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Validation of the Principal's Computer Technology Survey

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Validation of the Principal's Computer Technology Survey

Abstract

The purpose of this study was to provide a more in-depth analysis of the psychometric characteristics of the Principal's Computer Technology Survey (PCTS). The PCTS developmental process yielded a 40–item survey with groups of items comprising five subscales (i.e., curriculum integration, perceptions, acquired expertise, needs assessment, and professional development). Principals' responses to items within the five subscales was measured on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An expert panel reviewed the instrument plus exploratory factor analyses and confirmatory factor analyses were conducted. This analysis resulted in a restructured instrument with seven subscales instead of the five hypothesized subscales and four fewer items. Measurement invariance of the instrument was found for gender and race. Cronbach's alpha for the 36 items was .94 and subscale Cronbach's alpha ranged from .78 to .90.

Keywords

Principal's computer technology survey, PCTS, Curriculum integration, Perceptions, Acquired expertise, Needs assessment, Professional development

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Validation of the Principal's Computer Technology Survey

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Abstract: The purpose of this study was to provide a more in-depth analysis of the psychometric characteristics of the Principal's Computer Technology Survey (PCTS). The PCTS developmental process yielded a 40–item survey with groups of items comprising five subscales (i.e., curriculum integration, perceptions, acquired expertise, needs assessment, and professional development). Principals' responses to items within the five subscales was measured on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An expert panel reviewed the instrument plus exploratory factor analyses and confirmatory factor analyses were conducted. This analysis resulted in a restructured instrument with seven subscales instead of the five hypothesized subscales and four fewer items. Measurement invariance of the instrument was found for gender and race. Cronbach's alpha for the 36 items was .94 and subscale Cronbach's alpha ranged from .78 to .90.

Validation of the Principal's Computer Technology Survey

Teachers have been at the center of efforts to achieve technology's promise of restructuring classrooms and increasing student achievement. Brooks (1997) hypothesized that the ultimate success or failure of technology in schools resided with teachers. To that end, technology-rich classrooms were established specifically for teachers to practice and to emerge loaded with technology expertise for their classrooms. In time, many schools were inundated with computer technology and teachers participated in computer technology staff development**.** Yet, technology did not yield the intended student achievement outcomes envisioned (Whitehead, Jensen, & Boschee, 2003). The anticipated impact on teachers' instructional methods and increased student achievement failed to materialize.

However, the importance of principals in the integration of technology into classrooms was overlooked as teachers continued to receive training. Principals are a crucial part of the process in facilitating the integration of computer technology into the teaching and learning process. In 1995, the Office of Technology Assessment reported that if principals are comfortable with technology then principals will foster technology use in their schools. Cooley and Reitz (1997) concluded that the principal, more than any other educator, is the key to teachers' adoption and use of technology.

Hope and Stakenas (1999) suggested three primary roles for principals relative to computer technology use in schools; role model, instructional leader, and visionary. Principals function as role models when applying computer technology to administrative and managerial tasks. Principals that are knowledgeable about computer technology and demonstrate a commitment to technology can personally assist teachers to acquire technology expertise. As an instructional leader, principals facilitate teachers' integration of computer technology into the teaching and learning process. Principals' knowledge of hardware and software applications can contribute to integration of technology into the curriculum. In the visionary role, principals establish a context

for technology in the school. The visionary principal understands how technology can assist in restructuring the learning environment and empower teachers and students. Finally, Hope and Stakenas stated that the degree that principals are prepared to fulfill these roles is unclear.

Restructuring the teaching and learning process and increasing student achievement through the integration of technology requires leadership with vision and expertise. Slowinski (2003) and Golden (2004) stated that principals are responsible for leadership in knowing how best to use technology in the teaching and learning process, facilitating its integration into the learning environment, and making it possible for teachers to adopt technology. However, there is a threshold of technology expertise that principals must acquire to become the leader of technology utilization in their schools. On one hand, many principals have surpassed this threshold for incorporating technology to accomplish tasks and to facilitate its integration into teaching and learning. On the other hand, there are still principals that have not reached the threshold of expertise necessary for technology leadership.

Golden (2004) indicated that the challenge facing principals is not the recognition of the capabilities of technology, but one of acquiring the expertise to become the leader in integrating technology into the classroom. In addition, principals need to develop a shared vision of technology use with their teachers. Principals that develop the expertise and that shared vision with their teachers can increase the pace for restructuring classrooms and increasing student achievement. Principals' use of technology and their expertise to be the school leader in integrating technology into the teaching and learning process needs further investigation.

Purpose of the Study

The purpose of this study was to investigate the psychometric characteristics of the PCTS. While Brockmeier, Sermon, and Hope (2005) carefully constructed this instrument, the authors presented little evidence of validity in their original work. A more in-depth analysis of the instrument's validity was warranted due to the intention of utilizing this instrument in a new investigation. First, each item was examined to determine whether the item belonged on the instrument and whether the item was technically well-written. Second, the instrument was examined to determine whether any items should be added, modified, or deleted to improve the instrument. Third, the instrument was analyzed to determine whether the items fit the hypothesized factor model.

Methodology

Population and Sample

Brockmeier, Sermon, and Hope (2005) reported that elementary, middle, and high school principals in the state of Florida constituted the population for their investigation. A 20% stratified random sample of this population was selected from the Florida Education Directory. Five hundred questionnaires were mailed and 316 principals returned a completed and usable questionnaire. The response rate for the investigation was 63% after two mailings. Table 1 presents the number and percentage of principals responding to the PCTS by gender, race or ethnicity, educational level, school configuration, and level of computer technology expertise. Approximately 58% of the principals were female and 42% of the principals were male. The chi-square statistic was employed to determine if the proportion of respondents were similar to the overall population for gender. A nonsignificant chi-square, $\chi^2(1, N = 7{,}640) = .250$, $p = .617$, indicated that the proportion of female and male respondents were similar to the overall principal

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population. Seventy-one percent of principals were Caucasian, 21% were African American, and 8% of principals were Hispanic. A nonsignificant chi-square, $\chi^2(2, N = 7, 595) = .884$, $p = .643$, indicated that the proportion of Caucasian, African American, and Hispanic respondents were similar to the overall principal population. Approximately 70% of principals reported having a master's degree, 17% of principals reported having an Educational Specialist degree, and 13% of principals reported having a doctorate. Almost 62% of principals reported working in an elementary school, while 20% of principals reported working in a middle school and 18% of principals reported working in a high school.

Table 1

Demographic Information of Principals Responding to the PCTS

Source	N	%	Source	N	%
Gender			*School Configuration*		
Female	183	58.10	Elementary	194	61.78
Male	132	41.90	Middle	63	20.06
			High	57	18.15
Race or Ethnicity			*Computer Technology Expertise*		
African American	64	20.51	Novice	14	4.43
Caucasian	221	70.83	Intermediate	215	68.04
Hispanic	24	7.69	Advanced	80	25.12
			Expert	7	2.22
Educational Level					
Master's	188	70.15			
Specialist	46	17.16			
Doctorate	34	12.69			

PCTS Development: A Brief History

The current PCTS (see appendix A) is a modified version of a computer technology survey developed by Hope and used by Hope and Brockmeier (2002). The PCTS development process entailed the delineation of specific domains for the construct of interest, item construction, and an analysis of item content by the authors. The developmental process yielded the PCTS that became a 40–item survey with groups of items comprising five subscales (i.e., curriculum integration, perceptions, acquired expertise, needs assessment, and professional development). Principals' responses to items within the five subscales was measured on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree).*

Brockmeier, Sermon, and Hope (2005) reported that Cronbach's alpha reliability for the PCTS total scale was .87. The subscale Cronbach's alpha coefficients were .82 for the curriculum integration, .60 for perception, .75 for acquired expertise, .86 for needs assessment, and .85 for professional development. Cronbach's alpha reliability coefficients were good to very good for the PCTS total scale and four of the five PCTS subscales. The authors deemed that the

perception subscale was adequate for the purposes of their research. Appendix B presents the percentage of principals that responded to each of the items included in this analysis.

New PCTS Analyses

Although validity and reliability were addressed in the developmental process, further examination into the validity and reliability of the PCTS is warranted. To that end, the investigation began with a reexamination of the PCTS items and concluded with a statistical analysis of the PCTS structure.

Instrument Validation. To begin the process, an Expert Panel Review Form was developed to collect information from a panel of six experts. The expert panel included one current high school principal, four college faculty members of Educational Leadership and former principals, and one college faculty member of Educational Technology. The panel reviewed the PCTS for clarity of directions, adequacy of items to meet the intended purpose, item clarity, and grammatical correctness. In addition, panel members were asked to identify additional items that might improve the instrument.

Feedback from the expert panel was very positive. All expert panel members agreed that the survey directions were clear and the items matched the stated purpose. However, one panel member suggested that the purpose statement be changed to be more people-centered, perhaps beginning with, "We value your opinions …"

The expert panel identified only four items that potentially required modification. One expert panel member suggested for item 16, "The Technology Standards for School Administrators (TSSA) can assist me to facilitate computer technology integration into instruction," that the ISTE and/or NETS-A standards be employed rather than the TSSA. The International Society for Technology in Education (ISTE) developed standards for teachers, students, and administrators, while the NETS-A is the National Educational Technology Standards for Administrators.

All expert panel members suggested a change to item 25, "I access the Florida Information Resource Network (FIRN) for information," to reflect an accessible resource for principals in Georgia. Note that the expert panel resides in Georgia and that the planned study will be conducted in Georgia. A panel member suggested for item 26, "I would benefit from experiences that assist me to assess computer technologies influence on student achievement," that "professional development" be inserted before the word "experiences." Another panel member identified item 38, "I have participated in training designed to develop skills to facilitate teachers' integration of computer technology into the curriculum," as "not understandable." The panel member suggested an alternative wording for item 38. The panel member suggested rewording item 38 to state, "I participated in professional development activities related to becoming a more influential technology leader."

In summary, the expert panel was very positive about the PCTS items and directions. Panel members made a few substantive suggestions that will improve the PCTS. The potential modifications with the greatest impact are the suggested changes to item 16 and to item 38. A change to the different standards may be warranted in item 16. The suggested rewording to item 38 should make the intent of the statement much clearer to future respondents.

Statistical Analyses. The statistical analyses revealed a significant amount of information about the structure of the PCTS. The process included conducting exploratory factor analyses, confirmatory factor analyses, and an examination of the measurement invariance by gender and

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race or ethnicity. Muthén (2004) suggested these three analyses for instrument development in his lecture series on *Statistical Analysis with Latent Variables*.

Exploratory Factor Analyses. Before the exploratory factor analysis began, three bootstrap samples were drawn from the 316 principal's responses to the PCTS items. One sample consisted of 10,000 responses and two samples consisted of 5,000 responses. This was done to ensure a sufficient sample size for the exploratory factor analysis and sufficient data for cross validation purposes. In the initial phases of the exploratory factor analysis, both SAS and Mplus were utilized for the analyses. Initially, an exploratory factor analysis was run allowing the PCTS items to load on an unspecified number of factors. Kaiser's criterion, Cattell's scree test, and residuals were examined for each of the factor models (Stevens, 2002) to select the most appropriate parsimonious factor model. One thing became apparent very quickly; the five-factor model hypothesized by Brockmeier, Sermon, and Hope (2005) did not fit the data well. All three of the criteria indicated that more than five factors were present. Kaiser's criterion of 1 indicated that there were up to 10 factors present, while Cattell's scree test indicated that seven factors fit the model. An examination of the residuals indicated a slight decrease in the root mean square residual from .042 to .031 as one went from 7 to 10 factors. After examining the individual item residuals and taking into account the other criteria, the more parsimonious seven factor model was selected for the confirmatory factor analysis.

In addition, the factor loadings of the PCTS items were examined. Based on the factor loadings and the expert panel's comments, two items (item 10 and item 25) were removed from further analysis. Although the expert panel noted nothing wrong with item 10, the item did not load on a single factor in any of the exploratory factor models. The expert panel noted the problem with item 25 and the item only loaded on one of the exploratory factor analytic models.

Confirmatory Factor Analyses. Employing the information gained in the exploratory factor analysis as a guide, a confirmatory factor analysis using Mplus was run on the original data set with items 10 and 25 removed from the analysis. This was the initial baseline model used in other analyses. The comparative fit index (CFI), Tucker and Lewis fit index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) surpassed minimal value fit indices for assessing model fit (see Table 2). The only exception was the chi-square statistic. Once other statistical analyses were conducted, it was noted that item 19 and item 39 were problematic. These two items had negative residual variances when running the confirmatory factor analyses. While constraint of these two items to nonnegative residual variances is possible in Mplus, the decision was to delete items 19 and 39 from the analyses. This resulted in a final baseline model. Appendix C presents the factor loadings for the seven factor model. The fit indices reported in Table 2 are only slightly lower than the fit indices from the initial baseline model. One might conclude that there is no difference in fit between the initial and final baseline models.

Table 2

Fit Indices by Confirmatory Factor Analysis for the PCTS

	Chi-Square	Degrees of Freedom	p - Value	CFI	TLI	RMSEA	SRMR
Initial Baseline Model – Items 10 and 25 deleted	3660.187	35	.000	.970	.990	.058	.044
Final Baseline Model – Items 10, 19, 25, and 39 deleted	3416.169	35	.000	.969	.989	.059	.044
Factorial Invariance for Gender	3367.256	63	.000	.971	.987	.067	NA*
Factorial Invariance for Race or Ethnicity (White & Black)	2908.760	66	.000	.976	.984	.073	NA

Note. * Not available. Mplus does not generate the SRMR for this model configuration.

After generating the final baseline model, separate multiple group analyses were conducted; one multiple group analysis by gender and another multiple group analysis by race or ethnicity. Mplus by default constrains intercepts and factor loadings to be equal across groups, allows residual variances to be free, and factor means are held at zero in one group and free in the other groups. Muthén and Muthén (2006) asserted that these default values are sufficient to establish measurement invariance. In these analyses male and White were the reference groups, while female and Black were the focal groups.

In the multiple group analysis by gender, the fit indices generated were very similar to the baseline fit indices. Table 2 presents the results of this analysis and one might conclude from these data that by gender the PCTS is measurement invariant. In the second multiple group analysis, measurement invariance of the PCTS by race or ethnicity was examined. In this first analysis only White and Black were considered. The fit indices in Table 2 were very similar to the multiple group analysis for gender and the baseline model. The RMSEA fit indice was a little higher than the baseline model (.073 vs. .059), but still met established acceptable criteria. It was concluded from these data that by race or ethnicity (White and Black) the PCTS is measurement invariant. In the description of the population and sample, the chi-square statistic was employed to determine if the proportion of White, Black, and Hispanic respondents were similar to the overall principal population. Although the proportions were similar, the Hispanic sample included only 24 principals. Therefore, a multiple group analysis including this group was not conducted.

Reliability Estimate. Finally, Cronbach's alpha was used to estimate reliability based on the instrument and reconstructed subscales with the four items deleted. Cronbach's alpha for the reconstructed 36 item instrument is .94 versus .87 for the original 40 item instrument. Cronbach's alpha for the new seven subscale model ranges from .78 to .90 versus .60 to .86 for the original five subscale model.

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Conclusion

It is apparent from these data that the original PCTS items as developed and constructed by Brockmeier, Sermon, and Hope (2005) operated fairly well. Even the expert panel convened for this study only suggested a couple of minor improvements to a few items. The previous data seemed to indicate that their five subscale model was working very well, except for that one subscale that was deemed to have adequate reliability. However, an exploratory factor analysis followed by confirmatory factor analyses indicated that the five subscale model for this instrument did not fit the data well. A reconstructed seven subscale model emerged from this process that fits the data well and has more reliable dimensions.

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Appendix A

Principal's Computer Technology Survey

Principal's Computer Technology Survey

Purpose: This research examines the principal's (a) role (facilitation or participation) in integrating technology into the teaching and learning process, (b) perceptions of computer technology for managerial or administrative tasks and in teaching and learning, (c) expertise in using computer technology, and (d) professional development needs to enhance computer technology skills.

Directions: Please darken the numeral in each column that best represents your degree of agreement with each statement. 5 = Strongly Agree; 4 = Agree; 3 = Neither Agree nor Disagree; 2 = Disagree; 1 = Strongly Disagree	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Curriculum Integration					
1. I allocate a significant amount of time to assist teachers in integrating computer technology into their instruction.	(5)	(4)	(3)	(2)	(1)
2. Facilitating computer technology integration into the teaching and learning process is one of my important instructional tasks.	(5)	(4)	(3)	(2)	(1)
3. I am familiar with many academic software programs that teachers can use to support teaching and learning.	(5)	(4)	(3)	(2)	(1)
4. I support computer technology integration in teachers' instruction by providing computer technology training experiences.	(5)	(4)	(3)	(2)	(1)
5. I encourage teacher collaboration in using computer technology for teaching and learning.	(5)	(4)	(3)	(2)	(1)
6. I provide teachers release time to facilitate their becoming familiar with the capabilities of technology devices.	(5)	(4)	(3)	(2)	(1)
7. I provide teachers release time to evaluate software to determine its appropriateness for integration into the teaching and learning process.	(5)	(4)	(3)	(2)	(1)
8. I encourage teachers' use of computer technology to meet learners' individual needs.	(5)	(4)	(3)	(2)	(1)
9. I ensure equity of access to computer technology resources.	(5)	(4)	(3)	(2)	(1)
Perceptions					
10. The integration of computer technology into the teaching and learning process is a decision best made by the teacher.	(5)	(4)	(3)	(2)	(1)
11. Computer technology generally provides a more efficient way to complete tasks than using paper and pencil.	(5)	(4)	(3)	(2)	(1)
12. Principals' professional development to use computer technology has been a focus of the district's efforts to infuse computer technology into schools.	(5)	(4)	(3)	(2)	(1)
13. Computer technology can be used to improve student academic achievement.	(5)	(4)	(3)	(2)	(1)
14. My computer technology expertise contributes to me being viewed as a technology leader in the school.	(5)	(4)	(3)	(2)	(1)
15. I am capable of evaluating computer technology that can be used to support instruction.	(5)	(4)	(3)	(2)	(1)
16. The Technology Standards for School Administrators (TSSA) can assist me to facilitate computer technology integration into instruction.	(5)	(4)	(3)	(2)	(1)
17. My ability to use computer technology improves my managerial or administrative performance.	(5)	(4)	(3)	(2)	(1)
Acquired Expertise					
18. I routinely use a word-processing program to compose correspondence (memos and letters).	(5)	(4)	(3)	(2)	(1)
19. I routinely use electronic mail (e-mail) to communicate with faculty, staff, and colleagues.	(5)	(4)	(3)	(2)	(1)
20. I use computer technology on a regular basis to develop schedules.	(5)	(4)	(3)	(2)	(1)
21. I use computer technology on a regular basis to create databases.	(5)	(4)	(3)	(2)	(1)
22. I use computer technology on a regular basis to construct budgets.	(5)	(4)	(3)	(2)	(1)
23. I use computer technology on a regular basis to make presentations.	(5)	(4)	(3)	(2)	(1)
24. I access and navigate within the district's information management system to retrieve information.	(5)	(4)	(3)	(2)	(1)
25. I access the Florida Information Resource Network (FIRN) for information.	(5)	(4)	(3)	(2)	(1)

Continued on next page

Principal's Computer Technology Survey (Continued)

		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	Needs Assessment					
26.	I would benefit from experiences that assist me to assess computer technology's influence on student achievement.	(5)	(4)	(3)	(2)	(1)
27.	I would benefit from professional development experiences that inform me on how to integrate computer technology into the curriculum.	(5)	(4)	(3)	(2)	(1)
28.	I would benefit from professional development experiences that promote my understanding of legal issues related to software licensing.	(5)	(4)	(3)	(2)	(1)
29.	I would benefit from professional development experiences that promote my understanding of ethical issues related to computer technology.	(5)	(4)	(3)	(2)	(1)
30.	I would like to participate in more professional development experiences to learn how to apply computer technology to my work as a principal.	(5)	(4)	(3)	(2)	(1)
31.	I would like to participate in professional development experiences to learn about protecting students from inappropriate materials available on the Internet.	(5)	(4)	(3)	(2)	(1)
32.	I would like to participate in computer technology professional development experiences that assist me to facilitate organizational change.	(5)	(4)	(3)	(2)	(1)
33.	I would like to participate in professional development experiences that assist me to use computer technology to collect and analyze data.	(5)	(4)	(3)	(2)	(1)
	Professional Development					
34.	The school district has offered training for principals on the use of computer technology to develop budgets.	(5)	(4)	(3)	(2)	(1)
35.	The school district has offered training for principals on the use of computer technology to create databases.	(5)	(4)	(3)	(2)	(1)
36.	The school district has provided professional development experiences for principals in using the Internet for research purposes.	(5)	(4)	(3)	(2)	(1)
37.	The school district has provided professional development for principals in using applications such as spreadsheets, presentations, e-mail, and word processing.	(5)	(4)	(3)	(2)	(1)
38.	I have participated in training designed to develop skills to facilitate teachers' integration of computer technology into the curriculum.	(5)	(4)	(3)	(2)	(1)
39.	I have experienced professional development that assists me in evaluating software applications to be used in the teaching/learning process.	(5)	(4)	(3)	(2)	(1)
40.	I have experienced professional development that assists me in evaluating computer technology hardware to be used in the teaching and learning process.	(5)	(4)	(3)	(2)	(1)

Demographic Information

Directions: Please check or darken the appropriate space for each of the demographic items.

41. **Gender**
( ) Female
( ) Male

42. **Race or Ethnicity**
( ) African American
( ) American Indian/Alaskan Native
( ) Asian/Pacific Islander
( ) Caucasian
( ) Hispanic
( ) Other (identify) _____

43. **Educational Level**
( ) Master's Degree
( ) Education Specialist's Degree
( ) Doctorate

44. **School Configuration**
( ) Elementary
( ) Middle
( ) High
( ) Other (identify) _____

45. **Computer Technology Expertise**
( ) Novice
( ) Intermediate
( ) Advanced
( ) Expert

46. **Years of Experience as a Principal**
____ (Please write the number in the space.)

Thank you very much for your assistance!

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Appendix B

Percentage of Principals' Responses to PCTS Items by Category

Appendix B

Percentage of Principals' Responses to PCTS Items by Category

Item	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
01	4.7	18.2	13.9	47.6	15.5
02	3.0	12.2	10.8	59.1	14.9
03	4.7	11.1	11.5	57.4	15.2
04	1.7	3.0	5.7	48.3	41.2
05	1.7	2.4	5.1	44.6	46.3
06	3.4	11.1	9.8	45.9	29.7
07	3.0	22.0	18.9	43.2	12.8
08	1.7	2.4	3.0	43.9	49.0
09	1.7	2.4	4.1	38.2	53.7
11	3.7	7.4	25.7	42.9	20.3
12	2.7	12.8	19.6	50.3	14.5
13	2.4	2.0	8.8	54.4	32.4
14	4.4	12.2	25.3	41.9	16.2
15	2.0	6.8	17.6	58.8	14.9
16	2.4	5.1	34.1	49.7	8.8
17	2.4	2.0	6.4	50.0	39.2
18	2.4	4.4	4.7	18.6	69.9
20	3.7	10.1	6.1	28.0	52.0
21	1.7	14.9	15.2	29.4	38.9
22	2.7	18.6	11.1	34.8	32.8
23	3.7	17.2	14.5	36.5	28.0
24	1.4	2.7	5.4	37.2	53.4
26	3.4	4.1	9.5	64.2	18.9
27	3.7	5.1	9.8	60.8	20.6
28	4.7	11.8	17.6	54.4	11.5
29	4.7	9.8	17.9	57.4	10.1
30	4.7	5.1	14.5	54.4	21.3
31	3.0	12.2	21.3	44.6	18.9
32	2.7	7.1	13.5	57.4	19.3
33	4.1	6.8	8.4	51.4	29.4
34	6.4	26.0	12.2	34.1	21.3
35	3.0	15.5	10.1	49.3	22.0
36	3.7	16.9	14.2	45.6	19.6
37	3.4	6.8	9.8	53.0	27.0
38	2.4	18.2	11.1	51.4	16.9
40	3.7	26.4	17.6	42.6	9.8

Note. Items numbered 10, 19, 25, and 39 were removed from the analysis.

DOI: 10.20429/ger.2009.070104

Appendix C

PCTS Seven Factor Model with Estimates

Appendix C

PCTS Seven Factor Model with Estimates

		Estimates	S.E.	Est./S.E.
F1 w/	U26	1.000	0.000	0.000
	U27	0.998	0.030	33.499
	U30	0.917	0.029	31.705
	U32	1.154	0.097	11.869
	U33	0.937	0.028	33.768
	U37	0.290	0.041	7.099
	U6	0.218	0.062	3.499
F2 w/	U1	1.000	0.000	0.000
	U4	1.886	0.320	5.898
	U5	2.066	0.329	6.280
	U6	2.635	0.483	5.450
	U7	2.934	0.565	5.191
	U8	1.325	0.267	4.956
	U9	0.941	0.209	4.511
	U40	-0.614	0.237	-2.595
F3 w/	U34	1.000	0.000	0.000
	U35	1.237	0.049	25.182
	U36	1.182	0.055	21.668
	U37	1.038	0.052	19.976
	U38	0.767	0.060	12.877
	U12	0.660	0.070	9.396
	U40	0.764	0.083	9.202
	U18	-0.250	0.088	-2.853
	U22	0.261	0.078	3.365
	U17	-0.170	0.071	-2.392
	U15	-0.164	0.065	-2.519
F4 w/	U17	1.000	0.000	0.000
	U18	2.050	0.311	6.588
	U20	2.247	0.349	6.439
	U21	2.751	0.483	5.690
	U22	1.865	0.326	5.721
	U23	1.814	0.306	5.928
	U24	1.428	0.211	6.767
	U14	1.277	0.204	6.256
	U3	0.851	0.161	5.282
	U15	1.234	0.195	6.335
	U9	0.780	0.170	4.586
	U4	0.250	0.120	2.086
F5 w/	U40	1.000	0.000	0.000
	U15	0.622	0.091	6.809
	U3	0.703	0.103	6.827
	U16	0.612	0.101	6.065
	U1	0.734	0.118	6.234
	U2	0.760	0.105	7.239
	U38	0.607	0.092	6.605
	U23	0.269	0.095	2.840
	U14	0.484	0.091	5.343
	U18	-0.447	0.107	-4.183
	U12	0.350	0.097	3.612
	U20	-0.282	0.095	-2.961

DOI: 10.20429/ger.2009.070104

Appendix C (Continued)

PCTS Seven Factor Model with Estimates

		Estimates	S.E.	Est./S.E.
F6 w/	U28	1.000	0.000	0.000
	U29	1.024	0.025	41.660
	U14	-0.156	0.047	-3.335
	U24	0.158	0.056	2.827
	U31	0.758	0.038	19.897
	U32	-0.289	0.102	-2.828
	U15	-0.190	0.051	-3.697
F7 w/	U17	1.000	0.000	0.000
	U11	1.523	0.319	4.770
	U13	1.914	0.407	4.703
	U16	0.976	0.245	3.981
	U8	0.919	0.290	3.168
	U21	-2.399	0.631	-3.804
	U2	1.114	0.277	4.019
	U20	-0.838	0.290	-2.885
	U23	-1.140	0.342	-3.329
	U22	-1.441	0.434	-3.322
	U7	-1.661	0.517	-3.213
	U6	-1.294	0.402	-3.224
F2 w/	F1	0.179	0.032	5.575
F3 w/	F1	0.107	0.038	2.791
F3 w/	F2	0.143	0.027	5.332
F4 w/	F1	0.242	0.043	5.685
F4 w/	F2	0.154	0.036	4.322
F4 w/	F3	0.180	0.036	5.053
F5 w/	F1	0.116	0.042	2.777
F5 w/	F2	0.184	0.036	5.161
F5 w/	F3	0.124	0.045	2.746
F5 w/	F4	0.151	0.040	3.817
F6 w/	F1	0.654	0.031	20.927
F6 w/	F2	0.127	0.027	4.652
F6 w/	F3	0.142	0.042	3.406
F6 w/	F4	0.149	0.033	4.519
F6 w/	F5	0.140	0.046	3.079
F7 w/	F1	0.227	0.051	4.413
F7 w/	F2	0.133	0.034	3.919
F7 w/	F3	0.136	0.034	4.050
F7 w/	F4	0.167	0.018	9.065
F7 w/	F5	0.095	0.034	2.828
F7 w/	F6	0.139	0.036	3.821
Var	F1	0.793	0.029	27.489
Var	F2	0.186	0.058	3.197
Var	F3	0.541	0.043	12.709
Var	F4	0.276	0.080	3.453
Var	F5	0.501	0.114	4.412
Var	F6	0.888	0.024	36.657
Var	F7	0.160	0.067	2.382