APPENDIX 3 – BEER DISTRIBUTION GAME SURVEY

Appendix 3 contains 4 documents:

1. IRB Approval Memorandum form the Institutional Review Board (Page 836)
2. Beer Distribution Game Survey – Study Methods, and Analysis. Documentation forwarded to IRB requesting approval.(Pages 837 – 843)
3. Beer Distribution Game Survey Instrument – the instrument used to survey the subjects. (Pages 844 – 845)
4. Beer Distribution Game Survey Results. Survey responses in tabular form. (Pages 846 – 848)

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board
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DATE: December 22, 2005

MEMORANDUM

TO: Konstantinos P. Triantis ISE 0118
Michael Sallada

FROM: Carmen Green CG

SUBJECT: **IRB Exempt Approval:** "Survey on the Beer Distribution Game" IRB # 05-795

I have reviewed your request to the IRB for exemption for the above referenced project. I concur that the research falls within the exempt status. Approval is granted effective as of December 22, 2005.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File
Department Reviewer: Thurmon E. Lockhart
T. Coalson 0118

Beer Game Survey – Study, Methods, and Analysis

The Beer Distribution Game is a simulation of supply chain dynamics that was first developed by Jay Forrester at MIT in the late 1950's. Over the past five decades the game has been played in many environments and has proven to be a valuable learning tool in several different subjects. The beer game is a board game simulation of a four node supply chain, with each player acting as an independent node within the supply chain. The objective of the game is to minimize total costs for the team. The key purposes of the game are to introduce the principal that structure produces behavior, and to enable students to experience the pressures of playing a role in a complex system. As a part of three different graduate classes: ENGR 5104 Applied Systems Engineering, BIT 5414: PRODUCTION AND OPERATIONS MANAGEMENT IN A GLOBAL ENVIRONMENT, and BIT 5495-5496: DSS DESIGN AND IMPLEMENTATION students participated in the game. Players participate by following a facilitator who walks them through the step by step process of filling orders for their customer and placing orders with their supplier. Players record data at each week on their effective inventory and what orders they placed with their supplier that week.

As part of Michael Sallada's research on "The unanticipated effects of implementing Information Technology" the game was modified from its original and normal format to include a new component of the game. Normally the game is played with no communication between players other than the passing of order slips from one node to the next. In the modified version of the game, play was stopped at week 20 to modify the rules for approximately half of the teams. All players were told that the selected teams were having Information Technology installed in their supply chain, and that for the remaining 32 weeks of the game these players would be able to view all orders in the supply chain, not just the immediate orders from their customer. The instructions to the players were given verbally by the facilitator, and play resumed. At the end of the game the data recorded by the students is collected. The game generally takes between two and two and one half hours to play. The collected data is analyzed and a feedback report is presented to the class at the following class meeting.

The game is very mechanical and players have one decision to make each week. The decision to be made is how much stock to order from the supplier each week. As part of the research on “The unanticipated effects of implementing Information Technology” researchers have prepared a brief survey to question the players on how this decision was made. The survey which will be made available to players on survey.vt.edu consists of 12 questions. Eleven of the questions are multiple choice with the last question being open
text.
The questions and the available answers are listed here along with the
purpose of asking each question.

Question 1.

My position in the Beer Game was?

- Retailer
- Wholesaler
- Distributor
- Factory

The purpose of this question was simply to identify the node in the supply chain that the player filled. It is expected that data from the different positions will differ.

Question 2.

My team had Information Technology Installed?

- Yes
- No

The purpose of this question was to identify if the supply chain had information technology installed.

Question 3.

I was motivated to optimize the performance of the

- Team
- Myself

The literature on the beer game suggests that in order to be successful players must be motivated by total supply chain performance and not by the performance of their own node. The purpose of this question was simply to identify if players felt they had been adequately informed of this necessity.

The next eight questions were done using a five point Likert Scale to rate players attitudes on the game. These questions were preceded by the following text:

Reflecting on your experience playing the game consider the following
statements and identify your level of agreement with the statement.

Question 4.

The game was a valuable exercise in supply chain logistics.

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

The purpose of this question was to ascertain players' attitude regarding the game they played. Literature on the beer game suggests that it is a valuable exercise in understanding supply chains.

Question 5.

The game was a valuable lesson in system dynamics.

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

The purpose of this question was to ascertain players' attitude regarding the game they played. Literature on the beer game suggests that it is a valuable exercise in system dynamics.

Question 6.

The game was a useful learning experience.

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

The purpose of this question was to ascertain players' general attitude regarding the game they played..

Question 7.

I felt that I was participating in a team exercise.

Strongly disagree

Disagree

No opinion

Agree

Strongly agree

The purpose of this question is to ascertain if players understood that the game was a team exercise and not an individual exercise.

Question 8.

I considered the stock in transit when making my ordering decisions.

Strongly disagree

Disagree

No opinion

Agree

Strongly agree

The purpose of this question was to understand players thoughts in making ordering decisions. This is one of the key questions for the research, we are trying to develop a model of how information technology changes the system and are looking to understand what information players use in making their decisions.

Question 9.

I considered the stock in my neighbors' inventory when making ordering

decisions.

Strongly disagree

Disagree

No opinion

Agree

Strongly agree

This question also addresses the issue of player's decision process. The stock of all positions on the board is clearly visible to all players. The question is whether or not players actually use that information in making their ordering decisions.

Question 10.

After Information Technology I expected to see a performance improvement in the teams that had IT.

Strongly disagree

Disagree

No opinion

Agree

Strongly agree

The purpose of this question is to identify players' attitudes and expectations towards the play of the game after information technology was introduced. Anecdotal evidence from the time of the game leads the researchers to believe that introducing information technology changes the expectations of teams with and without information technology. The question is designed to understand how pervasive this attitude was.

Question 11.

After Information Technology was implemented I changed how I made my ordering decisions.

Did not have IT

Strongly disagree

Disagree

No opinion

Agree

Strongly agree

The purpose of this question was to understand if the introduction of Information Technology had the expected results of altering how players made ordering decisions.

Question 12.

Please take a few moments and quickly describe how you made your ordering decisions both before and after the implementation of IT.

[Open Text – up to 1000 characters available]

The purpose of this question is to elicit information on what mental process players used to make their ordering decisions.

The data derived from this survey will be used to help researchers understand the decision process used by players in ordering stock for the game. Players are not identified in any manner other than what position they played in the game and whether or not the team they played on had Information Technology installed.

Beer Distribution Game

My position in the Beer Game was?

- ☐ Retailer
- ☐ Wholesaler
- ☐ Distributor
- ☐ Factory

My team had Information Technology Installed?

- ☐ Yes
- ☐ No

I was motivated to optimize the performance of the

- ☐ Team.
- ☐ Myself.

Reflecting on your experience playing the game consider the following statements and identify your level of agreement with the statement.

The game was a valuable exercise in supply chain logistics.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

The game was a valuable lesson in system dynamics.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

The game was a useful learning experience.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

I felt that I was participating in a team exercise.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

I considered the stock in transit when making my ordering decisions.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

I considered the stock in my neighbors inventory when making ordering decisions.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

After Information Technology was implemented I expected to see a performance improvement in the teams that had IT.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ No opinion
- ☐ Agree
- ☐ Strongly agree

After Information Technology was implemented I changed how I made my ordering decisions.

- ☐ Did not have IT

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

Please take a few moments and quickly describe how you made your ordering decisions both before and after the implementation of IT.

Submit

Beer Game Survey Results

	Date	My position in the Beer Game was?	My team had Information Technology Installed?	I was motivated to optimize the performance of the	The game was a valuable exercise in supply chain logistics.
1	12/29/2005 11:54	Factory	Yes	Team.	Agree
2	12/29/2005 12:00	Wholesaler	Yes	Team.	Agree
3	12/29/2005 12:12	Distributor	Yes	Myself.	Agree
4	12/29/2005 12:33	Wholesaler	Yes	Team.	Agree
5	12/29/2005 12:56	Wholesaler	Yes	Team.	Agree
6	12/29/2005 13:27	Retailer	Yes	Team.	Agree
7	12/29/2005 15:25	Factory	No	Myself.	Agree
8	12/29/2005 16:46	Wholesaler	Yes	Team.	Agree
9	12/29/2005 18:55	Retailer	No	Team.	Agree
10	12/30/2005 9:54	Wholesaler	No	Team.	Agree
11	12/30/2005 19:09	Distributor	No	Team.	Strongly agree
12	12/30/2005 19:11	Factory	No	Team.	Strongly agree
13	12/30/2005 23:13	Distributor	Yes	Myself.	No opinion
14	12/31/2005 10:39	Factory	Yes	Myself.	Strongly agree
15	1/1/2006 14:34	Retailer	No	Team.	Agree
16	1/3/2006 6:51	Distributor	No	Team.	Agree
17	1/4/2006 14:16	Factory	Yes	Team.	Agree
18	1/4/2006 14:20	Factory	No	Myself.	Agree
19	1/4/2006 14:25	Factory	Yes	Myself.	Agree
20	1/4/2006 14:30	Distributor	Yes	Team.	Strongly agree
21	1/4/2006 14:41	Distributor	Yes	Team.	Agree
22	1/4/2006 15:34	Retailer	Yes	Myself.	Agree
23	1/4/2006 17:57	Wholesaler	Yes	Team.	Strongly agree
24	1/4/2006 17:57	Retailer	No	Team.	Strongly agree
25	1/4/2006 20:03	Retailer	Yes	Team.	Strongly agree
26	1/5/2006 8:13	Distributor	Yes	Team.	Strongly agree
27	1/5/2006 11:02	Wholesaler	Yes	Myself.	Strongly agree
28	1/5/2006 11:05	Factory	No	Myself.	Agree
29	1/5/2006 16:42	Factory	Yes	Team.	Strongly agree
30	1/5/2006 21:27	Wholesaler	Yes	Myself.	Agree
31	1/19/2006 9:59	Retailer	No	Myself.	Agree

Beer Game Survey Results

The game was a valuable lesson in system dynamics.	The game was a useful learning experience.	I felt that I was participating in a team exercise.	I considered the stock in transit when making my ordering decisions.	I considered the stock in my neighbors inventory when making ordering decisions.
Agree	Agree	Strongly agree	Strongly disagree	Strongly disagree
Agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Agree	Agree	Agree	Agree	Agree
Agree	Agree	Agree	Agree	Agree
Agree	Agree	Strongly agree	Strongly agree	Strongly agree
Agree	Agree	Agree	Strongly agree	Strongly agree
Agree	Agree	Agree	Disagree	Agree
No opinion	Strongly agree	Strongly agree	Agree	Agree
Strongly agree	Agree	No opinion	Agree	Agree
Agree	Agree	Strongly agree	Strongly agree	Disagree
Strongly agree	Agree	Agree	Strongly agree	Strongly agree
Agree	Strongly agree	Strongly agree	Strongly agree	Agree
No opinion	Strongly agree	Agree	Agree	Strongly agree
Agree	Strongly agree	Strongly agree	Strongly agree	Agree
Agree	Strongly agree	Strongly agree	Agree	Agree
Agree	Agree	Agree	Disagree	Agree
Agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Agree	Agree	No opinion	No opinion	Disagree
Agree	Strongly agree	Agree	Strongly agree	Disagree
Agree	Agree	Agree	Disagree	Strongly agree
No opinion	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Agree	Agree	Disagree	Agree	Agree
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Agree	Strongly agree	Strongly agree	Agree	Agree
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Agree	Strongly agree	No opinion	Agree	Agree
Agree	Agree	Disagree	Agree	Disagree
Strongly agree	Agree	No opinion	Strongly agree	Strongly agree
Agree	Agree	Agree	Disagree	Disagree
Agree	Agree	Agree	Disagree	Disagree

Beer Game Survey Results

After Information Technology was implemented I expected to see a performance improvement in the teams that had IT.	After Information Technology was implemented I changed how I made my ordering decisions.
Strongly agree	Strongly agree
Agree	Strongly agree
Agree	Agree
Agree	No opinion
Strongly agree	Strongly agree
Agree	Strongly agree
Strongly agree	No opinion
Strongly agree	Agree
Strongly agree	No opinion
Agree	Did not have IT
Agree	Agree
Strongly agree	Did not have IT
Strongly agree	Disagree
Strongly agree	Strongly agree
Strongly agree	Did not have IT
Agree	Did not have IT
Agree	Disagree
Agree	Did not have IT
Agree	Strongly disagree
Agree	No opinion
Strongly agree	Agree
Agree	Agree
Strongly agree	Strongly agree
Strongly agree	Strongly agree
Agree	Disagree
Agree	Agree
Strongly agree	Strongly agree
No opinion	No opinion
Strongly agree	Strongly agree
Agree	Strongly agree
Agree	Did not have IT