

# WERNER WOTHKE, PH.D.

3412 15<sup>TH</sup> ST N, ARLINGTON, VA 22201

(202) 379-8023 WEWO@SMALLWATERS.COM

## OBJECTIVE

Consulting or managerial role in statistically-based software development, analytic research and reporting

## QUALIFICATIONS

More than 8 years experience in large-scale educational assessment and reporting; and more than 12 years experience in marketing, leading and developing statistically-based software in consulting and software publishing industries. Skills include:

- Leading high-level creative teams of psychometricians, programmers, research associates and managers in large-scale educational assessment under NCLB legislation
- Developing statistical software components and turn-key applications for educational measurement and social science research
- Breaking into established markets with new software applications
- Managing international and outsourced software projects
- Writing and presenting technical papers
- Consulting in statistical analysis and modeling

## PROFESSIONAL EXPERIENCE

AMERICAN INSTITUTES FOR RESEARCH, WASHINGTON, DC

2006-PRESENT

### Principal Statistician

Guiding teams of psychometricians, programmers and managers servicing large-scale educational assessment contracts.

- As senior psychometrician for the Delaware Comprehensive Assessment System—Alternate (DCAS-Alt1), New Mexico Alternate Performance Assessment (NMAPA) and South Carolina Alternative Assessment (SC-Alt) projects, manages the psychometric team for these large-scale assessment contracts. The task requires analysis, documentation and coordination of technical aspects of these high-stakes testing programs in support of the federal approval process under NCLB legislation, particularly in relation to test validity, employing univariate and multivariate statistical data analyses, classical test theory and IRT pattern scoring under an adaptive testing approach.
- Maintains and publishes the award-winning OpenIRT project, an open source C++ code library and applications for item response theory (ETIRM, UNCMIN++ and SCPNT) on [www.smallwaters.com](http://www.smallwaters.com). Promoted OpenIRT in conference presentation and workshops starting in 2008.
- As part of the SAS Institute's Advanced Analytics Series, teaches a webcast titled Introduction to Structural Equation Modeling, now in the fifth year.
- As senior psychometrician in the joint Ohio-Minnesota-Oregon working group on Alternate Assessment—Modified Achievement Standards (AA-MAS), planned and analyzed pilot and field studies of item revisions targeted to persistently low-performing 7<sup>th</sup>-grade students. Produced technical reports, TAC presentations and item data reviews for the purpose of evaluating item design strategies for AA-MAS. Currently serving as senior psychometrician on the continuation project for 5<sup>th</sup>-grade students, conducted by the State of Ohio.
- Previously served as a managing SAS programming lead for large-scale educational assessment projects, including Chicago High School Transformation, New Mexico Alternate Performance Assessment (NMAPA), Ohio Achievement Test for Students with Disabilities (OAT-SWD) and the South Carolina Alternative Assessment (SC-Alt).
- Developed workflow models and a framework of general reporting specifications, including rules for data validation, cleaning, processing and reporting for several large-scale

customized testing programs. Designed original test decks for AIR's in-house scanning operations. Migrated these rule sets to scan center staff.

- Promoted best-practices methods of software development, such as version control, code reviews and unit testing.
- Managed the construction and delivery of a geocoding software application for Windows and Macintosh platforms under the NAEP background variables project.

CTB/MCGRAW-HILL, MONTEREY, CA

2002-2006

**Manager Quantitative Methods**

Led team of software engineers, business process analysts and Ph.D. psychometricians/statisticians to support and improve research activities and technical operations with statistical methodology, process control and software.

- Managed software and methodology development projects with budgets of up to \$500K.
- Managed source code transition of legacy Item Response Theory (IRT) software to a new team of software professionals, introducing code documentation and structuring, version control and regression testing to enable maintenance and continuing development.
- Drove onshore/offshore construction of PC-based field tools to reduce the turn-around time for standard-setting workshops from four weeks to one.
- Tracked and diagnosed accuracy problems in legacy production scoring software, researched alternative algorithms, proposed a fast, reliable solution for item-pattern scoring by maximum likelihood and saw through its implementation and deployment across departments.
- Collaborated with other teams in the design and implementation of design specifications for a psychometric code library, business modeling for data analytic research services, approaches for diagnostic assessment, and methods for group-level cheating detection.

SMALLWATERS CORPORATION, CHICAGO, IL

1994-2002

**President**

Founded and led SmallWaters Corporation to provide statistical consulting services and to publish statistical software.

- Marketed and distributed Amos, a program for structural equation modeling (SEM), through retail and resellers, including a negotiated sub-licensing agreement with SPSS, Inc.
- Promoted Amos via workshops, conference presentations, advertisements, representation in statistical textbooks, and online discussion groups, increasing its market from about 50 shareware users in early 1994 to consistently over \$1.5M field sales per year.
- Presented over sixty-five SEM workshops at universities, think tanks and businesses in North America, Japan and Europe, significantly raising awareness of SmallWaters.
- Managed Amos version releases 3.5 through 5.0, providing editorial guidance for Amos' user interface and online help, systematic Q/A testing, and major revisions of the user's guide.
- Localized Amos for the Japanese market, in cooperation with SPSS and the program author.
- Provided statistical consulting services to D & B HealthCare Information and university-based research projects.

DUN & BRADSTREET HEALTHCARE INFORMATION, INC, CHICAGO, IL

1994

**Senior Statistician**

Provided in-house statistical consulting, development and Q/A of risk-adjustment models for clinical outcomes and resource use.

- Evaluated risk and resource use models for some 400 diagnosis-related groupings based on state and federal data to facilitate evaluation of health care providers.
- Performed contract research for the Illinois Department of Public Aid, evaluating the effects of a Medicaid case-management program with field data.

SCIENTIFIC SOFTWARE, INC, CHICAGO, IL

1985–1993

**VP, Technical Operations**

- Edited and maintained statistical software (LISREL, BILOG); ported software to IBM MVS, DOS, OS/2 and Unix platforms; initiated and coordinated ports to MacOS and IBM VM/CMS systems; built up technical support hotline; initiated systematic regression testing.
- Performed contract research for the US Air Force Office System Command, evaluating the factorial validity of the Armed Services Vocational Aptitude Battery (ASVAB).

**OTHER PROFESSIONAL EXPERIENCE**

Positions as lecturer, statistical programmer, psychometric consultant, and research associate.

**PRO BONO ACTIVITIES**

Manuscript/proposal reviewer for Journal of Educational and Behavioral Statistics, Journal of Structural Equation Modeling, Multivariate Behavioral Research, the National Council for Measurement in Education, the National Science Foundation, Nursing Research, and Psychometrika.

Web master for b-a-h.com, openirt.com and smallwaters.com.

Maintenance and promotion of open source IRT software, ICL, ETIRM, UNCMIN++ and SCPNT.

**EDUCATION**

Returning Scholar in Statistics and Econometrics, **UNIVERSITY OF CHICAGO, CHICAGO , IL**

Post-doctorate, Evaluation Research, **NORTHWESTERN UNIVERSITY, EVANSTON, IL**

Ph.D., Methodology of Behavioral Research, **UNIVERSITY OF CHICAGO, CHICAGO, IL**

Diplom (M.A.), Applied Psychology, **UNIVERSITY OF MÜNSTER, GERMANY**

**SKILLS, TOOLS & TECHNIQUES**

Structural equation modeling	Item response theory	Bayesian estimation
Multivariate statistics	Linear, logistic and probit regression	SAS, SPSS, R
Missing data problems	Bootstrapping and M/C simulation	Java, C, C++, Fortran, VB
Latent class analysis	Statistical planning & design	Bilingual, German/English

**HONORS AND AWARDS**

**2011 Bradley Hanson Award for Contributions to Educational Measurement**, National Council on Measurement in Education (NCME), for the OpenIRT project

**PRESIDENT**, Chicago Chapter of the American Statistical Association 1999-2000

**EDITORIAL BOARD**, Structural Equation Modeling: A Multidisciplinary Journal 1993-1998

**POST-DOCTORAL FELLOWSHIP**, National Institute of Mental Health: Northwestern University, Measurement and Evaluation in Mental Health Settings

**EXCHANGE SCHOLARSHIP** for graduate study at the University of Chicago, German Academic Exchange Service

**MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS**

American Educational Research Association

American Psychological Association, Division 5 (associate member)

American Statistical Association

Association for Computing Machinery

National Council on Measurement in Education

Psychometric Society

**PUBLICATIONS**

- Wothke, W., Burket, G., Chen, L., Gao, F., Shu, L., and Chia, M. (*In press*) Multimodal likelihoods in IRT-based response-pattern scoring: Will the real maximum likelihood score please stand up? *Journal of Educational and Behavioral Statistics*.
- Wothke, W. (2010) OpenSource Estimation Toolkit for Item Response Theory Modeling. Atlanta, GA: 75<sup>th</sup> Meeting of the Psychometric Society (Conference Presentation)
- Wothke, W. (2009) OpenSource Estimation Toolkit for Item Response Theory Modeling. Washington, DC: Joint Statistical Meetings (Conference Presentation)
- Wothke, W., Cohen, J., Cohen, D., and Zhang, J. (2009) AA-MAS Working Group Spring 2009 Pilot Study Technical Report. Washington, DC: The American Institutes for Research  
Retrieved 9-29-2009 from the world wide web at  
<http://www.ode.state.oh.us/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=73925>
- Wothke, W., Cohen, J., and Zhang, J. (2009) AA-MAS Working Group Fall 2008 Pilot Study Technical Report. Washington, DC: The American Institutes for Research  
Retrieved 9-29-2009 from the world wide web at  
<http://www.ode.state.oh.us/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=74516>
- Wothke, W. (2005) I May Not Leave This Child Behind--Large Scale Educational Assessment. Chicago, IL: *American Statistical Association, Chicago Chapter* (Conference Presentation)
- Wothke, W. (2005) Factor analysis: Multitrait-multimethod. In B. Everitt & D.C. Howell [Eds.] *Encyclopedia of Statistics in Behavioral Science*. New York, NY: Wiley
- Dembo, R., Schmeidler, J., and Wothke, W. (2003) The impact of a family empowerment intervention on juvenile offender involvement in delinquent behavior: A latent growth model analysis. *Journal of Offender Rehabilitation*, **37**(2), 17-41
- Dembo, R., Wothke, W., Seeberger, W., Shemwell, M., Pacheco, K., Rollie, M., Schmeidler, J., Klein, L., Livingston, S., Hartsfield, A. (2002). Testing a longitudinal model of the relationships among high risk youths' drug sales, drug use and participation in index crimes. *Journal of Child and Adolescent Substance Abuse*, 37-61.  
Reprinted in: M. Natarajan [Ed.] (2010) *Drugs and Crime. Volume II. The Library of Drug Abuse and Crime*. London, UK: Ashgate Publishing
- Dembo, R., Schmeidler, J., Seeberger, W., Shemwell, M., Rollie, M., Pacheco, K., Livingston, S., and Wothke, W. (2001) Long-term impact of a family empowerment intervention on juvenile offender psychosocial functioning. *Journal of Offender Rehabilitation*, **33** (1), 59-109
- Wothke, W. (2000) Longitudinal and multigroup modeling with missing data. In T.D. Little, K.U. Schnabel and J. Baumert [Eds.] *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples*. Mahwah, NJ: Lawrence Erlbaum Associates
- Dembo, R., Shemwell, M., Pacheco, K., Seeberger, W., Rollie, M., Schmeidler, J., and Wothke, W. (2000) A longitudinal study of the impact of a family empowerment intervention on juvenile offender psychosocial functioning: An expanded assessment. *Journal of Child and Adolescent Substance Abuse*, **10**, 1-7
- Dembo, R., Wothke, W., Seeberger, W., Shemwell, M., Pacheco, K., Rollie, M., Schmeidler, J., Klein, L., Hartsfield, A., and Livingston, S. (2000) Testing a model of the influence of family problem factors on high-risk youth's troubled behavior: A three-wave longitudinal study. *Journal of Psychoactive Drugs: A Multidisciplinary Forum*, **32**(1), 55-65
- Dembo, R., Shemwell, M., Pacheco, K., Seeberger, W., Rollie, M., Schmeidler, J., and Wothke, W. (2000) Psychosocial functioning among juvenile offenders 12 months after family empowerment intervention. *Journal of Offender Rehabilitation*, **32** (1/2), 1-56
- Arbuckle, J.L. and Wothke, W. (1999) *Amos 4.0 User's Guide*. Chicago, IL: SPSS Inc. and SmallWaters Corporation
- Rigdon, E.E., Schumacker, R.E. and Wothke, W. (1998) A comparative review of interaction and nonlinear modeling. In R.E. Schumacker and G.A. Marcoulides [Eds.] *Interaction and nonlinear effects in structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates

- Wothke, W. (1996) Models for multitrait-multimethod matrix analysis. In G. Marcoulides and R. Schumacher [Eds.] *Advances structural equation modeling techniques*. Mahwah, NJ: Lawrence Erlbaum Associates
- Wothke, W. and Arbuckle, J.L. (1996) Full-information missing data analysis with Amos. In F. Faulbaum and W. Bandilla [Eds.] *SoftStat '95 Advances in Statistical Software 5*. Stuttgart, Germany: Lucius & Lucius, 219–228
- Wothke, W. (1995) Covariance components analysis of the multitrait-multimethod matrix. In P. E. Shrout and S. T. Fiske [Eds.] *Personality research, methods, and theory: A Festschrift honoring Donald W. Fiske*. Mahwah, NJ: Lawrence Erlbaum Associates
- Dembo, R., Williams, L., Schmeidler, J., Berry, E., Wothke, W., Getreu, A., Wish, E.D., and Christensen, C. (1995) Examining a structural model of the relationship between marijuana/hashish use and delinquency among a cohort of high risk youths over time. In R.L. Taylor [Ed.] *African-American youth: Their social and economic status in the United States*. Westport, CT: Praeger
- Gross, D., Conrad, B., Fogg, L. and Wothke, W. (1994) A longitudinal model of maternal self-efficacy, depression, and difficult temperament during toddlerhood. *Research in Nursing and Health*, **15**, 207–215
- Wothke, W. (1993) Nonpositive definite matrices in structural modeling. In K. Bollen and S. Long [Eds.] *Testing Structural Equation Models*. Newbury Park, CA: Sage
- Dembo, R., Williams, L., Schmeidler, J. and W. Wothke (1993) A longitudinal study of the predictors of the adverse effects of alcohol and marijuana/hashish use among a cohort of high risk youths. *International Journal of the Addictions*, **28**, 1045-1085
- Dembo, R., Williams, L., Wothke, W., Schmeidler, J. and Brown, C.H. (1992) The role of family factors, physical abuse, and sexual victimization experiences in high-risk youth's alcohol and other drug use and delinquency: A longitudinal model. *Violence and Victims*, **7**, 245–266
- Dembo, R., Williams, L., Schmeidler, J., Berry, E., Wothke, W., Getreu, A., Wish, E.D., and Christensen, C. (1992) A structural model for examining the relationship between child abuse, sexual victimization, marijuana/hashish use in delinquent youth: A longitudinal study. *Violence and Victims*, **7**, 41–62
- Dembo, R., Williams, L., Wothke, W., Schmeidler, J. (1992) Examining a structural model of the relationship among alcohol use, marijuana/hashish use, their effects, and emotional psychological problems over time in a cohort of high risk youths. *Deviant Behavior: An Interdisciplinary Journal*, **13**, 185-215
- Dembo, R., Williams, L., Wothke, W., Schmeidler, J., Getreu, A., Berry, E. and Wish, E.D. (1992) The generality of deviance: Replication of a structural model among high risk youths. *Journal of Research in Crime and Delinquency*, **29**(2), 200–216
- Wothke, W., Bock, R.D., Curran, L.T., Fairbank, B.A., Augustin, J.W., Gillet, A.H., Guerrero, C., Jr. (1991) *Factor analytic examination of the armed services vocational aptitude battery (ASVAB) and the kit of factor-referenced tests. Final technical report for the period September 1986 – August 1990*. Brooks Air Force Base, TX: Air Force Systems Command.
- Dembo, R., Williams, L., Wothke, W., Schmeidler, J., Getreu, A., Berry, E., Wish, E.D., and Christensen, C. (1990) The relationship between cocaine use, drug sales, and other delinquency among a cohort of high-risk youths over time. In M. De La Rosa, E.Y. Lambert, and B. Gropper [Eds.] *Drugs and Violence: Causes, Correlates, and Consequences*. NIDA Research Monograph 103. Rockville, MD: National Institute on Drug Abuse
- Wothke, W. and Browne, M.W. (1990) The direct product model for the MTMM matrix parameterized as a second order factor analysis model. *Psychometrika*, **55**(2), 255–262
- Silverstein, B., Wothke, W. and Slabaugh, R. (1988) Toward parsimony with comprehensiveness: Management applications of MDPS factor scores. *Mental Retardation*, **26**, 145–153
- Wothke, W. and Zimowski, M.F (1988) *Item analysis of the paper folding test, Worksample 622*. Technical Report 1988-6. Chicago, IL: The Johnson O'Connor Research Foundation (ERIC Document No. ED305385)

- Zimowski, M.F. and Wothke, W. (1988) *Measurement of structural visualization: Evaluation of spatial and nonspatial sources of variation in the wiggly block and paper folding test scores*. Technical Report 1988-5. Chicago, IL: The Johnson O'Connor Research Foundation (ERIC Document No. ED305384)
- Zimowski, M.F. and Wothke, W. (1986) *The Measurement of Human Variation in Spatial Visualizing Ability: A Process-Oriented Perspective*. Johnson O'Connor Research Foundation, Chicago, IL. Human Engineering Lab. Technical Report No. 1986-1 (ERIC Document No. ED306224)
- Boruch, R. F. and Wothke, W. (1985) Seven kinds of randomization plans for designing field experiments. In R. F. Boruch and W. Wothke [Eds.] *Randomization and Field Experimentation*. New Directions for Program Evaluation, No. 28. San Francisco: Jossey-Bass, 1985

## RECENT COURSES PRESENTED

### 2011, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Psychometrician seminar, American Institutes for Research, Washington, DC

### 2010, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Advanced Analytics Webcast series, SAS Institute, Cary, NC

### 2009, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Advanced Analytics Webcast series, SAS Institute, Cary, NC

### 2008, ICL AND ETIRM: OPEN SOURCE IRT ESTIMATION SOFTWARE FOR RESEARCHERS

Conference Training Session, presented jointly with Alan D. Mead and Yanwei Zhang, Annual Meeting of the National Council for Measurement in Education

### 2008, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Advanced Analytics Webcast series, SAS Institute, Cary, NC

### 2007, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Advanced Analytics Webcast series, SAS Institute, Cary, NC

### 2006, INTRODUCTION TO STRUCTURAL EQUATION MODELING

Advanced Analytics Webcast series, SAS Institute, Cary, NC

### 2003, ITEM RESPONSE THEORY COURSE

Seminar on Computational Psychometrics, CTB/McGraw-Hill, Monterey, CA

### 2002, ITEM RESPONSE THEORY COURSE AND LECTURE

Seminar on Computational Psychometrics, CTB/McGraw-Hill, Monterey, CA  
Bayesian IRT with WinBUGS, University of California at Berkeley

### 2002, STRUCTURAL EQUATION MODELING WORKSHOPS

Cornell University, Ithaca, NY  
Navy Postgraduate School, Monterey, CA  
SPSS, Inc., Chicago, IL, and Washington, DC

### 2001, STRUCTURAL EQUATION MODELING WORKSHOPS

Charter Communications, St. Louis, MO  
London Guildhall University, London, UK  
MARCRsearch, Irving, TX  
SPSS, Inc., Chicago, IL, New York, NY, and Washington, DC  
U.S. Air Force Academy, CO  
Western Illinois University, Moline, IL  
Zentrum für Umfragen, Methoden und Analysen (ZUMA), Mannheim, Germany

2000, STRUCTURAL EQUATION MODELING WORKSHOPS

American Statistical Association, Chicago Chapter, Chicago, IL  
Institute of Education, London, UK  
Long Island University, Brooklyn, NY  
Ohio University, Athens, OH  
Richmond University, Richmond, VA  
SPSS, Inc., Chicago, IL, New York, NY, San Francisco, CA, and Washington, DC  
Total Research, Inc., Princeton, NJ  
University of Colorado, Boulder, CO  
University of Helsinki, Finland  
Wisconsin Public Service Corporation, Green Bay, WI  
Zentralarchiv für Sozialwissenschaftliche Forschung, Universität Köln, Cologne, Germany

1999, STRUCTURAL EQUATION MODELING WORKSHOPS

Gallup Organization, Lincoln, NE  
Grapentine & Co., Ankeny, IA  
Oregon Social Learning Center, Eugene, OR  
SPSS Germany GmbH, München, Germany  
SPSS, Inc., Chicago, IL, New York, NY, and Washington, DC  
SPSS Japan, Tokyo  
Pennsylvania State University, College Station, PA  
SmallWaters Corp., Montreal, Canada  
University of Jena, Germany  
University of Omaha, NE  
University of Regina, Regina, SA, Canada  
U.S. Air Force Academy, CO

1998, STRUCTURAL EQUATION MODELING WORKSHOPS

SPSS, Inc., San Francisco, CA, Newton, MA and Washington, DC  
SPSS Scandinavia, Stockholm, Sweden  
SPSS UK, Woking, England  
Psychometric Society Meeting, University of Illinois, Urbana-Champaign, IL  
SmallWaters Corp., Arlington, VA, Boston, MA, Chicago, IL, Dallas, TX, San Diego, CA, and San Francisco, CA  
State University of New York, Buffalo, NY

1997, STRUCTURAL EQUATION MODELING WORKSHOPS

Max Planck Institute for Education, Berlin, Germany  
Softstat '97, Zentrum für Umfragen, Methoden und Analysen (ZUMA), Heidelberg, Germany  
SPSS, Inc.  
University of Quebec, Hull, Canada  
University of Tennessee, Knoxville, TN

1996, STRUCTURAL EQUATION MODELING WORKSHOPS

Chase Manhattan Bank, New York, NY  
SPSS, Inc.

1995, STRUCTURAL EQUATION MODELING WORKSHOPS

Softstat '95, Zentrum für Umfragen, Methoden und Analysen (ZUMA), Heidelberg, Germany  
SPSS, Inc., Chicago, IL  
SPSS Germany, GmbH, München, Germany