
Decision Support	1	0.14081	0.14081	6.03	0.044*
Error	7	0.16333	0.02333		
Total	15	0.44168			

\* shows a significant effect

Table D-11: Analysis of variance for the effect of technological support for the decision making process on decision making effectiveness.

Source	DF	SS	MS	F	P
Team (random)	7	3.7822	0.5403	2.18	0.163
Decision Support	1	0.0281	0.0281	0.11	0.747
Error	7	1.7376	0.2482		
Total	15	5.5479			

\* shows a significant effect

Table D-12: Analysis of variance for the effect of technological support for the decision making process on confidence in the decision.

## Group-related outcomes

Source	DF	SS	MS	F	P
Team (random)	7	7.2870	1.0410	2.78	0.101
Decision Support	1	2.2425	2.2425	5.98	0.044*
Error	7	2.6253	0.3750		
Total	15	12.1548			

\* shows a significant effect

Table D-13: Analysis of variance for the effect of technological support for the decision making process on satisfaction with the group process.

## Qualifications of the researcher

### **Personal Information**

**Arnoldo Rafael Cano Santayana**

Born in Panama City, Panama on June 2, 1971

26 years old, Single.

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### **Education**

Currently completing degree of **Masters in Industrial and Systems Engineering**

Virginia Polytechnic Institute and State University – Blacksburg, Virginia. EE.UU.

Specialization in **Management Systems Engineering**.

Degree expected in December, 1997.

**Bachelor degree in Industrial and Systems Engineering**

University of South Florida – Tampa, Florida. EE.UU.

Graduated with honors *Cum Laude*.

Degree obtained in May, 1994.

**High School degree in Science, Literature and Accounting**

Colegio San Agustín – Panama, Rep. of Panama.

Degree obtained in December, 1988.

### **Work Experience**

**Graduate research assistant for NASA benchmarking project**

Macroergonomics and Group Decision Systems Laboratory - Blacksburg, Virginia. EE.UU.

Part of a research group at the Macroergonomics and Group Decision Systems Laboratory performing a benchmarking study, or analysis of best practices, in the area of project management. The study was aimed at improving project management at NASA by analyzing successfully managed projects.

June - August, 1997

**Graduate Teaching Assistant in Industrial Engineering course**

Virginia Polytechnic Institute and State University – Blacksburg, Virginia. EE.UU.

Teaching assistant in an undergraduate course taught by the Industrial and Systems Engineering Department. The course, titled *Global Issues in Industrial Engineering*, teaches international business concepts, customs and business practices in other countries, use of the internet, and HTML programming. Duties included assisting the instructor, Dr. Brian M. Kleiner, in the preparation and presentation of teaching material, design and administration of tests, and maintaining the course's web site.

September 1996 - May 1997

**Experience  
(Cont.)**

**Design and implementation of a quality and performance measurement system**

*Servicentro los Libertadores, S.A. – Panama, Rep. of Panama*

Design and implementation of a system to measure the business performance of Servicentro Los Libertadores, in the gas and food retail business. The system included methods for measuring the quality of the company's products and services, customer satisfaction, and compliance with safety and health regulations.

*June - September 1996*

**Database development for the United States Department of Energy**

*Macroergonomics and Group Decision Systems Laboratory – Blacksburg, Virginia. EE.UU.*

Research assistant in a project funded by the U.S. Department of Energy. Duties included the development of a database to track emerging technologies, and the organization of a national conference (Technology and Information Exchange Conference; Santa Fe, New Mexico), to facilitate the exchange of new technologies in the area of radioactive and toxic cleanup.

*January - June 1996*

**Graduate Research Assistant**

*Macroergonomics and Group Decision Systems Laboratory – Blacksburg, Virginia. EE.UU.*

Assistant in a number of research projects at the Macroergonomics and Group Decision Systems Laboratory, at Virginia Tech. Duties included performing statistical analysis in a study of group dynamics, maintaining the labs computer network, and designing and implementing a web site for the lab.

*September - December 1995*

**Production Manager**

*Panasal, S.A. – Aguadulce, Rep. of Panama*

Production Manager in charge of the manufacturing and packaging plant of Panasal, S.A., located in Aguadulce, Province of Coclé. Duties included supervising daily operations, implementing improvements to the quality control program, and supervising the technical aspects of the purchase of new manufacturing and packaging equipment.

*Mayo - August 1995*

**Information System Support**

*Servicentro los Libertadores, S.A. – Panama, Rep. of Panama*

Design and improvement of a number of improvements to the company's information system, including management information systems and accounting. The improvements included the transition to new accounting software, the development of new data capture methods, and the installation of new hardware and software for network communication. Duties included the evaluation of the new company requirements, the purchase and installation of new hardware and software, and training of the personnel in the use of the new system.

*May - August 1994*

*May - August 1994*



**Experience  
(Cont.)**

**Engineering Assistantship**

*Johnson and Johnson Medical, Inc. – Oldsmar, Florida. EE.UU.*

Two job assignments at a Johnson and Johnson Medical Inc. manufacturing plant. The facility manufactures, assembles, packages, and sterilizes surgical instruments. Duties included the implementation of a new automated storage and retrieval system, research on clean room and contamination standards, work design, and process optimization.

*September 1992 - January, 1993*

*January - May, 1992*

**Engineering Assistantship**

*AMP, Inc. – Clearwater, Florida. EE.UU.*

Engineering internship at an electronic component research facility owned by AMP, Inc. The research facility designs and tests high performance digital electronic connections. Duties included process documentation, quality control, process scheduling, and optimization of equipment usage.

*May - September, 1991*

**Other  
Positions  
Held**

**Vice-president of the local chapter of the Institute of Industrial Engineers**

*Institute of Industrial Engineers, IIE.*

*University of South Florida – Tampa, Florida. EE.UU.*

*January - December, 1994*

**Vice-president of the local chapter of the Alpha Pi Mu Industrial Engineering Honor Society**

*Alpha Pi Mu Industrial Engineering Honor Society, A M.*

*University of South Florida – Tampa, Florida. EE.UU.*

*January - December, 1994*

**Publications**

**Sociotechnical Design Factors of Virtual Team Performance**

Journal article presented at the 1996 Human Factors and Ergonomic Society Annual Meeting. Published in *Proceedings of The Human Factors and Ergonomics Society.*

*November, 1996*

**Professional  
Societies**

**Institute of Industrial Engineers, IIE**

**Alpha Pi Mu Industrial Engineer Honor Society, A M.**

**Human Factors and Ergonomics Society, HFES**

**Special Skills**

**Computers and Technology**

Broad experience with computer and information technology. Expert in the use of database software (Paradox, Microsoft Access), spreadsheets (Lotus, Microsoft Excel), word processors (Microsoft Word), and many others (Microsoft PowerPoint, etc.).

Extensive knowledge of the installation, administration, and use of Computer Supported Cooperative Work software (Ventana Group Systems, Team ExpertChoice, TeamWave), as well as Video-Conferencing (CUSeeMe, NetMeeting)

Experience with the installation, administration, and use of multiple operating systems: Apple MacOS, Microsoft Windows ('95 y NT), y MS DOS. Broad knowledge of network administration. Knowledge of internet protocols (TCP/IP). General knowledge of programming in high-level languages (HTML, JavaScript, Java, VisualBasic, C++)

**Language**

Fully bilingual. Speak, read, and write Spanish and English.