20th ICCRTS

Title of Paper: An Empirical Analysis on Cognitive Conceptual Reference Model
for Command and Control

Assigned Number: 060

Topics: Concepts, Theory and Policy; Organizational Concepts and Approach;
Experimentation, Metrics and Analyses

Authors: Byungjin Park(BJ), Ph.D.

SoYeon Park, Ph.D.(Candidate)

Sunhyung Kim, Ph.D.

Point of Contact:

Name: Byungjin Park(BJ), Ph.D.

Organization: Incorporated Association Defense Network Centric Warfare Forum,
Republic of Korea.

Address: Jonghap Hall 911, 206 Worldcup-Ro, Yeongton-Gu, Suwon, Gyeonggi-
Do, Republic of Korea, 443-749

Telephone: 82-10-2065-4733

E-Mail: ncw0431@naver.com

An Empirical Analysis on Cognitive Conceptual Reference Model for Command and Control

INTRODUCTION

War has been for better or worse served as dependent variable throughout human civilization. The term 'Command and Control (C2)' is coined and sprung from the necessity of having to give an order and manage the troops in every combat situation. The Command and Control is without a doubt invariable constant that determines the outcome of otherwise center of gravity on the enemy.

In an age when a rapid convergence of various subjects and information breeds uncertainties upon complexity; thus a call for more effective and efficient solution to answer the current situation is imminent. Amongst the answers lies the element of agility. The task for the coming days as a scholar in this field would be successfully coming up with ways to define and integrate the factor of agility into the existing concept of Command and Control.

Previous studies in this field of C2 varied in its focus and vastness; however the lack of defined modeling and empirical analysis was evident. Especially regarding the effectiveness of C2 in conjunction with the element of agility. In addition, the recent study of C2 based on NCW (Network Centric Warfare) has to incorporate the factors such as amazing development of weapon system, information sharing as well as the critical Peer-to-Peer decision making process.

Hence, the need for a comprehensive research on how the element of agility plays in the effectiveness between the upper-level decision makers and whether this affects the overall outcome of the C2, became imminent.

PRIOR QUANTITATIVE RESEARCH

Thus, the following thesis seek to provide the following: First, provide a cognitive conceptual reference model by distinguishing each process of C2 based on the element of agility. In order to explain whether such model could serve as an alternative solution to ever more uncertain environment as well as to come up with various factors that affect the Command and Control.

Second, by applying the given model to the perceived acceptance scale at the individual level by carrying out a sample survey in furtherance of providing implicating factors, and affects the C2 in general.

EMPRICAL ANALYSIS

Methodology for this research are as follows: First, define the term, "Agility"; use the inference process and concept of MECE as basis for deducting the factor of agility in terms of use of military power. Second, define the term, "Command", and "Control", both in literary and based on the Network-Centric Warfare tenets. Then using preceding researches to analyze the changes in the concept of C2 - to deduct the fundamental function of C2. Third, analyzing the different models of C2, especially the procedural aspects to find the common process within the C2. Fourth, utilizing the four models deducted from the earlier analysis, introduce the "Structural Model for Examining the Effectiveness of Command and Control." Fifth, analyzing the perceived acceptance scale of individuals to identify the factors that directly and indirectly affects the C2 effectiveness by using the above structural model.

DETAIL OF SURVEY

The details of the individual survey are as follows: in total of 518 people who answered the survey, 317 (61.2%) were military personnel, 201 (38.8%) were civilians. 237 (45.8%) were in their 40s, and 421(81.3%) were male. Although the age and sex were skewed however given the question and scope of the research it was appropriate. Also, 355 (68.5%) responded as "middle-class" economically, and 296 (57.1%) had lived in Capital or the vicinity of Capital. In terms of level of education, those with Masters of Arts degree made up 254, 49% making the demographic above average in education level.

Due to the nature of the survey and the questions asked, out of 317 military personnel, Army made up 147 (28.4%) and 101 (31.5%) were a lieutenant colonel. As for civilians, 58 (11.2%) held the position of "section-chief."

INSIGHT OF EMPRICAL ANALYSIS

To briefly summarize the findings: out of four factors that affect the effectiveness of C2; agility efficient coefficient (EC) were measured highest at 0.5702; common procedural EC at 0.2933; collaborative interaction at 0.2726 and unique function of C2 at – 0.1372.

These results are broken down to these interpretations: First, the agility factor had the biggest ramification in terms of affecting the C2. Secondly, sharing and bettering of the common procedures in C2 should be used in educating and training in order to improve the collaborative interaction as well. Third, direct and indirect effectiveness of collaborative interaction has proven itself with EC at 0.2726 and another imperative factor in C2.

However, the unique function of command and control of lacks the effectiveness in both direct/indirect way to the betterment of the acceptance of C2. What this implies is that, the commander's duties of; situation awareness, establishment of

intention, sense of responsibility, delegation of authority, establishment of rules, set up limitation, control, evaluation, education and training is run idly. In particular, at independent level of evaluation; majority of those surveyed and interviewed answered that they had little awareness in terms of situational awareness, intention, education and training.

Hence, the difficulty in executing the plans and sharing the information on the situational analysis. In addition, commented that they had not received, a lack of, training/education on the unique function of command and control to carry out effective command and control. Thus, this research suggests that in order to improve the effectiveness of carrying out command and control, one would need comprehensive education on this matter.

RESULTS AND RECOMMDATION

Thus, the conclusion of this research are as follows: First, those who have answered the survey are well aware of the need of 'C2' while affected by natural disasters and other crises. Second, in order to effectively achieve one's goals one could be trained and educated. On the four basic tenets that have been suggested by the 'Concept Reference Model' derived in this thesis along with 32 specified attributes that could be applied to any practical situation. Third, this paper lends theoretical background to assess and evaluate during training in order to enhance C2 capabilities. Fourth, the findings of this research used as a tool to further development of the theoretical and practical betterment in the subject of C2 studies both in and outside the country. Fifth, this paper could serve as a valuable asset (blueprint) for the currently ongoing development of software and design of the C2 and as supplementary information for practical application in due time. Sixth, this paper expanded the scope of research from the previous ones.

From the limited perspective to NC-based environment, approaching it by AHP method, to include verifiable way to prove the correlation of multi-criteria decision analysis (known as SEM methods). Thus, pave the way for future improvements on the subject.

On the note, the effort in reducing the errors in the sample data should be continued vigorously. As well as a hope that there will be many researches following the similar line of questioning for betterment hence put into more practical applicable use.

BIBLIOGRAPHY

[1] Anderson, James C., and David W. Gerbing. "Structural Equation Modeling in Practice: A Review and Recommended Two-step Approach." *Psychological Bulletin* 103, no. 3 (1988): 411-23.

[2] Bagozzi, Richard P., and Youjae Yi. "On the Evaluation of Structural Equation Models." *Journal of the Academy of Marketing Science* 16, no. 1 (1988): 74-94.

[3] Campbell, Donald T., and Donald W. Fiske. "Convergent and Discriminant Validation by the Multitrait-multimethod Matrix." *Psychological Bulletin* 56, no. 2: 81-1051959.

[4] United States. Department of Defense. DoD. *Network-Centric Warfare: Creating a Decisive Warfighting Advantage*. By Donald H. Rumsfeld. Washington DC: DoD, 2003.

[5] United States. Department of Defense. *Net-Centric Environment Joint Functional Concept Version 1.0*. Washington D.C: 1~19, 21~33, D1-7. 2005.

[6] United States. Department of Defense. The Chief Information Officer. *Department of Defense Information Enterprise Architecture Version 2.0: Volume II – IEA Description*. Washington D.C.: 1-10. 2012.

[7] Garstka, John. "Network Centric Operations Conceptual Framework Version 1.0." Evidence Based Research Inc, VA: 14-52, Nov. 2003.

[8] United States. Department of Defense. Joint Chiefs of Staff. *The Global Information Grid (GIG) 2.0 Concept of Operations Version 1.1*. By Nancy E. Brown. Washington DC: DoD: 1-13, 2009.

[9] United States. Department of Defense. Joint Chiefs of Staff, Director for Strategic Plans and Policy J5: Strategy Division. *Joint Vision 2020*. Washington DC: US Government Printing Office: 15-36. 2000.

[10] United States. Department of Defense. Joint Staff. N*ET-CENTRIC OPERATIONAL ENVIRONMENT JOINT INTEGRATING CONCEPT Version 1.0*. Washington DC: US Government Printing Office: 1-22. 2005.

[11] CRS Report for Congress. *Network Centric Operations: Background and Oversight Issues for Congress*. By Clay Wilson. Congressional Research Service: 2-6, 15. 2007.

[12] United States. Committee on Armed Services House of Representatives. Subcommittee on Intelligence, Emerging Threats and Capabilities. *Information Technology and Cyber Operations: Modernization and Policy Issues to Support the Future Force*. By Mac Thornberry and Jeff Miller. 113th Congress. Washington DC: US Government Printing Office: 1-26. 2013.

[13] United States. Department of Defense. Joint Chiefs of Staff. *Joint Publication 3-0*. By M. G. Mullen. Joint Operations. Washington DC, DoD: I 1- V 5. 2011.

[14] United Kingdom. Ministry of Defence. *Joint Operations Execution: Joint Warefare Publication 3-00 Second Edition*. Swindon: Joint Doctrine & Concepts Centre:11-1A6. 2004.

[15] United States. Department of Defense. Joint Chiefs of Staff. *Joint Communication Systems*. By M. G. Mullen. Joint Publication 6-0. Washington DC: I 3- I 17. 2010.

[16] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Interoperability and Supportability of Information Technology and National Security Systems*. CJCSI 6212.01E. Washington DC:1-4, A1-A3. 2008.

[17] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Net Ready Key Performance Parameter (NR-KPP)*. By William E. Gortney.CJCSI 6212.01F. Washington DC: A1-A8. 2012.

[18] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Interoperability and Supportability of National Security Systems, and Information Technology Systems*. CJCSI 6212.01B. Washington DC:1-8, B1-B15. 2000.

[19] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Interoperability and Supportability of Information Technology and National Security Systems.* CJCSI 62

12.01C.Washington DC: 1-6, A1-A22. 2003.

[20] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Interoperability and Supportability of Information Technology and National Security Systems.*CJCSI 621 2.01D. Washington DC: 1-6, A1-A6. 2007.

[21] United States. Department of Defense. Joint Chiefs of Staff. *Department of Defense Di ctionary of Military and Associated Terms*. Joint Publication 1-02. Washington DC: 158, 210. 2013.

[22] United States. Department of Defense. Joint Chiefs of Staff. *Joint Doctrine for Military Operations Other Than War*. Joint Publication 3-07. Washington DC: I1-I7, 1995.

[23] Lawson, J. "Command Control as a Process." *IEEE Control Systems Magazine* 1, no. 1 : 5-6. 1981.

[24] Crumley, Lloyd M., and Mitchell B. Sherman. *Review of Command and Control Model s and Theory*. Ft. Belvoir: Defense Technical Information Center: 18-25. 1990.

[25] United States. Department of Defense. Joint Chiefs of Staff. *Doctrine for the Armed Fo rces of the United States*. Joint Publication 1. Washington DC: IX- I 2. 2013.

[26] Department of Defense. *National Defense Strategy: 2008*. By Robert M. Gates. Washi ngton DC:17-18. 2008.

[27] Department of Defense. Joint Chiefs of Staff. *Manual for the Operation of the Joint Ca pabilities Integration and Development System*. Washington DC: Joint Capabilities Integ ration Development System (JCIDS): A4-A8. 2012.

[28] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Joint Capabiliti es Integration and Development System*. CJCSI 3170.01H. Washington DC: A1-A13. 20 12.

[29] United States. Department of Defense. *Quadrennial Defense Review Report*. By Donal d H. Rumsfeld and Henry H. Shelton. Washington DC: 11-16. 2001.

[30] United States. Department of Defense. *Quadrennial Defense Review Report*. By Donal

d H. Rumsfeld and Peter Pace. Washington DC: vi-vii, 4-7. 2006.

[31] Department of Defense. The Assistant Secretary for Public Affairs. *Facing the Future: Meeting the Threats and Challenges of the 21st Century*. By Donald H. Rumsfeld. Washington DC: 11-17. 2005.

[32] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Universal Joint Task List (UJTL) Policy and Guidance for the Armed Forces of the United States*. CJCSI 3500.02A. Washington DC: A1-C6. 2011.

[33] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Universal Joint Task Manual*. CJCSI 3500.04F. Washington DC: A1-C4. 2011.

[34] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Universal Joint Task List (UJTL)*. CJCSI 3500.04C. Washington DC: A1-A3. 2002.

[35] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Universal Joint Task List (UJTL)*. CJCSI 3500.04E. Washington DC: A1-A5. 2008.

[36] Command and Control Research Program (CCRP). The Assistant Secretary of Defense. *Measuring Agility*. By David S. Alberts: 7-10. 2011.

[37] DoD, Strategic Deterrence Joint Operating Concept, pp. 63~75, Feb. 2004.

[38] United States. Department of Defense. Joint Chiefs of Staff. *Multinational Operations*. Joint Publication 3-16. Washington DC: I1-I9. 2013.

[39] Stenbit, John P. *Code of Best Practice Experimentation*. By David S. Alberts and Richard E. Hayes. Information Age Transformation Series. Washington DC: DoD Command and Control Research Program: 10-17. 2002

[40] DoD, Joint Command and Control Functional Concept, pp. 23~26, Feb. 2004.

[41] *Army Leadership: Competent, Confident and Agile*. FM 6-22 (FM 22-100). Washington, DC: HQ. Dept. of the Army: 1-1-2-4. 2006.

[42] Alberts, David S., and Richard E. Hayes. *Understanding Command and Control*. Washington DC: CCRP Publications, 2006. 64-66, 124-50. 2006.

[43] Garstka, John, and David Alberts. *Network Centric Operations Conceptual Framework*. Vienna, VA: Evidence Based Research: 14-52. 2004.

[44] Lemon, Alan G., and Michael B. Cowen. "A Task-Based Design Guide for Command and Control." 2012 Command and Control Research and Technology Symposium, June 2012.

[45] Attafar, Ali, Mahsa Ghandehari, and Golnaz Momemi. "Study of Required Organizational Base for Implementation of Agility Strategy in Organizations." Interdisciplinary Journal of Contemporary Research in Business 3, no. 11: 141. 2012

[46] Kelly, Allan, and Software Strategy Ltd. "Objective Agility: What Does It Take to Be an Agile Company?" Business Analysis Conference Europe 2010, September 2010.

[47] Andreas, Tolk, Dr, and James L. Boulet. "Lessons Learned on NATO Experiments on C2/M&S Interoperability." Reading, Spring Simulation Interoperability Workshop, Virginia, Norfolk, March 2007.

[48] Andriole, Stephen J., and Stanley M. Halpin. Information Technology for Command and Control: Methods and Tools for Systems Development and Evaluation. New York: IEEE Press, 1991.

[49] Medinilla, Ángel. Agile Management: Leadership in an Agile Environment. Berlin: Springer, 2012.

[50] Athans, M. "Command and Control (C2) Theory: A Challenge to Control Science." IEEE Transactions on Automatic Control 32, no. 4: 286-93. 1987

[51] Becker, Bob. Strategic Agility: The Ultimate Competitive Advantage. Development Advantage Group, LLC, 2007.

[52] Sherehiy, Bohdana, Waldemar Karwowski, and John K. Layer. "A Review of Enterprise Agility: Concepts, Frameworks, and Attributes." International Journal of Industrial Ergonomics 37, no. 5: 445-60. 2007.

[53] Undeger, Cagatay, Askin Ercetin, and Ziya Ipekkan. "Modeling Command & Control

Centers." Reading, NATO & OTAN: C3I and Modeling and Simulation Interoperability, Turkey, Antalya: 9-10. October 2003.

[54] Adding Agility to Execution: Strategic Planning in the Digital Age. Capgemini Consulting, 2012. Can be retrieved from http://www.capgemini.com/resources/

[55] Command Five Pty Ltd. "Command and Control in the Fifth Domain." February 2012, 1-29. Can be retrieved from http://www.commandfive.com/papers/C5_APT_C2InTheFifthDomain.pdf.

[56] Dick, David, and John D. CComerford. "C2 Policy Evolution at the U.S. Department of Defense: WWMCCS to a Unified Military Command Capability." Speech, 10th International Command and Control Research and Technology Symposium, The Future of C2, VA, Arlington, 2003.

[57] Alberts, David S. Network Centric Warfare, Understanding Information Age Warfare and Power to the Edge. Washington DC: Command and Control Research Program (CCRP): 48-54. 2000.

[58] Alberts, David S., and Richard E. Hayes. Power to the Edge: Command and Control in the Information Age. Washington DC: CCRP Publication Series, 2003.

[59] Alberts, David S., and Richard E. Hayes. Understanding Command and Control. Washington, D.C.: CCRP Publications, 2006.

[60] Alberts, David S., Reiner K. Huber, and James Moffat. NATO NEC C2 Maturity Model. Washington: DoD Command and Control Research Program, 2010.

[61] Alberts, David S. The Agility Advantage: A Survival Guide for Complex Enterprises and Endeavors. Washington DC: DoD Command and Control Research Program, 2011.

[62] Alberts, David S., and Marco Manso. ""Operationalizing C2 Agility": Operationalizing and Improving C2 Agility: Lessons from Experimentation." 17th ICCRTS, VA, Alexandria, June 2012.

[63] Vogel, David. Achieving Strategic Agility in Hypercompetitive Environments. Califor

nia Management Review, 2012.

[64] Canada. Canadian Health Services Research Foundation. Impact of the Manager's Span of Control on Leadership and Performance. By Diane Doran, RN and Amy S. McCutcheon, RN. Ontario: Canadian Health Services Research Foundation, 2004.

[65] Cathcart, Deb, Susan Jeska, Joan Karnas, Sue E. Miller, Judy Pechacek, and Lolita Rheault. "Span of Control Matters." JONA: The Journal of Nursing Administration 34, no. 9: 395-99. 2004.

[66] Department of Defense. CCRP. Network Centric Warfare: Department of Defense Report to Congress. Washington DC: DoD Command and Control Research Program, 2001.

[67] The Economist. "Organizational Agility: How Business Can Survive and Thrive in Turbulent times." A Report from the Economist Intelligence Unit, 2009.

[68] Garstka, John. "Network Centric Operations Conceptual Framework Version 1.0." Evidence Based Research Inc, Vienna, VA, November 2003.

[69] Cedergårdh, Erik, and Olle Wennström. The Elements of Command & Control: The General Principles of Command & Control in Fire and Rescue Operations. Karlstad, Sweden: Swedish Rescue Services Agency, 2002.

[70] Galbraith, Jay R. "Organization Design: An Information Processing View." Interfaces 4, no. 3: 28-36. 1974.

[71] George Mason University. "Performance Prediction of a Network-Centric Warfare System." System Architectures Laboratory, 2000.

[72] George Mason University C41 Center (GMU-C4I). "Technical Summary for Joint Battle Management Language Phase 1 Project." Modeling and Simulation Steering Committee and Managed by the US Army Topographic Engineering Center (TEC) of the Engineer Research and Development Center (ERDC), Rev1-19. 2007.

[73] Halbert, Germaine E., and Daniel W. Stockton. Adaptive Architecture for Command and Control (A2C2) Experiment 11 Determining an Effective ISR Management Structure

at the Operational Level of Conflict. Monterey, CA: Naval Postgraduate School, 2008.

[74] Graicunas, V. A. "GULICK, LUTHER, and L. URWICK (Eds.). Papers on the Science of Administration. Pp. Vii, 195. New York: Institute of Public Administration, 1937." The ANNALS of the American Academy of Political and Social Science 197, no. 1:183-87. 1938

[75] Parnell, G. S., Chapter 19, Value-Focused Thinking Using Multiple Objective Decision Analysis, Methods for Conducting Military Operational Analysis: Best Practices in Use Throughout the Department of Defense, Military Operations Research Society, Editors Andrew Loerch and Larry Rainey, 2007.

[76] Walker, Guy H., Neville A. Stanton, Paul M. Salmon, and Daniel P. Jenkins. "An Evolutionary Approach to Network Enabled Capability." International Journal of Industrial Ergonomics 39, no. 2: 303-12. 2009.

[77] Simon, Herbert A., and Allen Newell. "Human Problem Solving: The State of the Theory in 1970." American Psychologist 26, no. 2: 145-59. 1971.

[78] Baratta, James N. Network-Centric Warfare and Information Technology: The Stock Market as a Historical Model. NPS, 2000.

[79] Winnefeld, James A., and Dana J. Johnson. Command and Control of Joint Air Operations: Some Lessons Learned from Four Case Studies of an Enduring Issue. Santa Monica, CA: Rand, 1991.

[80] Moffat, James. Adapting Modeling & Simulation for Network Enabled Operations. Washington, DC: DoD Command and Control Research Program, 2010.

[81] Martin, James N. Systems Engineering Guidebook: A Process for Developing Systems and Products. Boca Raton, Fla: CRC Press, 1997.

[82] Freeman, Jared, PhD, Shawn A. Weil, PhD, and Kathleen P. Hess, PhD. Measuring, Monitoring, and Managing Knowledge in Command and Control Organizations. RTO-MP-HFM-136. NATO, 2006.

[83] Cooley, Jeffrey G., and Jennifer A. McKneely. "Command and Control Systems Engineering: Integrating Rapid Prototyping and Cognitive Engineering." Johns Hopkins APL Technical Digest 31, no. 1: 2012.

[84] Ross, Jeanne W., Peter Weill, and David Robertson. Enterprise Architecture as Strategy: Creating a Foundation for Business Execution. Boston, MA: Harvard Business School Press, 2006.

[85] Liu, Jianying, and Xiaolong Li. "Developing a Generic Command and Control Model", Department of Scientific Research Academy of Armored Force Engineering Beijing, China. 2010

[86] Lawson, J. "Command Control as a Process." IEEE Control Systems Magazine 1, no. 1: 5-11. 1981.

[87] Campbell, John P., David A. Bownas, Norman G. Peterson, and Marvin D. Dunnette. The Measurement of Organizational Effectiveness: A Review of Relevant Research and Opinion. Ft. Belvoir: Defense Technical Information Center: 210-16. 1974.

[88] Carreno, Jose, George Galdorisi, Stephanie Hszieh, and Antonio Siordia. Rethinking Command and Control. Ft. Belvoir: Defense Technical Information Center, 2009.

[89] Hamilton, J. A. "A Conceptual Model for Interoperable Command and Control Acquisition." The Journal of Defense Modeling and Simulation: Applications, Methodology, Technology 3, no. 2: 125-38. 2006.

[90] Green, John M. "C2 Assessment Tools and Metrics: Towards a Theory of Measures of Effectiveness." Naval Postgraduate School, 2001.

[91] McCann, Joseph, John Selsky, and James Lee. "Building Agility, Resilience and Performance in Turbulent Environments." People and Strategy 32, no. 3: 2009.

[92] Meier, Kenneth J., and John Bohte. "Span of Control and Public Organizations: Implementing Luther Gulick's Research Design." Public Administration Review 63, no. 1: 61-70. 2003.

15

[93] Hafshajani, Kiamars, Mohammad Movahhedi, and Mohammad Mehrizi. "Analysis of Organizational Agility in Auto Industry & Identifying Improvement Strategies Using Quality Function Deployment." International Journal of Economics and Management Sciences 1, no. 7: 8-18. 2012.

[94] Department of Numerical Analysis and Computer Science. A Generic Model of Management and Command and Control. By Klas Wallenius. Royal Institute of Technology. Sweden: Parallel and Scientific Computing Institute (PSCI) and SaabTech Systems AB, 2002.

[95] Nyamekye, Kofi. "Collaboration, Shared Awareness, and Decision Making; Modeling and Simulation; Concepts, Theory, and Policy." 18th ICCRTS: 7-17. 2013.

[96] Crumley, Lloyd M., and Mitchell B. Sherman. Review of Command and Control Models and Theory. Ft. Belvoir: Defense Technical Information Center, 1990.

[97] United States. Committee on Armed Services House of Representatives. Subcommittee on Oversight & Investigation. Agency Stovepipe vs Strategic Agility: Lessons We Need to Learn from Provincial Reconstruction Teams in Iraq and Afghanistan. By Lorry M. Fenner and Suzanne McKenna. Washington DC: US Government Printing Office, 2008.

[98] London Business School, "Achieving Strategic Agility: Staying one step ahead Strategy", can be retrieved from http://www.academiccourses.com/Achieving-Strategic-Agility/UK/London-Business-School/

[99] Santala, Maarit. "Strategic Agility in a Small Knowledge Intensive Business Services Company: Case Swot Consulting." 2009.

[100] Glinska, Malgorzata, Sean D. Carr, and Amy Halliday. Workforce Agility: An Executive Briefing. The University of Virginia's Darden School of Business, BATTEN Institute. 2012.

[101] Manso, Marco. "N2C2M2 Validation Using AbELICIT: Design and Analysis of ELICIT Runs Using Software Agents." 17th ICCRTS: Operationalizing C2 Agility, 2012.

[102] Chrissis, Mary Beth., Mike Konrad, and Sandy Shrum. CMMI: Guidelines for Process Integration and Product Improvement. Boston: Addison-Wesley, 2003.

[103] Roeser, Matthias, and Stefan Pechardscheck. "Increased Agility through Selective Sourcing Strategies." BearingPoint Switzerland AG, 2013.

[104] Downs, Michael S. Developing Integrated Decision Support Systems from Mathematical Models. Monterey, CA: Naval Postgraduate School: 15-29. 1995..

[105] Joze, M.,Fras, M., and Cucej, Z., "New approach to the modeling of Command and Control Information Systems," Military Communications Conference, 2008. MILCOM 2008. IEEE: 1, 7, 16-19. 2008.

[106] Stanton, N. A., C. Baber, and G. H. Walker. "Developing of Generic Activities Model of Command and Control." Defence Technology Centre for Human Factors Integration (DTC-HFI), 2008.

[107] Stenbit, JP, Wells, L, Alberts, DS. NATO Code of Best Practice for C2 Assessment. In NATO Code of Best Practice for C2 Assessment. NATO C3A. Washington DC: DoD Command and Control Research Program; 2002.

[108] *Exploring New Command and Control Concepts and Capability: Final Report*. SAS-050. Prepared for NATO. Department of Defense Command and Control Research Program, 2006.

[109] Eggenhofer-Rehart, Petra, Julius Barath, Philip S.E. Farrell, Reiner K. Huber, James Moffat, Paul W. Phister, Jr., and Jens Roemer. *C2 Conceptual Reference Model Version 2.0: With Suggestions For Its Application In Conjunction With The Nato Nec C2 Maturity Model (N2C2M2)*. Department of Defense Command and Control Research Program, 2009.

[110] Netemeyer, RG, Johnston, MW, Burton, S. Analysis of role conflict and role ambiguity in a structural equations framework. Journal of Applied Psychology; 75(2):148-157. 1990.

[111] Sproles, N. Establishing measures of effectiveness for command and control a system s engineering perspective. Salisbury, S. Aust.: Defence Science and Technology Organis ation; 2001.

[112] Sproles, N. A systems approach to establishing effectiveness for command and contro l. University of South Australia. *Information Technology Division Electronics and Survei llance Research Laboratory*; 2002.

[113] Evans, ND. Business agility: strategies for gaining competitive advantage through mo bile business solutions. Upper Saddle River, NJ: Financial Times/Prentice Hall; 2002.

[114] Horney, N. Organizational Agility Process Audit. Organizational Agility Process Aud it. 2013.

[115] Carino, NJ, Lew, HS. THE MATURITY METHOD: FROM THEORY TO APPLICA TION. National Institute of Standards and Technology: 2001 Structures Congress & Exp osition. 2001.

[116] OrianaBandiera, Andrea Prat,RaffaellaSadun, Julie Wulf, "Span of Control or Span of Activity?", HBS, December 22, 2011.

[117] Shockley-Zalabak, P. Fundamentals of organizational communication: knowledge, se nsitivity, skills, and values. In Fundamentals of organizational communication: knowled ge, sensitivity, skills, and values. 6th Edition. Pearson Education Inc. New York: Allyn a nd Bacon: 69-72. 2006.

[118] Kocourek, Paul, Eric Spiegel, Paul Hyde, John Treat, and Martin Bollinger. "Beyond Command-and-Control: Managing the Diverse Corporation in Today's Turbulent Times. " Booz•Allen & Hamilton: 1-18. 2000.

[119] Soelberg, P. A CRITICAL REVIEW OF THEORIES OF PROBLEM SOLVING AN D DECISION BEHAVIOR. Massachusetts Institute of Technology (MIT), 1975. Boston MA: 8-23, 198-221. 1975.

[120] Doz, Yves. *Peter Drucker: A Forerunner of Strategic Agility as a Dynamic Capabilit*

y? 1st Global Peter Drucker Forum. Veinna: Wharton School Publishing, 2009.

[121] STIMSON. *A New US Defense Strategy for a New Era: Military Superiority, Agility, and Efficiency - A Summary of the Findings of the Defense Advisory Committee*. Washington DC: Peter G. Peterson Foundation, 2012.

[122] Cothier, Philippe H., and Alexander H. Levis. "Timeliness and Measures of Effectiveness in Command and Control." *IEEE Transactions on Systems, Man, and Cybernetics* 16, no. 6 (November/December 1986): 844-53.

[123] Premkumar, G., K. Ramamurthy, and Carol Stoak Saunders. "Information Processing View of Organizations: An Exploratory Examination of Fit in the Context of Interorganizational Relationships." *Journal of Management Information Systems* 22, no. 1 (July 01, 2005): 257-94.

[124] Sprague, Ralph H., Jr. "A Framework for the Development of Decision Support Systems." *MIS Quarterly* 4, no. 4 (December 01, 1980): 1-26.

[125] Kuusisto, Rauno. "Information Sharing Framework for Agile Command and Control in Complex Inter-domain Collaboration Environment." 17th ICCRTS: Operationalizing C2 Agility, Finnish Defense Forces Technical Research Centre (PVTT), 2012.

[126] Huber, Reiner K., James Moffat, and David S. Alberts. "Achieving Agile C2 by Adopting Higher Levels of C2 Maturity." Operationalizing C2 Agility: 17th International Command and Control Research and Technology Symposium, Institute of Technology of Intelligent Systems at Universität Der Bundeswehr München: 3-13, 24-26. 2012. =204동일

[127] Shafer, Richard A., Lee Dyer, Janine Kilty, Jeffrey Amos, and Jeff A. Erickson. *Crafting A Human Resource Strategy To Foster Organizational Agility: A Case Study*. Working paper no. #00-08. Ithaca, NY: Cornell University. Center for Advanced Human Resources Studies (CAHRS), 2000.

[128] Richard E. Hayes, "Command and Control Agility", The evidence Based Research. Inc, 2010.12. Hayes, Richard E., PhD. "Concepts, Theory and Policy; Organizational Conc

epts and Approaches; Experimentation, Metrics and Analyses." Empirical Agility: 19th International Command and Control Research and Technology Symposium, Virginia, June 2014.

[129] Hayes, Richard E., PhD. "Measuring Command and Control (C2) Effectiveness." MORS (Military Operations Research Society) Workshop: Joint Framework for Measuring C2 Effectiveness, Evidence Based Research, Inc, 2012.

[130] Deakin, Richard S. *Battlespace Technologies: Network-enabled Information Dominance*. Boston: Artech House, 2010.

[131] Erbacher, Robert F. "Extending Command and Control Infrastructures to Cyber Warfare Assets." In Proceedings: The International Conference on Systems, Man and Cybernetics, Waikoloa Hilton Village, Waikoloa, Hawaii, USA, October 10-12, 2005, 3331-337. Vol. 4. Piscataway, NJ: Institute of Electrical and Electronics Engineers, 2005.

[132] Wysocki, Robert K. *Effective Project Management: Traditional, Agile, Extreme*. 6th ed. Wiley & Sons Canada, Limited, John, 2013.

[133] Tripp, Robert S., John G. Drew, and Robert G. DeFee. Improving Air Force Command and Control through Enhanced Agile Combat Support Planning, Execution, Monitoring, and Control Processes. Santa Monica, CA: RAND, 201.

[134] Atkinson, Simon R., and James Moffat. *The Agile Organisation: From Informal Networks to Complex Effects and Agility*. Washington DC: CCRP Publications, 2005.

[135] Sproles, Noel. "The Difficult Problem of Establishing Measures of Effectiveness for Command and Control: A Systems Engineering Perspective." Systems Engineering 4, no. 2 (2001): 145-55.

[136] Hutchins, S. G., and W. G. Kemple. "Measures of Effectiveness under Different Command and Control Organizational Architectures." 1997 IEEE International Conference 5 (1997): 4342-347.

[137] Sweet, Ricki, Dennis Mensh, Pat Gandee, Ingabee Stone, and Kevin Briggs. The Mod

ular Command and Control Evaluation Structure (MCES): Applications of and Expansio
n to C3 Architectural Evaluation. Ft. Belvoir: Defense Technical Information Center, 19
86.

[138] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Joint Strategic Planning System (JSPS)*. CJCSI 3100.01B. Washington DC, 2008.

[139] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Joint Operatio n Planning and Execution System (JOPES) Volume I: Planning Policies and Procedures*. CJCSI 3122.01. Washington DC, 2001.

[140] Chairman of the Joint Chiefs of Staff Instruction. Joint Chiefs of Staff. *Joint Operatio n Planning and Execution System (JOPES) Volume I: Planning Policies and Procedures*. CJCSI 3122.02B. Washington DC, 2001.

[141] United States. Department of Defense. Joint Chiefs of Staff. *Joint Doctrine for Comm and and Control Warfare (C2W)*. Joint Publication 3-13.1. Washington DC: DoD, 1996

[142] United States. Department of Defense. Joint Chiefs of Staff. *Joint Operations*. Joint P ublication 3-07. Washington DC: 62-66. 2011.

[143] United States. Department of Defense. Joint Chiefs of Staff. *Joint Operations Plannin g*. Joint Publication 5-0. Washington DC: 52-77, 96-110. 2011.

[144] United States. Department of Defense. Joint Chiefs of Staff. *Joint Doctrine for the Ar med Forces of the United States*. Joint Publication 1. Washington DC: DoD, 2013.

[145] U.S JFCOM, "Commander's Handbook for Attack the Network", Joint Warfighting C enter, 2011.5.

[146] Hayes, Richard E., Richard L. Layton, and William A. Ross. The Army Command an d Control Evaluation System. Alexandria, VA: U.S. Army Research Institute for the Beh avioral and Social Sciences, 1995.

[147] Ancker, Clinton J., III. "The Evolution of Mission Command in U.S. Army Doctrine, 1905 to the Present." *Military Review* XCIII, no. 2 (2013): 42-52. Combined Arms Resea

rch Library.

[148] Barabási, Albert-László. "Emergence of Scaling in Random Networks." *Science* 286, no. 5439 (October 15, 1999): 509-12.

[149] Touchette, Hugo, and Seth Lloyd. "Information-theoretic Approach to the Study of C ontrol Systems." *Physica A: Statistical Mechanics and Its Applications* 331, no. 1-2 (200 4): 140-72.

[150] Granåsen, Magdalena, Patrik Lif, Per-Anders Oskarsson, Peter Klum, Lars Tydén, an d Niklas Hallberg. "Exploring Effects of C2 Warfare on C2 Ability in a Simulated Envir onment." Collective C2 in Multinational Civil-Military Operations: 16th International Co mmand and Control Research and Technology Symposium, Swedish Defence Research Agency, FOI, June 2011.

[151] Atkins, P.W.B., Wood, R.E. & Rutgers, P.J. The effects of feedback format on dynam ic decision-making. "Organizational Behavior and Human Decision Processes", 88 (2), p p. 587～604. 2002. // Edwards, Jeffrey R. "The Past, Present, and Future of Organizational Behavior and Hu man Decision Processes." Organizational Behavior and Human Decision Processes 87, n o. 1 (2002)

[152] Milling, Peter, and Erich Zahn. Computer-based Management of Complex Systems: P roceedings of the 1989 International Conference of the System Dynamics Society, Stuttg art, July 10-14, 1989. Berlin: Springer-Verlag, 1989. 189-96.

[153] Brehmer, Berndt. "Dynamic Decision Making: Human Control of Complex Systems." Acta Psychologica 81, no. 3 (1992): 211-41.

[154] Cannon-Bowers, Janis A., and Eduardo Salas. "Team Performance and Training in Co mplex Environments: Recent Findings from Applied Research." Current Directions in Ps ychological Science 7, no. 3 (1998): 83-87.

[155] Lee, John D., and Katrina A. See. "Trust in Automation: Designing for Appropriate R eliance." Human Factors: The Journal of the Human Factors and Ergonomics Society 46, no. 1 (2004): 50-80.

[156] Lim, Kai H., Marcus J. O'Connor, and William E. Remus. "The Impact of Presentatio n Media on Decision Making: Does Multimedia Improve the Effectiveness of Feedback? " Information & Management 42, no. 2 (2005): 305-16.

[157] Pilemalm, Sofie, Dennis Andersson, and Niklas Hallberg. "Reconstruction and Explor ation of Large-scale Distributed Operations – Multimedia Tools for Evaluation of Emerg ency Management Response." *Journal of Emergency Management* 6, no. 4 (2008): 31-47 .

[158] Riley, Jennifer M., David B. Kaber, and John V. Draper. "Situation Awareness and At tention Allocation Measures for Quantifying Telepresence Experiences in Teleoperation. " Human Factors and Ergonomics in Manufacturing 14, no. 1: 51-67 2004.

[159] Bell, Robert, and Michael Chumber, PhD. "Virtual Small Business Emergency Operat ions Center (VSBEOC): Shared Awareness and Decision Making for Small Business." C ollective C2 in Multinational Civil-Military Operations: 16th International Command an d Control Research and Technology Symposium, New Jersey Institute of Technology, Ju ne 2011.

[160] Gendron, Gerald, Lt.Col. "Innovating Command and Control Training Using Virtuali zation Technologies." Collective C2 in Multinational Civil-Military Operations: 16th Int ernational Command and Control Research and Technology Symposium, Special Operati ons Command Joint Forces Command, June 2011.

[161] Hewlett, Sylvia A., Laura Sherbin, and Karen Sumberg. "How Gen Y & Boomers Wil l Reshape Your Agenda." *Havard Business Review*: 71-76. 2009.

[162] Oblinger, Diana, and James L. Oblinger. *Educating the Net Generation.* Boulder, CO: EDUCAUSE., 2005.

[163] Sandwell, Isabella. "Libanius' Social Networks: Understanding the Social Structure of the Later Roman Empire." *Mediterranean Historical Review* 22, no. 1 (2007): 133-47.

[164] Baškarada, Saša. "Towards a Semiotic Information Position Framework for Network Centric Warfare." Collective C2 in Multinational Civil-Military Operations: 16th International Command and Control Research and Technology Symposium, Defence Science & Technology Organisation (Australia): 2-16. 2011.

[165] Fisher, Craig W., and Bruce R. Kingma. "Criticality of Data Quality as Exemplified in Two Disasters." *Information & Management* 39, no. 2 (2001): 109-16.

[166] Gouin, Denis, and Valérie Lavigne. "Trends in Human-Computer Interaction to Support Future Intelligence Analysis Capabilities." Paper presented at the 16th International Command and Control Research and Technology Symposium (ICCRTS), Québec, Canada, June 21–23, 2011.

[167] Uruguay, André Luiz Pimentel, and Carlos Henrique Costa Ribeiro. "A Topological Model for C2 Organizations." Paper presented at the 16th International Command and Control Research and Technology Symposium (ICCRTS), Québec, Canada, June 21–23, 2011.

[168] Matson, Eric T., Scott A. Deloach, and Raj Batnagar. "Evaluation of Properties in the Transition of Capability Based Agent Organization." *Web Intelligence and Agent Systems* 7, no. 1 (2009): 1-21.

[169] Huber, Reiner K., James Moffat, and David S. Alberts. "Achieving Agile C2 by Adopting Higher Levels of C2 Maturity." Operationalizing C2 Agility: 17th International Command and Control Research and Technology Symposium, Institute of Technology of Intelligent Systems at Universität Der Bundeswehr München: 3-13, 24-26. 2012.

[170] Alberts, David S. "Agility, Focus, and Convergence: The Future of Command and Control." *International C2 Journal* 1, no. 1 (2007): 1-30.

[171] Hukill, Jeffrey B. "Air Force Command and Control: The Need for Increased Adaptab

ility." Operationalizing C2 Agility: 17th International Command and Control Research a
nd Technology Symposium, Air Force Research Institute: 3-8, 11-15, 19-20. 2012.

[172] Kruse, John, PhD, and Todd Reily. "Composable Environments: A Systems Architect
ure for Agile User-driven Command and Control." Operationalizing C2 Agility: 17th Int
ernational Command and Control Research and Technology Symposium, The MITRE C
orporation: 1-9, 11. 2012.

[173] Levchuk, Georgiy, and Krishna Pattipati. "Design of Distributed Command and Contr
ol for Collaborative Situation Assessment." Paper presented at the 18th International Co
mmand and Control Research and Technology Symposium (ICCRTS), Alexandria, Virgi
nia, June 19-21, 2013.

[174] Levchuk, G., F. Yu, C. Meirina, S. Singh, and K. Pattipati. "Learning from the Enemy
: Approaches to Identifying and Modeling the Hidden Enemy Organization." In *Informat
ion Warfare and Organizational Decision-making*, by Alexander Kott, 29-62, 213~256.

Boston: Artech House, 2007.

[175] Nissen, Mark E., and W. David Place. "Archetypical C2 Organization Design for Eve
r Increasing Technological Autonomy: An Unmanned Aircraft System Illustration." Pape
r presented at the 18th International Command and Control Research and Technology Sy
mposium (ICCRTS), Alexandria, Virginia, June 19-21, 2013.

[176] Alberts, David S., and Mark E. Nissen. "Toward Harmonizing Command and Control
with Organization and Management Theory." *International C2 Journal* 3, no. 2 (2007):
1-59.

[177] Nissen, Mark E., and Richard M. Burton. "Designing Organizations for Dynamic Fit:
System Stability, Maneuverability, and Opportunity Loss." *IEEE Transactions on System
s, Man, and Cybernetics - Part A: Systems and Humans* 41, no. 3 (May 2011): 418-33.

[178] Creveld, Martin Van. *Command in War.* Cambridge, MA: Harvard University Press,

1985.

[179] McFarland, Jenny, Dan McConnell, Harvey Reed, and John Kane. "Modeling C2 Agility to Meet the Demands." Paper presented at the 18th International Command and Control Research and Technology Symposium (ICCRTS), Alexandria, Virginia, June 19-21, 2013.

[180] Brehmer, Berndt. "Understanding the Functions of C2 Is the Key to Progress." *International C2 Journal* 1, no. 1 (2007): 211-32.

[181] Cannon-Bowers, Janis A., and Eduardo Salas. "Reflections on Shared Cognition." *Journal of Organizational Behavior* 22, no. 2 (2001): 195-202.

[182] Salas, Eduardo, and Stephen M. Fiore. "Advances in Measuring Team Cognition." In *Team Cognition: Understanding the Factors That Drive Process and Performance*, 83-106. Washington, DC: American Psychological Association, 2004.

[183] Granlund, Rego. "Monitoring Experiences from Command and Control Research with the C3Fire Microworld." *Cognition, Technology & Work* 5, no. 3 (2003): 183-90.

[184] Hollenbeck, John. "A Structural Approach to External and Internal Person-Team Fit." *Applied Psychology* 49, no. 3 (2000): 534-49.

[185] Tremblay, S., F. Vachon, D. Lafond, and C. Kramer. "Dealing With Task Interruptions in Complex Dynamic Environments: Are Two Heads Better Than One?" *Human Factors: The Journal of the Human Factors and Ergonomics Society* 54, no. 1 (2012): 70-83.

[186] Gou, Liang, Xiaolong Zhang, Airong Luo, and Patricia F. Anderson. "SocialNetSense: Supporting Sensemaking of Social and Structural Features in Networks with Interactive Visualization." Paper presented at 2012 IEEE Conference on Visual Analytics Science and Technology (VAST), Seattle, WA, October 14-19, 2012.

[187] Gou, Liang, Xiaolong Zhang, Airong Luo, and Patricia F. Anderson. *The Network Lens: Interactive Exploration of Multivariate Networks Using Visual Filtering.* Proceedings of the 14th International Conference on Information Visualization, London. IEEE, 2010.

35-42.

[188] Wang, Taowei D., K. Wongsuphasawat, C. Plaisant, and B. Shneiderman. *Visual Info rmation Seeking in Multiple Electronic Health Records: Design Recommendations and a Process Model.* Proceedings of the 1st ACM International Health Informatics Symposiu m, New York. ACM, 2010. 46-55.

[189] Bélanger, Micheline. "The difficulty to document agility evidences from a C2 perspec tive." Paper presented at the 18th International Command and Control Research and Tec hnology Symposium (ICCRTS), Alexandria, Virginia, June 19-21, 2013.

[190] Yuefeng, Liu, Chen Shaodong, and Kong Fan'e. "Decision Allocation of C2 System B ased on ULMADM (uncertain linguistic multiple attribute decision making)."19th Intern ational Command and Control Research and Technology Symposium, Virginia, Alexand ria: 2-6. June 2014.

[191] Adams, Marilyn Jager, Yvette J. Tenney, and Richard W. Pew. "Situation Awareness and the Cognitive Management of Complex Systems." *Human Factors: The Journal of t he Human Factors and Ergonomics Society* 37, no. 1 (1995): 85-104.

[192] Hew, Patrick. "Reconciling Situation Awareness in Humans versus Machines via Mo de Awareness and Schemata." *Theoretical Issues in Ergonomics Science*, October 2011, 1-22.

[193] Saner, Lelyn D., Cheryl A. Bolstad, Cleotilde Gonzalez, and Haydee M. Cuevas. "Me asuring and Predicting Shared Situation Awareness in Teams." *Journal of Cognitive Engi neering and Decision Making* 3, no. 3 (2009): 280-308.

[194] Loaiza, Francisco, Steve Wartik, John Thompson, Dale Visser, and Edward Kenschaf t. "The Best of All Possible Worlds: Applying the Model Driven Architecture Approach t o a JC3IEDM OWL Ontology Modeled in UML." Paper presented at the 19th Internation al Command and Control Research and Technology Symposium (ICCRTS), Alexandria, Virginia, June 16-19, 2014.

[195] Grant, Tim, and Erik de Waard. "Reconciling Hierarchical and Edge Organizations: 9 -11 revisited." Paper presented at the 19th International Command and Control Research and Technology Symposium (ICCRTS), Alexandria, Virginia, June 16-19, 2014.

[196] Lavigne, Valérie, Régine Lecocq, Étienne Martineau, and Marielle Mokhtari. "Graph Analyzer Widget Closer to Agility through Sense- Making." Paper presented at the 19th

International Command and Control Research and Technology Symposium (ICCRTS), Alexandria, Virginia, June 16-19, 2014.

[197] Atkinson, Simon Reay, Amanda Goodger, Steve Lesher, Nicholas Caldwell, Jodi Stee l, and Dale Shoupe. "What are the Real Risks of Knowing and Not Knowing - Leading K nowledge in Cyber." Paper presented at the 19th International Command and Control Re search and Technology Symposium (ICCRTS), Alexandria, Virginia, June 16-19, 2014.

[198] Outhwaite, William. Habermas: A Critical Introduction (Key Contemporary Thinkers). 2nd ed. Cambridge: Polity Press, 2009.

[199] Scheidt, David, and Kevin Shultz. "On Optimizing Command and Control Structures. " Collective C2 in Multinational Civil-Military Operations: 16th International Command and Control Research and Technology Symposium, Johns Hopkins University Applied P hysics Laboratory. 1-5. 2011.

[200] Lecocq, Régine, and Valérie Lavigne. "C2 in Underdeveloped, Degraded and Denied Operational Environments." Paper presented at the 18th International Command and Con trol Research and Technology Symposium (ICCRTS), Alexandria, Virginia, June 19-21, 2013.

[201] Simon, Herbert A. "Organizations and Markets." *Journal of Economic Perspectives* 5, no. 2 (1991): 25-44.

[202] Anderson, John R., Lynne M. Reder, and Herbert A. Simon. "Radical Constructivism and Cognitive Psychology." *Brookings Papers on Education Policy* 1 (January 01, 1998)

: 227-78.

[203] March, James G. *Explorations in Organizations*. Stanford, CA: Stanford Business Books, 2008. 15-67.

[204] Whetten, David A. "What Constitutes a Theoretical Contribution?" The Academy of Management Review 14, no. 4 (1989): 490-95.

[205] Venkatesh, Viswanath, and Hillol Bala. "Technology Acceptance Model 3 and a Research Agenda on Interventions." *Decision Sciences* 39, no. 2 (2008): 273-315.

[206] Venkatesh, Viswanath, and Fred D. Davis. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." *Management Science* 46, no. 2 (2000): 186-204.

[207] Venkatesh, Viswanath, Fred D. Davis, and Michael G. Morris. "Dead or Alive? The Development, Trajectory and Future of Technology Adoption Research." *Journal of the Association for Information Systems* 8, no. 4 (2007): 267-86.

[208] Venkatesh, Viswanath, Michael G. Morris, Gordon B. Davis, and Fred D. Davis. "User Acceptance of Information Technology: Toward a Unified View." *MIS Quarterly* 27, no. 3 (September 2003): 425-78.

[209] Davis, Fred D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." *MIS Quarterly* 13, no. 3 (September 1989): 319-40.

[210] Davis, Fred D., Richard P. Bagozzi, and Paul R. Warshaw. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." *Management Science* 35, no. 8 (1989): 982-1003.

[211] Davis, Fred D., Richard P. Bagozzi, and Paul R. Warshaw. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." *Management Science* 35, no. 8: 982-1003. 1989.

[212] Doll, William J., Anthony Hendrickson, and Xiaodong Deng. "Using Davis's Perceived Usefulness and Ease-of-use Instruments for Decision Making: A Confirmatory and M

ultigroup Invariance Analysis." *Decision Sciences* 29, no. 4 (1998): 839-69

[213] Davis, Fred D. "User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts." *International Journal of Man-Machine Studies* 38, no. 3 (1993): 475-87.

[214] Mitleton-Kelly, Eve. *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations*. Oxford: Pergamon, 2003