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INVESTIGATING TWO CONTRADICTORY VIEWS OF FORMATIVE MEASUREMENT IN INFORMATION SYSTEMS RESEARCH

By:
Gimun Kim
College of Business Administration
Konyang University
Nonsan
KOREA
gmkim@konyang.ac.kr

Varun Grover
Department of Management
Clemson University
101 Sirrine Hall
Clemson, SC 29634-1305
vgrover@clemson.edu

Bongsik Shin
Information and Decision Systems
San Diego State University
San Diego, CA 92182
U.S.A.
bshin@mail.sdsu.edu

Appendix A

Description of Research Method

Survey Design and Validation

Initially candidate survey items were compiled from existing literature and presented on a seven-point Likert scale. Then the survey items were filtered through several iterations of pretests. First, these items were examined by a focus group. This group consisted of three colleagues who are knowledgeable about the research subject as well as the measurement theory, and five senior IT managers with practical knowledge in IT infrastructure. This group of people met three times to examine the content validity of the research instrument during the two week period. Each time they met, the participants gradually reduced the items through intensive discussions. Second, the revised questionnaire was pretested with 20 senior IT managers. Each participant was asked to complete the questionnaire and, during the debriefing period, to offer any suggestions for improvement. Again, from this process, four survey items were dropped and several minor refinements on the remaining items were made. Third, the revised questionnaires were mailed to another group of 20 senior managers for a pilot test. Follow-up interviews with 20 respondents did not indicate any need for substantive changes to the questionnaire. This seemed to indicate strong preliminary evidence of construct validity. Survey items used for this research and their sources are listed next.

Survey Constructs, Measures, and Sources

IT Performance (Source: Powell and Dent-Micallef 1997)
1. New information technologies have dramatically increased our productivity.
2. New information technologies have improved our competitive position.
3. New information technologies have dramatically increased our sales.
4. New information technologies have dramatically increased our profitability.

Financial Performance (Source: Powell and Dent-Micallef 1997)
1. Over the past 3 years, our financial performance has been outstanding.
2. Over the past 3 years, our financial performance has exceeded our competitors'.
3. Over the past 3 years, our sales growth has been outstanding.
4. Over the past 3 years, we have been more profitable than our competitors.

Business Process Performance (Source: Davenport and Short 1990)
1. Our company' is better than competitors in connecting (e.g., communication and information sharing) parties within a business process.
2. Our company' is better than competitors in reducing cost and human labor within a business process.
3. Our company' is better than competitors in bringing complex analytical methods to bear on a business process.
4. Our company' is better than competitors in bringing detailed information into a business process.

IT Planning (Sources: Boynton et al. 1994; Karimi et al. 2001; Sabherwal 1999; Segars and Grover 1999)
1. We continuously examine the innovative opportunities for the strategic use of IT.
2. We enforce adequate plans for the introduction and utilization of IT.
3. We perform IT planning processes in systematic and formalized ways.
4. We frequently adjust IT plans to better adapt to changing conditions.

IT Coordination (Souces: Boynton et al. 1994; DeSanctis and Jackson 1994; Karimi et al. 2001; Li et al. 2003)
1. In our organization, IS and line people meet frequently to discuss important issues both formally and informally.
2. In our organization, IS people and line people from various departments frequently attend cross-functional meetings.
3. In our organization, IS and line people coordinate their efforts harmoniously.
4. In our organization, information is widely shared between IS and line people so that those who make decisions or perform jobs have access to all available know-how.

Relational Knowledge (Sources: Boar 1996; Broadbent et al. 1996; Byrd and Turner 2000; Duncan 1995; Jiang et al. 2003; Lee et al. 1995; Nelson 1991; Tesch et al. 2003)
1. Our IT personnel are very capable in terms of planning, organizing, and leading projects.
2. Our IT personnel are very capable in terms of planning and executing work in a collective environment.
3. Our IT personnel are very capable in terms of teaching others.
4. Our IT personnel work closely with customers and maintain productive user/client relationships.

IT Infrastructure Flexibility (Derived sources: Broadbent et al. 1996; Byrd and Turner 2000; Davenport and Linder 1994; Duncan 1995; Gibson 1993)
Our company' IT infrastructure is better than competitors' in
1. linking to any other components inside and outside the organizational environment.
2. sharing any type of information across any technology components.
3. adding, modifying, and removing the modules of business applications with little or no widespread effects on the applications collectively.
4. retrieving and flowing data between authorized personnel in an organization or between organizations regardless of the underlying database standards utilized.

Data Collection

Data were collected through a field survey. The firms in the DART System (an electronic system for public announcement) supervised by the Financial Supervisory Service of the Korean government was adopted as a sampling frame. This system includes a mailing list of 1,835 firms, comprising 629 firms listed on the Korea Stock Exchange, 857 firms listed on the KOSDAK, and 349 unlisted firms. From this sampling frame,

a random sample of 800 firms was chosen. Using a key informant approach (Bagozzi et al. 1991), the survey was targeted at senior IS executives such as CIOs, directors, and senior managers of the IT department, as they are most likely to be informed about strategic issues pertaining to IT decisions and practices in their organizations.

Senior IT executives were contacted via various channels (e.g., e-mail, phone) to solicit participation in this study. A total of 655 executives (81.9%) agreed to participate, indicating that their organizations have a formal and sizable IT function. Four weeks after the initial mailing, a follow-up survey was sent to those individuals who did not return a completed questionnaire. Finally, a total of 251 responses were received. Of those, eight responses were discarded due to incompletion. With the final sample consisting of 243 responses (103 firms listed on the Korea Stock Exchange, 85 firms listed on the KOSDAK, and 55 unlisted firms), the actual response rate was 37.1 percent. To check for non-response bias, respondents were compared with those in the mailing list in terms of organization size and industry. The results of the chi-square analyses revealed no systematic bias. Chi-square tests comparing early and late respondents on organization size and industry also revealed no significant response bias.

A significant portion (47.7 percent) of the respondents were either chief information officers or vice presidents of the IS department. The job titles of the other respondents (senior vice president, vice president of technology, assistant vice president, director of information technology) also indicate that they were senior IS executives. All the respondents indicated that they were within two levels from the highest position in their organizational hierarchy.

Appendix B

Correlation Matrices (for *IT Infrastructure Flexibility*)

IT Infrastructure Flexibility (x1–x4), Financial Performance (y1–y4), and IT Performance (y5–y8)											
Input	**y1**	**y2**	**y3**	**y4**	**y5**	**y6**	**y7**	**y8**	**x1**	**x2**	**x3**	**x4**
y1	1.00											
y2	0.82	1.00										
y3	0.68	0.81	1.00									
y4	0.75	0.86	0.83	1.00								
y5	0.28	0.29	0.31	0.30	1.00							
y6	0.33	0.37	0.35	0.36	0.74	1.00						
y7	0.27	0.29	0.30	0.30	0.58	0.68	1.00					
y8	0.30	0.33	0.35	0.34	0.72	0.77	0.76	1.00				
x1	0.19	0.18	0.10	0.15	0.40	0.37	0.23	0.34	1.00			
x2	0.18	0.17	0.12	0.17	0.31	0.27	0.27	0.30	0.24	1.00		
x3	0.24	0.25	0.19	0.24	0.37	0.36	0.33	0.35	0.36	0.44	1.00	
x4	0.15	0.15	0.14	0.13	0.26	0.33	0.29	0.28	0.23	0.38	0.36	1.00

IT Infrastructure Flexibility (x1–x4), Financial Performance (y1–y4), and Process Performance (y5–y8)												
Input	**y1**	**y2**	**y3**	**y4**	**y5**	**y6**	**y7**	**y8**	**x1**	**x2**	**x3**	**x4**
y1	1.00											
y2	0.82	1.00										
y3	0.68	0.81	1.00									
y4	0.75	0.86	0.83	1.00								
y5	0.31	0.27	0.21	0.27	1.00							
y6	0.30	0.29	0.24	0.37	0.70	1.00						
y7	0.30	0.29	0.23	0.31	0.61	0.71	1.00					
y8	0.24	0.24	0.20	0.25	0.61	0.67	0.69	1.00				
x1	0.19	0.18	0.10	0.15	0.31	0.23	0.25	0.31	1.00			
x2	0.18	0.17	0.12	0.17	0.21	0.17	0.15	0.29	0.24	1.00		
x3	0.24	0.25	0.19	0.24	0.29	0.31	0.33	0.38	0.36	0.44	1.00	
x4	0.15	0.15	0.14	0.13	0.18	0.21	0.16	0.25	0.23	0.38	0.36	1.00

Appendix C

Correlation Matrices (for *Relational Knowledge*)

Relational Knowledge (x1–x4), Financial Performance (y1–y4), and IT Performance (y5–y8)												
Input	**y1**	**y2**	**y3**	**y4**	**y5**	**y6**	**y7**	**y8**	**x1**	**x2**	**x3**	**x4**
y1	1.00											
y2	0.82	1.00										
y3	0.68	0.81	1.00									
y4	0.75	0.86	0.83	1.00								
y5	0.28	0.29	0.31	0.30	1.00							
y6	0.33	0.37	0.35	0.36	0.74	1.00						
y7	0.27	0.29	0.30	0.30	0.58	0.68	1.00					
y8	0.30	0.33	0.35	0.34	0.72	0.77	0.76	1.00				
x1	0.16	0.13	0.05	0.12	0.33	0.37	0.33	0.36	1.00			
x2	0.19	0.16	0.08	0.16	0.39	0.40	0.34	0.37	0.83	1.00		
x3	0.17	0.14	0.04	0.13	0.37	0.38	0.32	0.36	0.77	0.83	1.00	
x4	0.17	0.15	0.06	0.14	0.44	0.44	0.38	0.43	0.79	0.84	0.88	1.00

Input	y1	y2	y3	y4	y5	y6	y7	y8	x1	x2	x3	x4
Relational Knowledge (x1–x4), IT Planning (y1–y4), and IT Coordination (y5–y8)												
y1	1.00											
y2	0.73	1.00										
y3	0.67	0.82	1.00									
y4	0.60	0.71	0.68	1.00								
y5	0.46	0.47	0.48	0.47	1.00							
y6	0.41	0.43	0.45	0.45	0.62	1.00						
y7	0.52	0.53	0.52	0.45	0.72	0.69	1.00					
y8	0.43	0.47	0.45	0.42	0.62	0.62	0.69	1.00				
x1	0.52	0.58	0.57	0.48	0.31	0.35	0.45	0.36	1.00			
x2	0.57	0.57	0.56	0.47	0.30	0.36	0.47	0.36	0.83	1.00		
x3	0.51	0.48	0.47	0.40	0.32	0.36	0.46	0.32	0.77	0.83	1.00	
x4	0.59	0.55	0.54	0.46	0.35	0.35	0.48	0.35	0.79	0.84	0.88	1.00