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CONSTRUCT VALIDATION OF COMMON FORMAT BIODATA WITHIN THE PUBLIC SECTOR

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Psychology:

Industrial/Organizational

---

by

James Foster Baxter

September 2003

CONSTRUCT VALIDATION OF COMMON FORMAT BIODATA

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by

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September 2003

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ABSTRACT

Biographical data inventories (Biodata) have been one of the best predictors of job performance criteria for over 100 years. Similarly, Common Format Biodata (CFB) inventories have also demonstrated their ability to predict certain performance criteria. Notably, there are two common themes and two common sub-themes typically associated with CFB instruments - Education and Experience and time and specificity respectively. As such, the major purpose of this paper was to employ a confirmatory factor analysis strategy to construct validate a CFB inventory.

Thus, 159 participants were given a CFB survey to answer the question: Which hypothesized model - either a Four Factor Model (Education - time, Education - specific, Experience - time, and Experience - specific) or a Two Factor Model (Education - time/specific, and Experience - time/specific) will best represent the actual data. Additionally, 73 participants were given a CFB survey to confirm the results.

After analyses, results provided limited support for the Four Factor Model. That is, CFA results from the APA CFB inventory was weak at best, but CFA results from the PAC CFB inventory was reasonably strong; CFI = .737 compared to CFI .914 respectively.

Further, based on the results of the research question and using a sequential regression strategy, 60 participants were given a CFB survey to determine if the hypothesized Four Factors Model extracted from the CFB inventory, hierarchically, predicted performance on a structured oral interview. Results support the hypotheses.

Additionally, based on the results of the research question, 60 participants were given a CFB survey to determine if the combined Four Factor Model predicted structured oral interview Job Preparation and Work Management sub-score performance; and, not predict Communication sub-score performance. Results support the first two hypotheses, but not the last hypothesis. That is, all structured oral interview sub-scores were predicted by the combined Four Factor Model.

Finally, based on the results of the research question, 73 participants were given a CFB inventory to determine if the Four Factor model sequentially predicts performance on a job knowledge written performance test. In step 1 (Education - time & specific), results did not predict written test scores. In step 2 (Education - time & specific and Experience - time & specific), prediction of oral interview scores significantly, incrementally improved.

Theoretical and practical implications suggest that more research needs to be conducted on the CFB inventory to ensure that the 4 Factors extracted are consistently represented. Further, this research does not support recent empirical evidence demonstrating that the combined Factors - Education - time and specific - predicts performance on a written test. Thus, it is posited that the combined Factors - Education - time and specific predicts written test performance depending on type of written test taken (education based, experience based). More theoretical and practical implications are discussed in this thesis.

ACKNOWLEDGMENTS

I would like to thank committee chair Dr. Ken Shultz for the skilled guidance and in-depth conceptual and theoretical support provided. Dr. Shultz's unwavering commitment, expertise, and expeditious feedback proved pivotal to the value, thoroughness, and timely completion of this thesis.

Furthermore, I would like to thank committee members Dr. Janet Kottke and Dr. Mark D. Agars for their continued support, skilled analysis, and comprehensive evaluation. This thesis truly benefited from their wisdom and insight.

Additionally, I would like to thank Dr. Scott Roesch for the expert statistical assistance and advice. Dr. Roesch's continued support and caring attitude was instrumental throughout.

Finally, I would like to thank Dr. Larry Goldman for the late-night assistance and technical support. Dr. Goldman's assistance markedly improved the quality of this thesis.

DEDICATION

I dedicate this thesis to my family - Melody, James, Steven, Andrew, and Ashley. Their love provides the light by which I see.

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CHAPTER ONE

BACKGROUND

Today's organizations are facing significantly more internal and external pressures to produce than just a few decades ago. The impetuses behind these forces result from "sweeping economic, demographic, and technological changes" that have occurred over the past twenty years (Pearlman & Barney, 2000, p. 4). Some of these internal and external pressures include increased global competition due to development of continent-wide strategic trading blocks, an explosion in communication technology, and a ubiquitous demand for significant increases in operational and employee performance (Chase, Aquilano, & Jacobs, 2001). Arguably, of the internal and external pressures faced, employee performance may have the greatest impact on organizations "because performance of employees is a major determinant of how successful an organization is in reaching its strategic goals" (Gatewood & Feild, 2001, p. 3). As a result, the surging state of affairs has created unprecedented challenges for human resources professionals, applied psychologists, and the entire subfield of personnel selection (Pearlman & Barney, 2000).

Personnel Selection

Operationally, personnel selection "is the process of selecting candidates that can most effectively meet the demands of a specific position" (Oskamp & Schultz, 1998, p. 181). Gatewood and Feild (2001) define selection as:

> Selection is the process of collecting and evaluating information about an individual in order to extend an offer of employment. Such employment could be either a first position for a new employee or a different position for a current employee. The selection process is performed under legal and environmental constraints and addresses the future interests of the organization and of the individual. (p. 3)

Within personnel selection there are many "conventional" methods that organizations use to attain specific information about employees including oral interviews, paper-and-pencil tests/surveys, performance tests, and others. One selection method that is used relatively infrequently, but has been demonstrated to represent an excellent measurement tool is Biographical Data (Hunter & Hunter, 1984; Reilly & Chow, 1982; Nickels, 1994; Gatewood & Feild, 2001). In fact, over the past 100 years, Biographical data in its various forms has reliably established its ability to be one of the most effective predictors for many different criteria (Mitchell, 1994). For example, Biographical data (A.K.A. Biodata) has reliably predicted training, tenure, and proficiency ratings across organizations and time (Stokes & Cooper, 1994; Hunter & Hunter, 1984; Reilly & Chao, 1982). Yet, even though other selection measures do predict job related performance - to some degree - there are some stark differences between Biodata and these other measures.

For example, Biodata measures an individual's likely performance whereas other selection measures, like mental ability and performance tests, measure an individual's maximum performance (Mitchell, 1994). Thus the ability to measure a candidate's likely performance may provide the employer with additional critical insight about latent job related performance behaviors like motivation and determination.

In addition, Biodata predicts performance across a variety of dimensions like wages, tenure, training, and promotion (Hunter & Hunter, 1984; Reilly & Chao, 1984), which is in contrast to other selection measures (e.g., cognitive ability tests) that typically predict fewer dimension (Gatewood & Feild, 2001). However, Schmidt and Hunter (1998) stated that Biodata may not necessarily enhance predictability of job performance over that of mental ability tests, but, in the long run, may be more suitable as an assessment measure due to its face validity and likely reduction in discriminatory impact (Gatewood & Feild, 2001).

Biographical Data (Biodata)

The use of Biographical data to select employees is a century old practice that some organizations have employed with a great deal of success. For example, in the late nineteenth and throughout the twentieth century, actuarial organizations used Biographical data surveys extensively to predict sales performance and job success (Stokes, 1994). However, many more organizations and human resource professionals are naïve about this type of selection method and subsequently employ often less advantageous techniques. Additionally, those organizations that are faced with a significantly large pool of applicants "fail to exploit biographical data" successfully at the pre-selection stage (Cook & Taffler, 2000, p. 104). That is, organizations will often use two assessment techniques known as Training and Experience (T & E) evaluation and Weighted Application Blanks (WAB) to pre-screen employees.

T & Es are evaluations that typically consist of specific, qualitative, task related experiential information that's collected on a candidate and evaluated subjectively. Additionally, T & E's can be scored by the point method, but the method generates correlations coefficients with performance criteria at around .10 and is therefore seldom used (Gatewood & Feild, 2001). WABs are common format background questionnaires that are scaled by cross validating and subsequently weighting items based on the relative strength of their relationships with some performance criteria such as job performance or training success.

Thus, both assessment strategies - WABs and T & E's - are employed within organizations to pre-screen employees; however, regardless of type of scaling method used to assess an applicant's competencies, results can generate less than adequate results. For example, Hunter and Hunter (1984) conducted a meta analysis that examined T & E validity coefficients and found that the average coefficient was .11. In contrast, Biodata's validity coefficients are substantially higher and range from .21 to .53 across a variety of criteria (Mumford & Owens, 1987; Stokes & Cooper, 1994). Further, T & Es typically use raters to assess training and experience of candidates by examining common format data found on a job candidate's application and/or résumé. Empirically though, this subjective "sift" approach has been demonstrated to be notoriously prone to bias and often arbitrary (Wingrove, Glendinning, & Herriot, 1984).

Correspondingly, Weighted Application Blanks (WAB) are vulnerable to many problems too. For example, WABs provide for structure and reliability, but can result in erroneous predictions due to diminishment of prediction effectiveness over time and changes in performance criteria as a result of contextual influences (Gatewood & Feild, 2001). That is, as the job performance standards change over time due to external conditions like increased competition, the WAB's ability to predict performance is reduced. Thus, the strength of its structure and innate inflexibility invariably becomes its *Achilles heel* during periods of change.

The WAB is a very close relative of Biodata in that Biodata functionally extends the WAB to be more flexible and comprehensive. For example, Owens (1976) posits that WAB's are "...shorter, less systematic, and more purely empirical" than Biodata. Further, Biodata questionnaires are structured in a way that queries respondents via multiple-choice questions rather than yes or no and/or a fill-in-the-blank strategy - as typically found on WAB's.

The metamorphosis of the WAB and other pre-1940s biographical surveys occurred around World War II when the military extensively used background data to predict success in military training (Stokes, 1994). Hence, the transformation of the selection instrument (Biodata) probably occurred during the 1940s and can best be demarcated by the change in data collection methodology and expansion of type of questions asked; that is, from a dichotomous format to a "Likert" type scale - e.g., multiple choice - and from mostly common format questions to questions about personality - respectively.

Today, Biodata is one of the best overall predictors of job performance, trainability, job involvement, and adjustment to work (Hough, 2000) with an average uncorrected validity coefficient around .35 (Mumford & Owens, 1987). The seemingly ubiquitous success of Biodata questionnaires at predicting job performance led Gatewood and Feild (2001) to state the following:

> Edwin Henry, for example concluded "with very few exceptions it [Biodata] has been found to be the best single predictor of future behavior where the predicted behavior is of a total or complex nature." Likewise, William Owens reported, "one of the unmixed and conspicuous virtues of scored autobiographical data has been its clear and recognized tendency to be an outstanding predictor of a broad spectrum of external criteria." Finally, Wayne Cascio added that, "Compelling evidence exists that when appropriate procedures are followed...accuracy of biographical data as a predictor of future behavior is superior to any known alternatives." (p. 503)

As such, many researchers today believe that Biodata offers a powerful method of performance prediction and can considerably increase the probability of selecting the best candidate for the job. However, despite its relative success, Hammer and Kleiman (1988) found that less than 15% of respondents from a pool of 718 personnel directors actually employ Biodata and van Rijin (1992) suggests that even fewer public institutions use Biodata. Therefore, even with its historical roots and robust performance over the years, Biodata remains an enigma to many applied practitioners.

What Exactly is Biodata?

Gatewood and Feild (2001) state that Biodata questions generally comprise those questions asked of applicants concerning their personal backgrounds and life experiences. Biodata instruments are evaluations developed to assess *typical* antecedent experiences and behaviors relative to some criteria, such as job performance, dependability, and integrity. There are several methods of collecting Biodata information including paper and pencil, oral interview, computer based surveys (via the inter/intranet), and others. According to Mumford and Owens (1987, as cited by Nickels, 1994) - a standard paper and pencil technique for collecting life history information are Biodata items, in which individuals are asked to recall and report their typical behaviors or experiences in a referent situation.

Because life history experiences and past behaviors are thought to shape cognitive schemas, which are subsequently employed to negotiate proximal life situations, many applied psychologist feel that Biographical Data Questionnaires offer substantial potential to accurately predict future behavior. This assumption reflects the embedded belief that future behavior predicts by past behaviors. Mumford and Stokes (1992) wrote:

> People's past behavior and experiences condition their future behavior and experiences. This is not to say that people necessarily behave in the future precisely as they have in the past, or that background data items are sensitive solely to issues of nurture. Instead, this statement implies that prior learning and heredity, along with the environmental circumstances in which they express themselves, make some forms of behavior and experiences more likely than others in new situations. (p. 64)

Empirically, the assumption has been reliably demonstrated by many researchers including Eberhardt and Muchinsky (1982), Mumford, Stokes, and Owens (1992), and Mumford, Constanza, Connelly, and Johnson (1996) to name a few. Additionally, Mitchell (1994) states that "effectiveness of Biodata in predicting a diverse array of criteria has been demonstrated by over a century of research, [however] Biodata may currently be the least understood and most underutilized of the available alternatives for fair, cost-effective, and valid selection of personnel" (p. 485).

Criticism of Biodata

Despite persistent empirical evidence indicating high validity coefficients for a variety of criteria, for example manager performance of .35, sales success of .35, clerical performance of .48 (Mumford & Owens, 1987), there are many researchers who have brought up concerns about Biodata. For example, Mumford and Owens (1987) state that our understanding of the processes through which Biodata effects prediction is limited. They posit that underlying behavioral constructs influencing future behavior is relatively unknown and more research needs to be conducted to rectify the problem. Additionally, researchers suggested that significant one-time validity results decrease over time and across situations, which impacts the stability of the instrument. For example, Mael and Hirsch (1993) state that Biodata - when empirically keyed - is "highly sensitive to sample-specific characteristics, so when the key is cross-validated, the regression coefficient is vulnerable to excessive shrinkage"

(p. 719-720). Moreover, as inferred from Stokes (1994), opponents of Biodata criticize its use due to its dust bowl empiricism approach. That is, underlying psychological constructs and phenomenological cognitions that may play a profound effect on an individual's motivation are ignored for the simple assumption that an applicant's previous behavior will probably be replicated in the future.

The assertion has some merit in that the complexity of an individual's psychological makeup may be far more intricate than assessing quantity and quality of an autonomous antecedent action. For example, Dean, Russell, and Muchinsky (1999) proposed that courage or ego resiliency may have a moderating effect on behavior. Further, Meehl (1945) criticized the deductive Biodata approach because "it assumes that the test developer has sufficient insight and knowledge about the relationship between a test item and the underlying characteristic or construct to develop a measure of the characteristics without the benefit of data" (p. 115). Yet, practitioners and researchers have made strides in advancing our knowledge about some of these related issues and continue to develop "more rational [and intuitive] methods for

Biodata item development and scoring" (Stokes, 1994, p. xvii).

For example, Mael (1991) proposes a rainforest empiricism approach that would focus on all aspects of behavior and the findings of other psychological disciplines to assess and document the validity of Biodata items. Moreover, the rational/intuitive approach addresses some of the former complaints identified by relying on the judgment of subject matter experts to connect Biodata items to latent psychological constructs (Hough, & Paullin, 1994). Thus, due to the aforementioned criticism and subsequent spotlight on Biodata item development, much of the focus on ameliorating some of these concerns has been on scaling methodology.

Biodata Scaling

There are three basic strategies of Biodata scale construction. They consist of the external or empirical approach, internal or inductive approach, and the deductive or rational approach. These methods differ by how the items are selected and how they are weighted. Hough and Paullin (1994) stated that the external method "makes both decisions empirically - that is, items are selected and weighted based on observed differences both on item responses and on the criterion" (p. 109). In contrast, the inductive method "makes both decisions based on item analyses of the item pool" (p. 109) whereas the deductive or rational method "makes both decisions based on expert opinion" (p. 109) or theory.

All three scaling methods have, to some degree (depending on who you're quoting) relative value associated with constructing biodata inventories. For example, Hough and Paullin (1994) posit that the empirical scaling method yields items that lack distinguishable underlying constructs and thus reveals relationships where none were presumed apparent. Mumford and Owens (1987) championed the inductive approach for its ability to reveal psychological reality through factor analysis. Gatewood and Feild (2001) argued that rationally developed scales could predict performance at least as well as an empirically developed scale. However, there is no axiom here and questions remain about the predictability, validity, and long term stability of items when used with a particular scale and the appropriate scale to use within a given context.

For example, Hough and Paullin (1994) note that subtle items commonly found in empirical scaling may be of a spurious nature and possibly capitalize on chance depending on respondents' psychological characteristics.

Schoenfeldt (1974) demonstrated that factor -analytic and rational scales have predicted customer service criteria better than empirical - keyed items. Further, scale strategy may depend on a strategy-by-criterion interaction. That is, in an experiment conducted by Goldberg (1972), "very high" variance was accounted for by using the inductive or deductive approach when predictability of criterion was high; whereas, low variance was accounted for when an empirical method was used. In contrast, when the predictability of the criterion measure was low, the empirical method captured more variance than did the inductive or deductive method. Here, "predictability of criterion" is inferred as subtle versus obvious items where subtle items do not obviously reflect the criterion and obvious items do. Further, Hough and Paullin (1994) conducted a comparison of criterion-related validities of different scale construction strategies and summarized by stating "no method has a clear superiority over any other method in terms of criterion-related validity" (p. 125). Thus, to date, there is little scientific unanimity on the best scaling methodology for Biodata to maximize predictive utility.

Organizational Specificity of Biodata Scaling

Mumford and Stokes (1992) noted that all of the aforementioned scaling methods have their strengths and weaknesses, so the decision to select the most appropriate scaling method is somewhat contingent on the practical realities at hand. However, what about simply using a pre-existing Biodata inventory to predict job performance? In a meta analysis conducted by Schmidt and Rothstein (1994), Biodata instruments were found to be generalizeable across organizations despite general perceptions to the contrary. That is, across organizations, Biodata scales true validities "can be expected to be at least .26 or larger...given a 90% credibility value" (Schmidt & Rothstein, 1994, p. 249). Though, this research implies transportability of a Biodata instrument, one should not assume that specific contextual influences would not moderate behavior within a novel environment.

For example, an empirically keyed Biodata instrument may predict performance within one organization, but have spurious results in another. That is, significant one-time validity results from a Biodata instrument have a tendency to decay over time and across situations (Hogan, 1994). In addition, transportability may require performance expectations to remain unchanged across organizational structure, which is typically improbable when transporting from a union to a non-union environment. Further, in the pre-selection arena where an organization needs to reduce large applicant pools by evaluating specific task related skills, transporting an instrument may be difficult depending on level and complexity of a particular job.

Aside from generalizability, trying to empirically scale a Biodata instrument may be down right impossible due to organizational structure. For example, an organization that uses a narrow classification methodology strategy (many job classes and few incumbents) to organize its work force might be hard pressed to validate and cross validate a Biodata instrument due to lack of available incumbents. Moreover, within a union environment, it is sometimes very difficult to gather reasonably *pure* criterion data on incumbents due to regulatory, culture, and legal influences. It follows then that within this context, unfettered access to large numbers of incumbents to validate and cross validate an instrument without an excessive amount of error due to external influences may be folly. Hence, even if empirical validation methodology was deemed better than the other two methods - inductive and rational - (which it has not), its use may be restricted to those organizations that have relatively few job classes with large numbers of incumbents and categorical freedom to measure criteria without encumbrances.

In contrast, the deductive approach or rational method selects and weights Biodata items based on expert opinion and/or theory. Accordingly, it becomes immediately apparent that using this method in the aforementioned context has many advantages over the former. For example, the deductive approach does not require hundreds of incumbents to key a Biodata instrument, which is very beneficial when only a few incumbents are available. Further, selecting and weighting Biodata items via subject matter experts rather than empirically facilitates the process and may reduce error. Thus, we can conclude that the deductive approach is more suitable for organizations that: 1) employ a narrow classification methodology; 2) manifest low numbers of available incumbents; and 3) are restricted by high levels of associated bureaucracy.

Construct Validity of Biodata

Ideally, when developing and scaling a Biodata instrument via the deductive approach, hypothesized latent variables anchor the measure or indicant. That is, the

Biodata instrument measures a hypothesized construct defined *a priori* by subject matter experts and related job analysis (Fine & Cronshaw, 1994; Gatewood & Feild, 2001). For example, academic achievement or vocational skills are constructs that may be identified as behaviors that are relative to some job. Subsequent labeling of constructs are somewhat influenced by interpretation and inferences made by the conceptual commonalities among Biodata items. Gatewood and Feild (2001) state that, "Construct validation is an accumulation of evidence that supports the links among the various indicants and constructs" (p. 185-186). Further, Shultz (1996) espouses "When...increased conceptual rigor in design and theorizing is applied to the measurement of personal constructs, more substantive and theoretically meaningful results are likely to be obtained" (p. 264). Thus, validating a Biodata instrument to assure relatedness of items to hypothesized latent variables is assumed critical for the overall validity and internal consistency of the testing instrument.

Confirmatory Factor Analysis (CFA) of a Biodata Instrument

The term CFA means testing hypothesized models for structure of functional relationships among observed variables and latent variables (Marcoulides & Hershberger, 1997). Further, Marcoulides and Hershberger (1997) state that the functional relationships are explained by parameters that specify the magnitude of the effect that independent variables have on dependent variables. Thus, CFA can be thought of as a series of linear regression equations that predict relationships between observed and latent variables. That is, a model's structure can be tested and confirmed thereby revealing the underlying factor structure of a particular domain (Ullman, 2001).

For example, based on theory, biographical items are developed to represent several behavioral dimensions or job related competencies. The Biodata instrument is administered to a pool of applicants and results are then tested for goodness of fit. Thus, if the proposed model *fits* the actual model then it is considered an acceptable candidate to represent the theoretical structure (Schoenfeldt & Mendoza, 1994). Therefore by definition and in contrast to empirical scaling methodology, Biodata items are not relied upon to predict performance criteria, rather we now hypothesize that behavioral constructs or factors will predict some job performance criteria.

Mumford and Owens (1987) suggest that "further examination of the predictive capabilities of factorial scales is needed, particularly since it was readily apparent that the content and construct validity of the scales has received little attention" (Stokes & Cooper, 1994, p. 335). That is, analyzing latent hypothesized variables is essential for the following reasons. It can provide meaningful descriptive information about the dimension being evaluated and hence, illuminate the relationships between predictor and latent construct. Recent research by Stokes and Cooper (1994) indicates that out of 11 factor analytic studies conducted, Academic factors have been analyzed the most. Mumford and Owens (1987) identified seven studies analyzing the factor Professional Skills, and five studies analyzing the factor Trade Skills. Hence, recent research supports the existence of the hypothesized variables - Education and Experience.

Moreover, Hough and Paullin (1994) state: "Evidence of construct validity of a scale rests on data demonstrating that the internal structure of the scale is homogeneous and data demonstrating that the measure of the construct relates to other variables as hypothesized; construct - valid scales are a necessity if scientific understanding is desired" (p. 138). Thus, to fundamentally understand the underlying structure of the instrument is critical for several reasons beyond those that have already been mentioned. For example, when developing a Biodata instrument rationally, hypothesized factors or behavioral constructs are at the heart of the scale and drives the development of the items. Therefore, for no other reason but to ensure homogeneity between construct and items, it becomes incumbent upon the researcher to assess the magnitude of the proposed parameters to determine if a functional relationship exists.

Common Format Biodata (CFB)

Common Format Biodata (CFB) is defined here as general information found on employment applications consisting of historical and verifiable pieces of information about an individual (Asher, 1972). Historical and verifiable Biodata is also known as Hard Biodata and is in contrast to Biodata items that are unverifiable (Gatewood & Feild, 2001; Shultz, 1996). Unverifiable Biodata is commonly referred to as Soft Biodata and consists of information that cannot necessarily be objectively verified. For example, "How much did you enjoy college?" is a soft Biodata item and must be subjectively evaluated for its authenticity; whereas, hard Biodata might ask: "How many years have you attended formal schooling?"

In the past, there has been ambiguity in predictive effectiveness of "common format" historical and verifiable Biodata items like education and experience. For example, Mosel (1952) and Pannone (1984) state that broad measures of amounts of education and experience are less useful as predictors whereas Hoiberg and Pugh (1978) have found, with N = 7,923 and across seven occupational groups, education is predictive of performance effectiveness.

Further, in 1971, England published *Taxonomy of Past Behavior* (as referenced by Brown, 1994), which identified personal history items found to be predictive of job success. Two of the taxa identified - education and employment experience - are consistent with information commonly found on general applications. Specifically, England noted the following as predictive of job success:

» Educational and vocational consistency

» Major field of study

» Specific courses taken

» Length of work experience

» Specific work experience

The fact that the research is contradictory and progressively dated is very relevant here. Assuming that in the 1950s, specificity and complexity of tasks may have been significantly less than today, then this intuitively suggest that relative need for education and experience may have been less too. Therefore, England's and Hoiberg and Pugh's findings that education and experience are predictive of job performance in 1971 and 1978, respectively, may in fact indicate a possible change in the relationship between job performance and education/experience. That is, as specificity and complexity of tasks increases, so does the relationship between education/experience and job performance increase. Thus, the following two studies may shed additional light on the subject.

In 2000, Cook and Taffler conducted an experiment examining the relationship between biographical data common to application forms/résumés and success on a written entrance examination. In their experiment, 442 college graduates trainees entering a 3-year training contract with 22 medium sized chartered accountancy firms were selected as participants. The six independent variables that were significant (i.e., $p < .05$) consisted of questions relating to education. The dependent variable was pass or fail on the written entrance examination. Using a logistic regression approach, analysis revealed

$p < .01$; $R^2 = .23$ and $r_{pbi} = .53$. Thus, the study demonstrated that common format biodata relating to education "contains sufficient predictive data to support an actuarial approach to selection at the professional entry level" (Cook & Taffler, 2000, p. 114). Parenthetically, in Cook and Taffler's discussion, they also reiterated the point that adopting this type of biodata model can substantially decrease organizational costs while increasing effectiveness.

Quinones, Ford, and Teachout (1995) created a "framework specifying two dimensions along which work experience measures can vary" (p. 887). That is, they developed the following two dimensions: measurement mode (amount, time, and type) and level of specificity (task, job, organizational). The utility of the structure was examined by analyzing 44 historical studies with N = 25, 911. The results of the meta-analysis revealed that the estimated population correlation between experience and performance was .27. However, more importantly, they discovered that Measurement Mode "amount," ($M_p = .43$, $SD = .17$) and Level of Specificity "task" ($M_p = .41$, $SD = .17$) had the highest correlation with work performance. Here M_p is an average confidence interval around the estimated population correlation, which used the standard error of the estimated population correlation (SE_{Mp}). Quinones et al. (1995) defined Measurement Mode "amount" as "how many times a particular task was performed; [thus,] individuals performing a task more often are viewed as having more work experience" (p. 897). Level of Specificity "task" was defined as performance of a particular duty or operation as part of the requirements of a Job. The researchers also discovered that measurement mode: time, had the next highest relationship with work performance, M_p = .27, SD = .11.

Thus, assuming (previously) that specificity and complexity of tasks has a positive linear relationship with time and building off of the research from Biodata development, Biodata scaling, and the two aforementioned studies (Cook & Taffler, 2000; Quinones et al., 1995), the inferences suggest that: by using a Common Format Biodata approach with a rational scaling methodology based on the two general themes found on common format applications, Education (time) and Experience (Task-time), may play a significant role in predicting performance. Here we define Education - time as years of Education and Experience - task/time as years of task related experience.

Further, it is intuitively conceivable that education has levels associated with it as well; Education (time) and Education (specific). That is, vocational education (type of education that is specific and directly related to task performance) may capture a significant amount of job performance variance above and beyond that captured by Education (time) and Experience (task-time) alone. Education and Experience have been identified as predictive of success on an entrance examination and job performance respectively, but vocational education relating to job performance has been somewhat ignored in the literature. Baird (1982) stated that the "fidelity between content of past experience and the present job would directly enhance the process of learning the new job," as referenced by Morrison (1994, p. 453). Further, Morrison also posits, "The more proximal the past experience of adults is to the behavior that we desire to predict, the more we enhance our ability to predict future behavior" (p. 456). Since vocational education is typically task specific (fidelity) and sometimes very proximal in nature, it follows then that we may be able to increase predictability of the model: Education (time) and Task Experience (time), by adding Education (specific - vocational education).

In addition, Quinones et al. found that how long (time) an employee performed a task was positively related to job performance. So, assuming that we can evaluate Task Experience at this level: time, it also implies that specificity of experience might also positively relate to performance. Here we operationalize Task Experience (specific) as task experience conducted at a specific level within the organization; for example, a computer technician performing diagnosis at the *stand-alone* unit level, small group or network level, or organizational - systems level. Interestingly, Pannone (1994) states that one of the criticisms of a T & E is that even though they may "...delineate what an applicant has done in the past, [they] say little about an applicant's level of skill...." It follows then, that level of specificity would hypothetically lead to a greater level of experience. Thus, by adding Experience (specific) to a model that contains Education (time), Task Experience (time), and Education (specific), we may be able to significantly increase our prediction of job performance.

Criteria Measured

Typically, outcome variables used to determine validity of a Biodata instrument are related to job performance. That is, some criteria related to job performance, such as number of life insurance policies sold, is quantitatively measured and subsequently correlated with the respective Biodata instrument to determine shared variance. However, given that job performance indicants may not be available due to organizational constraints, a candidate's performance in an oral interview or on a written test may be a reasonable substitute. Consider the following figure:

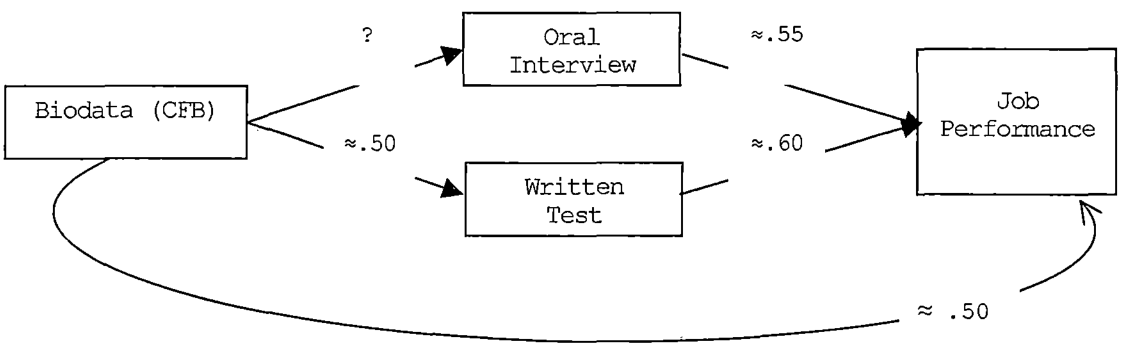


Figure 1. Independent and Dependent Variable Relationships

Figure 1 depicts validity coefficients associated with an observed variable (selection instrument) and its respective outcome variable. Recent research indicates that CFB, oral interview, and written test scores predict job performance. Specifically, Gatewood and Feild (2001) report that corrected validity coefficients for structured oral interviews and cognitive tests (based on meta analytic studies corrected for sample size) were around .60 and .55 respectively, depending on job performance criteria measured. In addition, corrected Biodata validity coefficients predicting job performance criteria are reported to be approximately .50 depending on the criterion used (Gatewood & Feild, 2001). Further, Cook and Taffler, (2000) found that CFB predicts performance on a written test (job knowledge) with r = .53. Thus, if CFB predicts oral interview and written test scores, then the variance captured may be the same variance that's being shared between oral interview/written test scores and job performance. Note, there is no apparent empirical evidence relating Biodata scores with structured oral interviews scores, hence the question mark between the two variables in Figure 1.

Additionally, the rationale behind this strategy is supported by the fact that regardless of job performance, applicants usually must perform successfully on a written test or structured oral interview before being offered a position. Thus, given that the utility of a Common Format Biodata instrument is partially based on its capacity to act as a valid pre-screening device to reduce large applicant pools, it follows then that inviting only those applicants with the best chance to succeed at subsequent testing stages (e.g., oral interview), would be advantageous. Further, Gatewood and Feild (2001) state that pairing a Biodata and a cognitive test together in a selection regiment can increase the overall predictability of job performance. Therefore, using structured oral interview and cognitive test results as proxies for job performance criteria to partially validate a pre-screening instrument makes logical sense and can provide critical information about observed relationships between the performance predictors.

Summary and Hypotheses

Due to Biodata's robust validity coefficients, lack of understanding, underutilization in the professional field, and potential as an "efficient and cost effective" pre-selection assessment tool, Biographical data in general and common format data - more specifically - make it thoroughly ripe for additional empirical examination. More importantly, this assertion becomes more salient within the public sector where cost effectiveness and efficiency are critical determinants for use due to declining budgets and shifting demands on organizational resources (e.g., increased cost of health benefits and rising fixed expenses). Further, there is a lack of construct evidence supporting the latent dimensions Common

Format Biodata purport to represent and no empirical evidence relating CFB with structured oral interviews.

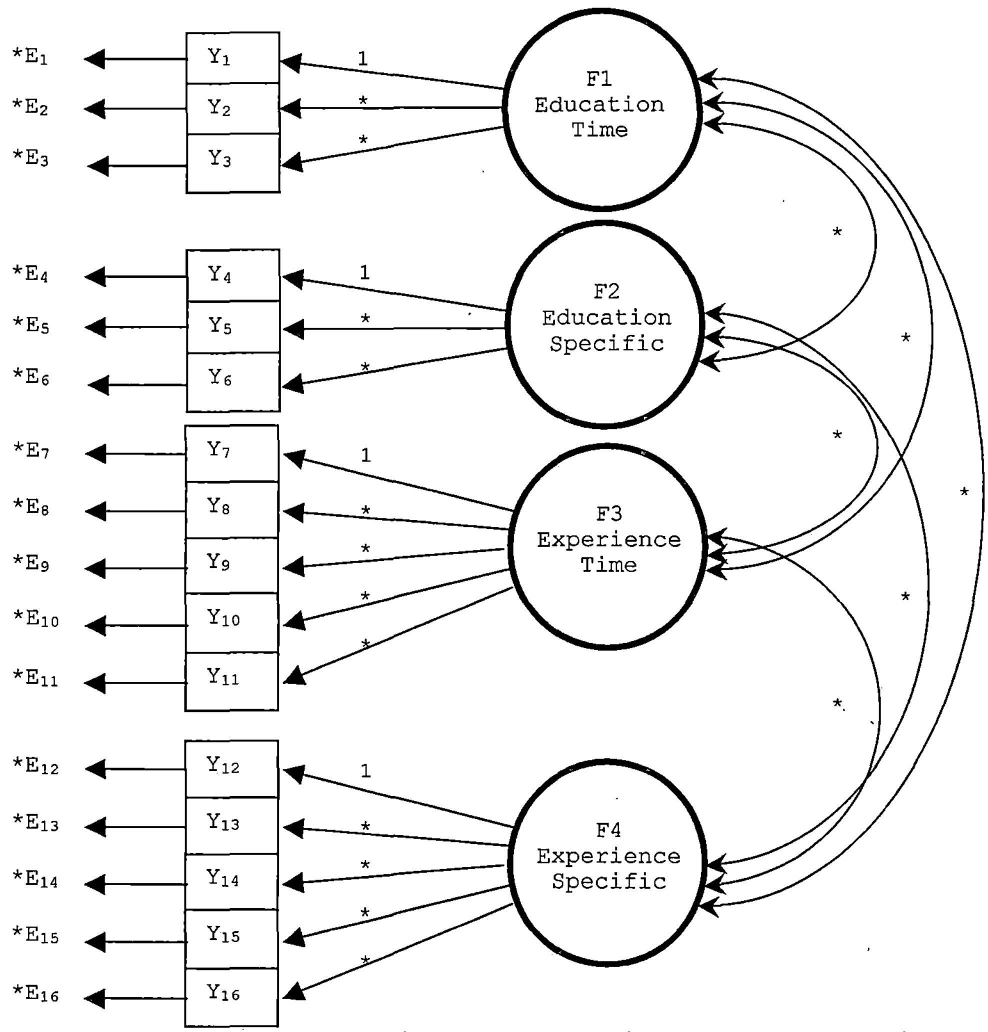
Thus, the current study focuses on professional assessment at the pre-selection stage where public organizations are somewhat constrained to work with common format application data (historical and verifiable or "hard biodata") alone to reduce large numbers of applicants to a more manageable pool. Specifically, this study concentrated on examining common format application data that is related to two common themes - Education and Experience. That is, the two themes universal to public domain applications are Education and Experience, which - mostly - can be objectively verified through examination of public and private archival data. Therefore, based on these two common themes - Education and Experience - and employing a rational scaling and content validation strategy to develop Common Format Biodata (CFB) instruments, several hypothesize were put forth.

Models to be Tested

Based on the work of Quinones et al. (1995) cited above, Model CFA - 4F (see Figure 1, Four Factor Model) is the initial logical model that is hypothesized to be the most salient and thus statistically consistent with the actual data. However, Model CFA - 4F is rather complex with four constructs (Education - time, Education - specific, Experience - time, Experience - specific). If Model CFA - 4F does not adequately represent the sample data, then a more parsimonious model - Model CFA - 2F - will be tested for consistency with the sample data. Model CFA - 2F contains two latent factors: Education - time/specific and Experience - time/specific.

If the covariance matrices of the two hypothesized models are not significantly different from each other then the most parsimonious model (e.g., CFA - 2F) will be used. The model chosen to best represent the sample data will then be confirmed with a second sample; see Figure 2 and 3 below.

Research Question. Which hypothesized model - either CFA 4F or CFA 2F - will be statistically consistent with the actual data? That is, which model will produce an estimated population covariance matrix that is most consistent with the sample (observed) covariance matrix? The model chosen will then be confirmed in a second sample.



Note: 12 regression coefficients, 6 covariance, and 16 variances; 34 parameters are to be estimated with 102 degrees of freedom; 16(16+1)/2 = 136 data points; model is over identified. The ratio of cases (≈200) to observed variables (16) is 13:1 and the ratio of cases to estimated parameters is 6: 1.

Figure 2. Hypothesized Confirmatory Factor Analysis Model

CFA - 4F

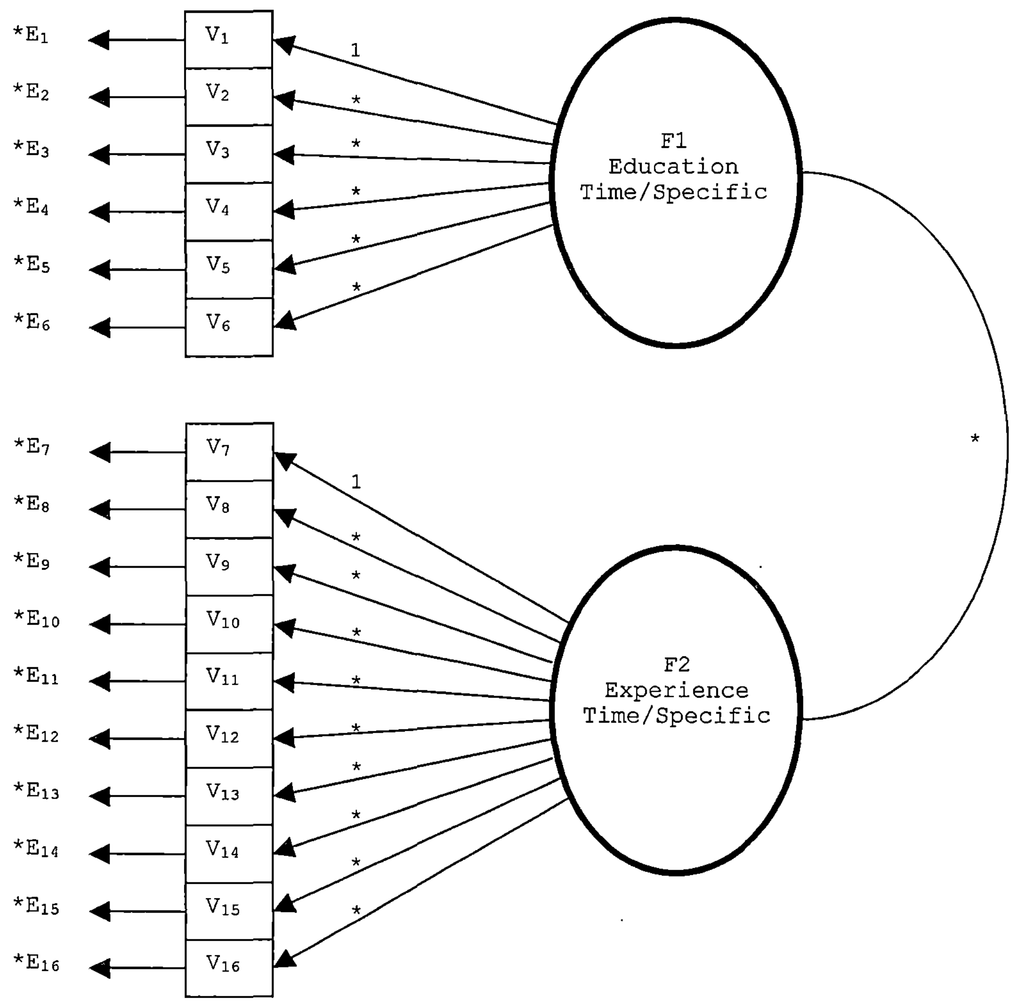


Figure 3. Hypothesized Confirmatory Factor Analysis Model CFA - 2F

Depending on the outcome from the research question the following hypotheses will be tested using four factors (Education - time, Education - specific, Experience - time, and Experience - specific) or two factors (Education - time/specific and Experience - time/specific).

Hypothesis 1_a. Employing a sequential regression strategy with 2 regression equations, a regression equation containing Education Factors 1 and 2 from CFA Model 4F or Education Factor 1 from CFA Model 2F will statistically predict overall performance scores on a structured oral interview. Here the independent variables are the hypothesized Education factor(s) and the dependent variable is the applicant's score on the structured oral interview.

Hypothesis 1_b. A sequential regression equation containing the hypothesized Experience factor(s) will account for substantial incremental variance beyond that accounted for by education alone in predicting oral interview scores.

Hypothesis $2_{a,b,c}$. A regression equation containing the hypothesized factors - Factors 1 – 4 from Model CFA - 4F or Factors 1 and 2 from Model CFA - 2F will be used to predict oral interview sub scores from structured oral interview. Thus:

a. Factors 1 - 4 or Factors 1 and 2 will significantly predict Computer Technologist Oral interview "Job Preparation" sub-scores.

b. Factors 1 - 4 or Factors 1 and 2 will significantly predict Computer Technologist Oral interview "Work Management" sub-scores.

c. Factors 1 - 4 or Factors 1 and 2 will not significantly predict Computer Technologist Oral interview "Oral Communication" sub-scores.

Hypothesis 3_a. Employing a sequential regression strategy with 2 regression equations, a regression equation containing Factor(s) 1 and 2 from CFA Model 4F or Factor 1 from CFA Model 2F will statistically predict overall performance scores on the COBOL written exam. Here the independent variables (IVs) are the hypothesized factors and the dependent variable (DV) is the written exam - job knowledge.

Hypothesis 3_b. A regression equation containing the IVs (Factors 3 and 4 from CFA model 4F or Factor 2 from Model 2F) will account for substantial incremental variance beyond that accounted for by the first regression equation. That is, the factor(s) containing the latent construct Experience will incrementally increase our ability to predict performance scores on the written exam above that provided by education.

CHAPTER TWO

METHOD

To explore the research question, a Common Format Biodata (CFB) questionnaire was given to 159 applicants who applied for the position of Assistant Programmer Analyst. To test Hypotheses $H1_{a,b}$ and $H2_{a,b,c}$, a CFB and structured oral interview was given to 60 applicants who applied for the position of Computer Technologist 1. In addition, to confirm the research question and to test Hypothesis $H3_{a,b}$, 73 applicants who applied for the position of Programmer Analyst - COBOL were asked to complete a CFB questionnaire and take a written test.

Assistant Programmer Analyst

This study was conducted at a large southern California public sector employer with a workforce of about 35,000 employees and 1100 job classifications. One hundred and ninety two candidates applied for the position of Assistant Programmer Analyst by mailing in a completed standard application developed and printed by the organization. Applicants who applied for the position were observed to be of diverse ethnic backgrounds and ranged in age from approximately 18-60 years with 18-30 years being the most prevalent; specific demographic information was not collected due to internal regulatory constraints, which leaves the aforementioned statement as a best estimate.

Procedure: Assistant Programmer Analyst: Common Format Biodata Questionnaire

All candidates who applied for the position of Assistant Programmer Analyst were invited to complete a sixteen-question Common Format Biodata (CFB) questionnaire - see Appendix A. One hundred and ninety two candidates were mailed (via US mail) the CFB questionnaire in May 2003 and given two weeks to complete the form. Candidates were required to return the CFB questionnaire by mail or by fax to the analyst in charge of the exam at the public sector employer's selection office. One hundred and fifty nine usable CFB questionnaires were returned.

Computer Technologist I

Participants who applied for the position of Computer Technologist I were invited to participate in a structured oral interview and complete a 15-question biographical data questionnaire (CFB) in March 2003 - see Appendix B. Applicants for the position were observed to be both men and women - though men were more prevalent - and between the ages of approximately 18 and 60; specific demographic information was not available consequently making the aforementioned information somewhat speculative. Candidates for the position were required to have a high school education and an A+ certification (skill to build and repair a computer) to compete in the examination process.

<u>Procedure: Computer Technologist I</u>

In March 2003, sixty-seven participants who applied for the position of Computer Technologist I were invited to the main testing center to participate in a structured oral interview and fill out a CFB questionnaire. Applicants were scheduled in groups of 9 (30-minutes apart) and total interview time was approximately 30-minutes. That is, approximately 7 groups of 9 applicants were scheduled 30 minutes apart to take part in the testing process.

Correspondingly, there were 9 interview panels consisting of 2 raters per panel. All raters were either subject matter experts (SME) or experienced, professional raters with the appropriate knowledge and skills.

Upon arrival at the testing center, a test proctor employed by the organization instructed applicants to present qualifying identification, read "Instructions to Candidates" (see Appendix D) and then wait for their name to be called for the oral interview. After applicants completed the oral interview, they were then asked by the proctor to complete a 15-question CFB questionnaire in an adjoining room. Candidates were allowed to take as much time as they wanted to complete the CFB questionnaire and they were not directly supervised. The entire process - oral interview and CFB - took applicants approximately 2-hours to complete. Sixty of the sixty-seven applicants that were invited showed up and completed both test parts.

Computer Technologist I: Oral Interview Raters

All oral interview raters were either subject matter experts or experienced raters who were knowledgeable in the area of computer repair and maintenance. Raters were briefed on the method and rating process and then paired with another rater. Raters were specifically instructed to review the candidate's application before beginning the actual interview. Further, raters were instructed to (if possible) conduct the interview within 30-minutes.

Programmer Analyst - COBOL

Seventy-three participants who applied for the position of Programmer Analyst - COBOL were invited to participate in a written exam, complete a 16-question CFB questionnaire and participate in a structured oral interview. Applicants for the position were both men and women - though men were more prevalent - and between the ages of approximately 18 and 60; this was based on observation as specific demographic information was not available, thus making the aforementioned information a best estimate.

Candidates for the position were not pre-qualified therefore allowing all who applied the opportunity to participate in the written and CFB test part. Applicants who were successful on the written exam (70% cut-off score) were invited back for the structured oral interview.

Procedure: Programmer Analyst - COBOL

In the first week of April 2003, seventy-three participants who applied for the position of Programmer Analyst - COBOL were invited down to the main testing center to participate in a written exam and fill out a 16-question CFB (see Appendix C). Over a three-day period (Monday, Tuesday, and Wednesday), applicants were scheduled in groups of 9 (3, 3, and 2-groups per day respectively), and 2-hours apart. That is, eight groups of 9 applicants were brought into the testing center, over a 3 day-period, 2-hours apart to take the computer based written test and the Common Format Biodata inventory. Total written test time was approximately 1½-hours. The

CFB questionnaire was administered to the applicants immediately after finishing the written exam and was not timed.

Written and Biographical Test Part: Programmer Analyst - COBOL

Upon arriving at the testing center applicants were instructed to present qualifying identification to a test proctor employed by the organization. Once applicant's identification was established, each applicant was asked to take a seat in front of a computer and begin answering proprietary questions relating to COBOL programming.

The test questions were purchased by the organization from Pre-valuate Software and were reviewed by three subject matter experts. In total, there were 42 COBOL related questions. Nine of the questions related to data division, 9 questions related to language, 7 questions related to syntax, 8 questions were miscellaneous and 9 questions related to columns. There were 30 basic questions, 11 intermediate questions and 1 advanced question.

Immediately after the applicant completed the 42-question examination, they were asked to complete the paper and pencil 16-question CFB questionnaire. Upon completion of the two test parts, each applicant was provided initial results from the written exam. That is, the initial results revealed only the number of answers correct on the written COBOL exam; at this point, they did not know if they qualified for the oral interview. Results from the Biodata instrument were mailed to the candidates within 2-3 weeks.

Common Format Biodata (CFB) Inventory

The CFB questionnaire was developed using a rational/intuitive, content validation approach. That is, four factors: Education - time, Education - specific, Experience - time, and Experience - specific and associated items were developed using archival data (job analysis, job description, and job bulletin) and input from subject matter experts.

The four Factors Education - time, Education - specific, Experience - time, and Experience - specific were developed in the following manner.

For reference, a competency was operationalized as a measurable human capability that is required for effective performance. A competency may be a single knowledge, skill, ability, or enabling behavior or it may be a cluster of any combination of these.

A preexisting competency model structure was used (developed by the public organization) to define the competency structure for the CFB inventories. Specifically, there were 7 competency categories A - D (see Appendix D, E, F, & G), each with several sub-competency dimensions. As can be seen on the related Appendices (D, E, F, & G), check marks were used to indicate the sub-competency dimension that was considered part of the competency category. These competency categories consisting of sub-competencies made up each of the 4 constructs (e.g., Education - time). Each Common Format Biodata inventory and their respective constructs (Education - time, Education - specific, Experience - time, and Experience - specific) were defined in the same manner.

<u>CFB Item Development Procedure</u>

Item development was modeled after Gatewood and Feild's (2001) classification response and behavioral content methodology. Thus, all questions were modeled in the following way: "Non-Continuum, Plus Escape Option" (p. 486) and verifiable, historical, actual behavior, factual, and specific (p. 487).

Common Format Biodata items were developed during a job analysis meeting with three subject matter experts for each CFB instrument - Assistant Programmer Analyst (APA), Programmer Analyst - COBOL (PAC), and Computer Technologist I (CT). The CFB items were based on two common themes associated with an application - Education and Experience. Subsequently, four factors were unanimously agreed upon to represent the corresponding factors associated with the job competencies (knowledge, skills, abilities and other relevant characteristics) as defined by the respective job analysis. These four factors were: Education (time), Education (specific), Experience (time), and Experience (specific).

Subsequently, items for each factor were written and then categorized by each SME incumbent based on the following scale:

Critical			Desirable				Not Critical		
1	2	3	4	5	6	7	8	9	10

Figure 4. CFB Item Scale

Three, current incumbent, subject matter experts participated in the item development stage. Items were evaluated on a continuum from 1-10 where 1 = critical 5 = desirable and 10 = not critical. Thus, Education (time/specific) items that attained an average score of 5 or below were retained. There was no attempt to rank the items on level of importance. After final review, there were a total of 3 items for Education (time) and 3 items for Education (specific) for each of the 3 CFB exams - Assistant Programmer Analyst (APA), Programmer Analyst - COBOL (PAC), and Computer Technologist I (CT).

Experience (time/specific) items were based directly on tasks that were defined within the job analysis. That is, tasks that were identified on the job analysis were formatted into "time" and "specific" questions and then categorized in the same method. Five items for each construct for the APA and PAC CFB inventory were retained and five and four items for each construct (Experience - time and Experience - specific) respectively were retained for the CT CFB inventory in the same aforementioned manner.

Construct Weighting

Items and constructs were not specifically weighted. That is, candidates were considered equal in ability to perform the related tasks if they had a lot of education and no experience, a lot of experience and no education or some relative combination of the two (i.e., a compensatory strategy was used to combine items). Those that had the highest total cumulative score were regarded as the most capable to perform the duties and responsibilities of the position as defined by the job analysis.

Of note, the total possible score for each construct respectively (Education - time, Education - specific, Experience - time and Experience - specific) was 3, 3, 5, and 5 for the Assistant Programmer Analyst (APA) and Programmer Analyst -COBOL (PAC) exam and 3, 3, 5, and 4 for the Computer Technologist CFB inventory.

The ratios between the Education constructs (time and specific) were equal for all CFB instruments and the ratios between the two Experience constructs (time and specific) for the APA CFB and PAC CFB inventory were also equal. However, for the CT CFB inventory, the ratios between the Experience (time and specific) constructs were fractionally un-equivalent with Experience (time) consisting of 5 available points and 4 available points for the Experience - specific construct. Further, more points were awarded for the two levels of Experience with 10, 10, and 9 available points respectively (APA, PAC, and CT instruments) as compared to the two combined levels of Education with 6 total available points.

The overall proportions reflected the SME's input that Experience should carry "marginally" more weight than Education. Here, marginal was operationalized qualitatively as a "little more" or a "little less" than. All three SME's approved the CFB's as positively, linearly related to job performance and representative of the competencies as defined by the job analysis.

Qualitative CFB Items

According to Hough and Paullin (1994), "evidence suggests that intentional distortion in self-report questionnaires is a concern..." (p. 136). Thus, there are several questions on each of the CFB inventories that are qualitatively measured but are not scored. These qualitatively measured questions function to discourage distortion. Further, these questions help to clarify the intent of the previous question and provide a resource to assist in verification if necessary. That is, several questions ask respondents to identify the number of educational hours or number of educational units received. Immediately after that question, respondents are asked to validate their response by writing the classes or courses taken and related units or hours. By performing this action, respondents realize that verification of their previous response is possible and thus potentially reduces false responding. Again, all qualitative questions were not scored and, for convenience, a box with a V in it designates the observed variable associated with the CFA model (see Appendix). Note, the box with the V in it was not present when the inventory was given to the candidates.

CFB for Assistant Programmer Analyst (APA)

Centering on two themes - education and experience - and four-sub themes - Education - time, Education - specific, Experience - time, and Experience - specific, CFB items were developed rationally and content validated as defined earlier in this section. After final review, there were three questions that related to Education - time, three questions that related to Education - specific, five questions that related to Experience - time, and five questions that related to Experience - specific for a total of 16 scored questions - see appendix Figure 2 and Appendix A.

CFB for Programmer Analyst - COBOL (PAC)

Biodata items were developed by focusing on time and specificity for each of the four factors and, after final review, there were three questions that related to Education - time, three questions that related to Education - specific, five questions that related to Experience - time, and four questions that related to Experience - specific - for a total of 16 scored questions - see appendix Figure 2 and Appendix C.

CFB for Computer Technologist I (CT)

Biodata items were developed by focusing on time and specificity for each of the four factors and, after final review, there were three questions that related to Education - time, three questions that related to Education - specific, five questions that related to Experience - time, and four questions that related to Experience - specific for a total of 15-scored questions - see Appendix B.

CFB Question Format

For all three CFB instruments, a multiple-choice self-assessment format was used where respondents chose the response that best fit their experiences. This is, in unity with Owens (1976), items with response options that lie along a continuum (either apparent or demonstrated), were used for ease of statistical analysis. All questions were scored the same and the responses were structured hierarchically, see Example 1 below.

Example 1 (Stem of the question here).

☐ = 1.00 point

☐ = 0.75 points

☐ = 0.50 points

☐ = 0.25 points

☐ = 0.00 points

On all three CFB questionnaires (APA, PAC, & CT), questions 14-18, 13-17, and 12-15 (respectively) were reversed. That is, the scale structure was opposite that of the preceding questions so that the value 1.00 was at the bottom and value 0.00 was at the top - see Example 2. This was done to guard against those candidates who might simply attempt to check off the top response iteratively.

Example 2 (Stem of the question here).

☐ = 0.00 point

☐ = 0.25 points

☐ = 0.50 points

☐ = 0.75 points

☐ = 1.00 points

Oral Interview Constructs

The structured oral interview conducted for the Computer Technologist I position assessed three general competencies. The three competencies were Job Preparation, Oral Communication, and Work Management skills (see Appendix E). The three constructs were identified and content validated by subject matter experts. The items that directly assessed the competencies were job related in that each question was framed with job related task, skills, and experience in mind. For example, asking applicants to recount a *job related incident* that demonstrates their ability to convey technical information to a non-technical person assessed the latent construct Oral Communication skills. Ideally, the applicant would relate an experience that occurred on the job. Therefore, in this context, oral communication skills may be related to the latent Experience factor associated with the CFB Questionnaire due to the probability that an applicant will convey an "on the job experience;" albeit, a relatively weak relationship.

Analyses

To explore the research question: A Confirmatory Factor Analysis strategy using EQS software was adopted. The models proposed are presented in the Figures 1-2 and were tested in order of presentation. That is, CFA Model - 4F was tested first and then CFA Model - 2F.

To Test $H1_{a,b}$ a sequential regression strategy was employed using SPSS. The first sequential regression analysis contained one dependant variable (Oral Interview scores) and two independent variables (Factors 1 & 2) from CFA Model - 4F.

The second sequential regression analysis contained one dependent variable (Oral Interview scores) and two independent variables (Factors 3 & 4) from CFA Model - 4F.

Proposed analysis for $H2_{a,b,c}$ employed a simultaneous entry strategy via multiple regression using SPSS. The three regression analyses each contained one DV (Job Preparation, Oral Communication, or Work Management - analyzed separately) and four independent variables (F1, F2, F3, & F4).

To test $H3_{a,b}$: Proposed analysis for H3 employed a sequential regression analysis using SPSS. The sequential regression analysis contained two regression equations with the first equation containing two independent variables (F1 & F2) and one dependent variable (Written Test score). The second regression equation contained the independent variables from the first equation plus two IVs from CFA Model - 4F (F3 & F4). Thus, a total of four IVs were contained within the second equation and analyzed sequentially so that *F* incremental was ascertained and tested for statistical significance.

CHAPTER THREE

RESULTS

Research Question: Assistant Programmer Analyst

The results of the investigation are reported in four sections: (1) Analyses of the Research Question (4 - Factor Model and 2 - Factor Model), (2) analyses of Hypothesis $1_{a,b}$, Sequential Regression of 4 - Factor Model on Computer Technologist Structured Oral Interview Scores, (3) analyses of Hypothesis $H2_{a,b,c}$, Regression of 4 - Factor Model on Computer Technologist Structured Oral Interview Job Preparation, Work Management, and Communication sub-scores, and (4) analyses of Hypothesis $H3_{a,b}$, Sequential Regression of 4 - Factor Model on Programmer Analyst - COBOL Written Test scores.

Analyses of the Research Question

A confirmatory factor analysis was performed on Common Format Biodata scores collected from participants who applied for the Assistant Programmer Analyst position. Analysis was performed using EQS 6.1 (XP version) on 16 observed variables. The hypothesized model presented in Figure 1 graphically illustrates the structure, where circles represent latent variables, and rectangles represent measured variables. Absence of a line connecting variables implies no hypothesized direct effect. A four-factor model of Education - time (F1), Education - specific (F2), Experience - time (F3), and Experience - specific (F4) was hypothesized. Three observed variables serve as indicators of the Education - time factor. Three observed variables serve as indicators of the Education - specific factor. Five observed variables serve as indicators of the Experience - time factor. And, five observed variables serve as indicators of the Experience - specific factor. The four factors were hypothesized to covary with one another.

Transformations of variables were attempted but did not restore normality; therefore, the estimation method Maximum Likelihood ROBUST was selected to address the non-normality (Ullman, 2001). Three multivariate outliers (case 6, 41, & 157) were discovered and deleted. Eight univariate outliers were discovered but were not deleted for the following reason. According to Ullman (2001), outliers that legitimately belong to the sample population are kept and dealt with through transformation or an estimation strategy. Given that the outliers were deemed legitimate and transformation of the variables unsuccessful, a ROBUST estimation method was employed to reduce the impact of the univariate outliers. Thus, using a ROBUST strategy, the assumptions of multivariate normality and linearity were evaluated through SPSS and EQS and met, Mardia's Coefficient (ROBUST) = .2463, Z < 3.3. Original data consisted of 159 cases. Confirmatory Factor Analysis (CFA) was performed using data from the 156 remaining candidates that completed the Assistant Programmer Analyst Common Format Biodata inventory.

Model Estimation

Maximum likelihood with ROBUST method estimation was employed to estimate both models - CFA Model - 4F and CFA Model - 2F. The independence model that tests the hypothesis that all variables are uncorrelated was easily rejectable, for the 2 Factor and 4 factor models, $\chi^2(103, N = 159) = 437.375$, $p < .0001$ (see Table 1). The hypothesized two factor model did not fit well statistically, MAMIMUM LIKELYHOOD $\chi^2(103, N = 159) = 437.375$, $p < .0001$ and did not fit well descriptively, Comparative Fit Index (CFI) = .635, Root Mean Square Error of Approximation (RMSEA) = .143(see Table 1). The 4 Factor Model did not fit well statistically, MAXIMUM LIKELYHOOD $\chi^2(98, N = 159) = 337.52$, $p < .0001$, but did fit better descriptively, Comparative Fit Index (CFI) = .737, Root

Mean Square Error of Approximation (RMSEA) = .128. The 4 Factor Model was statistically a better fit than the 2 Factor Model with the differences in χ^2 values of: $\chi^2(5, N = 156) = 87.335$, $p < .001$

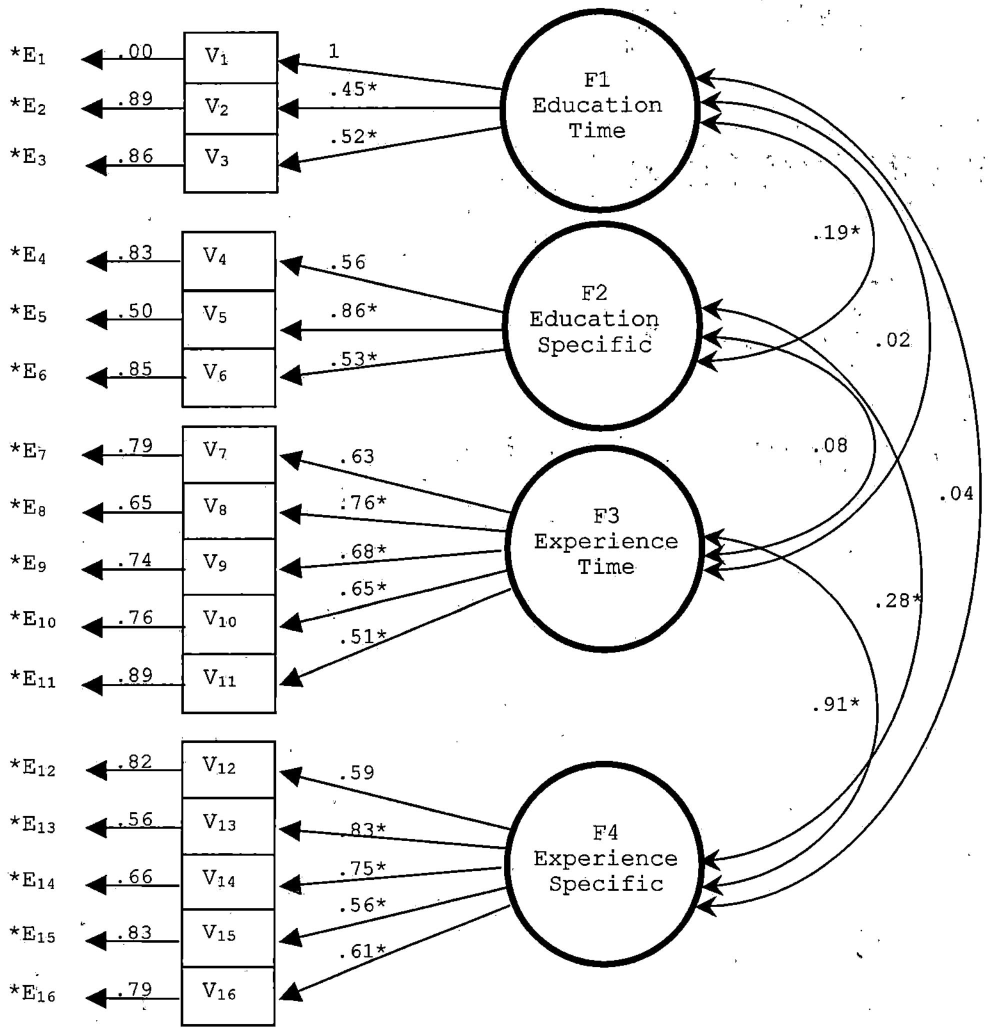
Table 1. Chi-Square of CFA Models Plus Fit Indices

CFA Model	χ^2	D.F.	N	CFI	RMSEA
CFA Model 4 - Factor	345.918	98	156	.737	.128
CFA Model 2 - Factor	433.253	103	156	.650	.144
Model Comparison	χ^2	D.F.	N	Difference in CFI	RMSEA
Model CFA 4-F vs Model CFA 2-F	87.335	5	156	.087	.016

Direct Effects

For the 4 Factor Model, all standardized factor loadings were generally large and significant (ranged from .45 to .75) and the factors generally accounted for a large amount of variance in the items (ranged from .20 to .68) - see Figure 5.

There were three pairs of constructs that were significantly intercorrelated. That is, latent constructs F1 and F2 were significantly correlated at $r_{1,2} = .19$, F2 and F4 were significantly correlated at $r_{2,4} = .28$, and F3 and F4 were significantly correlated at $r_{3,4} = .91$.



Note: 12 regression coefficients, 6 covariance, and 16 variances; 34 parameters were estimated with 102 degrees of freedom; 16(16+1)/2 = 136 data points; model was over identified. The ratio of cases (156) to observed variables (16) was 10:1 and the ratio of cases to estimated parameters was 5: 1. Significant at the 5% level are marked with *.

Figure 5. Hypothesized Confirmatory Factor Analysis Model CFA - 4F (Assistant Programmer Analyst; N = 156)

Modification

Modification was not attempted due to the fact that theoretically, any changes would be without cross-validation support. However, if modification was attempted, according to the Wald test, for the 2 - Factor model, there were no paths that could be removed that might benefit the solution. Additionally, for the 4 - Factor model, two paths (V2 - F1, & V3 - F1) could be dropped without significantly degrading the solution, but then only one variable would be left, V1 - F1, to represent F1 (Education - time).

When considering the LaGrange Multiplier test for the 2 - Factor model, a significant increase in fit would result by allowing a path from V14 to F1, $\chi^2 = 6.728$, though theoretically there is no support for this path. That is, Factor 1 represents Education - time and V14 is an Experience - specific item. Thus, theoretically, the two should be uncorrelated.

When considering the LaGrange Multiplier test (LMT) for the 4 - Factor Model, a significant increase in fit would result by allowing a path from V8 to F4, $\chi^2 = 10.217$, $p = .001$; and V16 to F3 $\chi^2 = 7.868$, $p = .005$. Empirically, the LMT indicates that by adding a path between an Experience - specific construct to an Experience - time item and an Experience - time construct to an Experience -specific item would appreciable increase the fit of the Model - Parameter Change = 1.720 and 1.411 respectively.

Alpha Coefficients

Finally, in examining the descriptive statistics for each Factor item and associated Alpha coefficients for the 4-Factor Assistant Programmer Analyst CFB instrument, inter item convergence is strongest for the two experience constructs and weaker for the two Education constructs - see Table 2 below.

Thus in summary, the 4-Factor Model containing Education - time, Education - specific, Experience - time, and Experience - specific was a better fit statistically and descriptively than the 2-Factor Model containing Education time/specific and Experience - time/specific. In addition, though modification could have significantly improved the fit of the 4-Factor Model, modification was not carried out because cross-validation was not possible.

Research Question: Programmer Analyst - COBOL

A confirmatory factor analysis was performed on Common Format Biodata scores collected from participants who applied for the Programmer Analyst - COBOL position in order to cross-validate the findings from the APA CFA.

Table 2. Assistant Programmer Analyst (APA) Descriptive Statistics and α Table (N = 156)

Factor 1: Education - time	Mean	SD	Skew (Z)	Kurtosis (Z)	α for APA APA
Item 1	.50	.16			
Item 2	.79	.29	-1.71	3.05	.47
Item 3	.24	.33			
Factor 2: Education - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 4	.28	.28			
Item 5	.36	.22	3.23	1.91	.62
Item 6	.25	.24			
Factor 3: Experience - time	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 7	.11	.23			
Item 8	.08	.21			
Item 9	.15	.29	11.71	16.27	.79
Item 10	.13	.25			
Item 11	.14	.25			
Factor 4: Experience - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 12	.23	.18			
Item 13	.18	.20			
Item 14	.22	.22	8.96	11.42	.80
Item 15	.32	.19			
Item 16	.33	.26			

A four-factor model of Education - time (F1), Education - specific (F2), Experience - time (F3), and Experience - specific (F4) is hypothesized. Three observed variables serve as indicators of the Education - time factor. Three observed variables serve as indicators of the Education - specific factor. Five observed variables serve as indicators of the Experience (time) factor. While, five observed variables serve as indicators of the Experience - specific factor. The four factors are hypothesized to covary with one another.

The assumptions of multivariate normality and linearity were evaluated through SPSS and EQS and met, Mardia's Coefficient (ROBUST) = .1293, $Z < 3.3$. There was one skewed and kurtotic variable, V13 (Level of Programming in Visual Basic) $Z = 3.8$. This variable was transformed using LG10(X + 1) function and Z was subsequently reduced to $Z < 3.3$.

After examination through SPSS FREQUENCY AND REGRESSION, there was one univariate and one multivariate outlier; the univariate outlier was not deleted and the multivariate outlier (case 53) was deleted. Original data consisted of 73 cases. Confirmatory Factor Analysis (CFA) was performed using data from the 72 remaining candidates.

Model Estimation

Maximum likelihood with ROBUST method estimation was employed to estimate two models. The independence model that tests the hypothesis that all variables are uncorrelated was easily rejectable for the 4 - factor model, $\chi^2(98, \underline{N} = 153) = 991.65$, $p < .01$.

The 4 - Factor Model did not fit well statistically, $\chi^2(98, \underline{N} = 72) = 172.7249$, $p < .0001$, but did fit well descriptively, Comparative Fit Index (CFI) = .914, Root Mean Square Error of Approximation (RMSEA) = .104.

Direct Effects

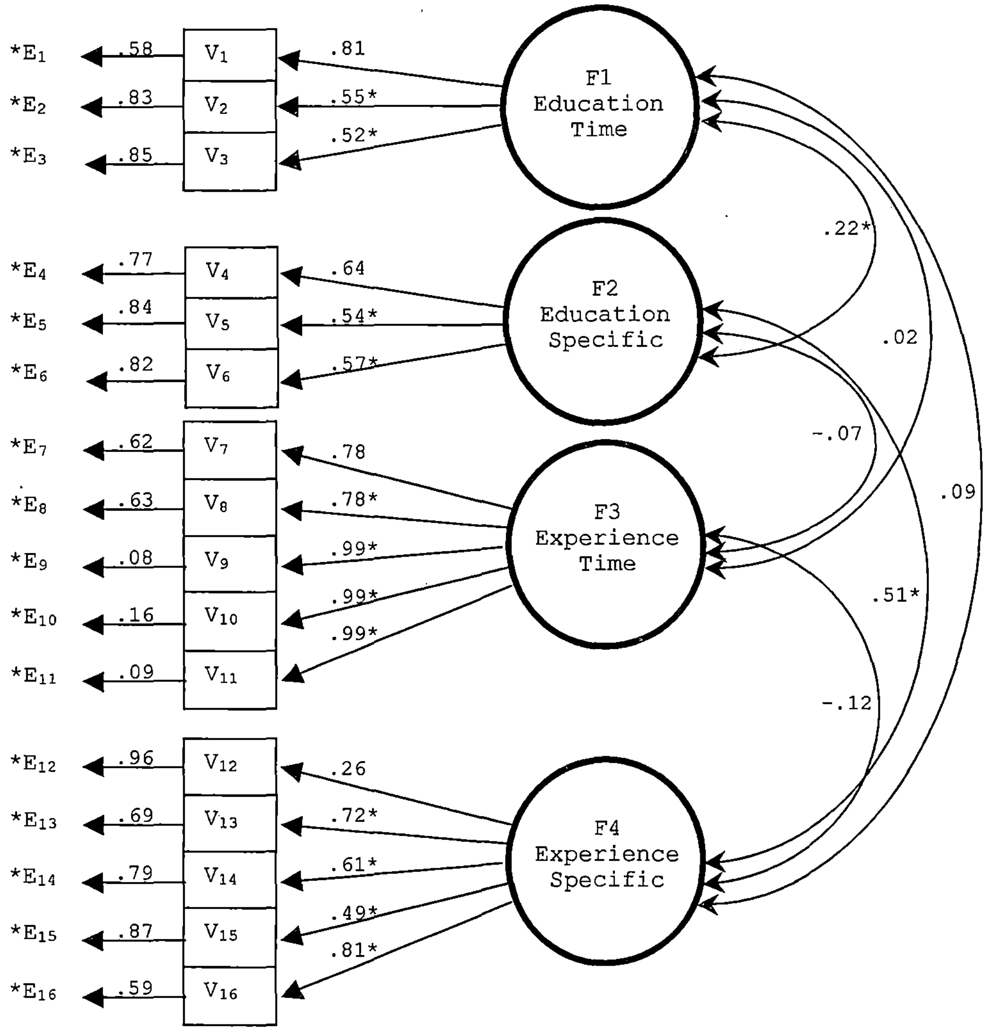
For the 4 Factor Model all standardized factor loadings were generally large and significant (ranged from .26 to .99) and the factors generally accounted for a large amount of variance in the items (ranged from .07 to .99); see Figure 6.

Additionally, there were two significant intercorrelation between constructs - F1 and F2 at $r_{1,2} = .22$ and F2 and F4 at $r_{2,4} = .51$.

Modification

A post hoc model modification was not performed; however, according to the Wald test, for the 4 - Factor Model, there were no paths that would ultimately benefit the solution if dropped.

When considering the LaGrange Multiplier test for the 4 - Factor Model, a significant increase in fit would result by allowing a path from V10 to F2, $\chi^2 = 8.455$, $\underline{p} = .004$, Parameter Change = .121 and V15 to F3, $\chi^2 = 7.653$, $p < .006$, Parameter Change = .330. Again, empirically, the LMT indicates that by adding a path from



Note: 12 regression coefficients, 6 covariance, and 16 variances; 34 parameters were estimated with 102 degrees of freedom; 16(16+1)/2 = 136 data points; model was over identified. The ratio of cases (72) to observed variables (16) was 5:1 and the ratio of cases to estimated parameters was 2:1. Significant at the 5% level are marked with *.

Figure 6. Hypothesized Confirmatory Factor Analysis Model

CFA - 4F (Programmer Analyst - COBOL)

Education - specific construct to an Experience - time item and from an Experience - time construct to an Experience - specific item would improve the fit significantly. However, given that these changes cannot be cross-validated, modification was not preformed.

Alpha reliability levels for the Assistant Programmer Analyst - COBOL CFB instrument were strongest for the two experience constructs and weaker for thee two Education constructs - see Table 3 below.

Table 3. Programmer Analyst - COBOL (PAC) Descriptive Statistics and α Table (N = 72)

Factor 1: Education - time	Mean	SD	Skew (Z)	Kurtosis (Z)	α for APA APA
Item 1	.51	.18			
Item 2	.66	.31	5.00	2.83	.65
Item 3	.45	.44			
Factor 2: Education - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 4	.30	.33			
Item 5	.43	.30	-1.03	-1.67	.61
Item 6	.28	.31			
Factor 3: Experience - time	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 7	.71	.35			
Item 8	.60	.36			
Item 9	.70	.35	-.18	-.99	.96
Item 10	.72	.34			
Item 11	.70	.55			
Factor 4: Experience - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**α for APA APA**
Item 12	.60	.31			
Item 13	.22	.27			
Item 14	.30	.34	.08	1.11	.73
Item 15	.61	.30			
Item 16	.26	.27			

Hypotheses $1_{a,b}$:
Computer Technologist I

Sequential regression was employed to determine if addition of latent construct CFA-4F (Experience - time (F3) and Experience - specific (F4)) significantly improved prediction of candidates oral interview test scores beyond that afforded by latent construct CFA-4F (Education - time (F1) and Education - specific (F2)). Analysis was performed using SPSS REGRESSION and SPSS FREQUENCIES for evaluation of assumptions.

The independent variable Education - time (F1) was not normally distributed (positively skewed) and therefore was transformed using LG10(X + 1) function. After transformation all IVs were normally distributed thus the assumptions of normality, linearity, and homoscedasticity of residuals were met. Further, with the use of a $p < .001$ criterion for Mahalanobis distance, no outliers among the cases were identified. No cases had missing data and no suppressor variables were found, $N = 59$.

Table 4 (below) displays the results according to each step. Step 1 (where F1 and F2 were entered into the equation) displays R, R^2, Adjusted R^2, the unstandardized regression coefficients (B), the standardized regression coefficients (β), and intercept. Step 2 displays (where all four factors were entered into the equation) the correlations among the variables, R, R^2, Adjusted R^2, change in R^2, (R^2_{change}), the unstandardized regression coefficients (B), the standardized regression coefficients (β), and the scale Means, Standard Deviations, and intercept.

Table 4. Sequential Regression of 4 - Factor Model on Structured Oral Interview Scores

Variables	Written Test	F1	F2	F3	F4	R	R^2	Adj. R^2	R^2 Change	B	β
Step 1											
F1 (LG10)						.34	.11*	.08		24.56	.26*
F2										3.41	.14
Constant	84.63										
Step 2											
F1	.31**					.58	.34*	.29	.23*	15.76	.17
F2	-.22*	33**								5.55	.22
F3	.45**	.12	-.14							9.08	.31
F4	.45**	.13	-.04	.74**						6.30	.21
Means	75.11	.07	.65	.60	.63						
Standard Deviation	7.11	.08	.28	.25	.23						
Constant	74.42										

N = 60
Note: * = $p < .05$
** = $p < .01$

After step 1, the latent constructs Education - time (F1) and Education - specific (F2) from Model CFA-4F - significantly predicted oral interview scores, R = .34, $F(2, 57) = 3.62$, $p < .05$, $R^2 = .11$, Adj. $R^2 = .08$; thus supporting hypothesis $H1_a$.

After step 2, with latent constructs - Experience - time and Experience - specific from Model CFA-4F added to prediction of oral interview scores, the latent constructs incrementally improved our ability to significantly predict oral interview scores, $R^2_{change} = .23$, $F_{change}(2, 55) = 9.34$, $p < .001$. Addition of latent constructs Experience - time and Experience - specific from Model CFA-4F to the equation, did significantly improve R^2; thus supporting Hypothesis $H1_b$. With all IVs (factors) added into the analysis, the four latent constructs significantly predicted oral interview scores, $R = .58$, $R^2 = .34$, Adj. $R^2 = .29$, $F(4, 55) = 7.03$, $p < .001$.

Beta weights associated with each latent factor and their significance in predicting structured oral interview scores in the first and second step of the sequential regression analyses are as follows. Specifically, for Step 1, F1 (Education - time) significantly predicted oral interview scores with $p < .05$. That is, after entering both latent constructs into the equation, only Education - time significantly predicted Oral Interview test scores. Thus, applicants who spent more time in school significantly received better scores on the Oral Interview.

However, for Step 2, only F2 (Education - specific) and F3 (Experience - time) came close to significantly predicting oral interview scores p = .07 and p = .07 respectively. As such, for every one unit increase in F2 scores, oral interview scores increased 5.55, M_{Oral} = 88.49 and for every one unit increase in F3 scores, oral interview scores increased 9.08, M_{Oral} = 88.49 (see Table 4).

Reliability analysis using the Alpha scale revealed that all items representing their respective factors were within limits; equal to or above .70 - see Table 5 below.

For Factor 1, if "V3" was removed the Alpha coefficient would have increased to r_{ALPHA} = .94. For Factor 2, if "V4" was removed, the Alpha coefficient would have increased to r_{ALPHA} = .84. For Factor 3, there were no items that could have been removed to improve Alpha. For Factor 4, if "V12" was removed Alpha would increase to r_{ALPHA} = .73.

Hypotheses $2_{a,b,c}$:
Computer Technologist

Regression analysis was employed to determine if a model containing latent constructs Education - time, Education - specific, Experience - time, and Experience -

Table 5. Computer Technologist I (CT) Descriptive Statistics and α Table (N = 60)

Factor 1: Education - time	Mean	SD	Skew (Z)	Kurtosis (Z)	Std. α for PAC
Item 1	.20	.22			
Item 2	.20	.26	.89	-1.23	.87
Item 3	.10	.29			
Factor 2: Education - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**Std. α for PAC**
Item 4	.80	.34			
Item 5	.66	.36	1.83	.34	.72
Item 6	.47	.35			
Factor 3: Experience - time	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**Std. α for PAC**
Item 7	.83	.25			
Item 8	.33	.36			
Item 9	.81	.27	2.91	.96	.83
Item 10	.32	.36			
Item 11	.67	.35			
Factor 4: Experience - specific	**Mean**	**SD**	**Skew (Z)**	**Kurtosis (Z)**	**Std. α for PAC**
Item 12	.85	.23			
Item 13	.41	.37	1.87	.05	.70
Item 14	.84	.25			
Item 15	.41	.39			

specific from CFA Model CFA-4F predicted Job Preparation, Communication, and Work Management Skills sub-scores, respectively. Analyses were performed using SPSS REGRESSION and SPSS FREQUENCIES for evaluation of assumptions.

The four independent variables were normally distributed; thus, the assumptions of normality, linearity, and homoscedasticity of residuals were met. Further, with the use of a $p < .001$ criterion for

Mahalanobis distance, no outliers among the cases were identified. No cases had missing data and no suppressor variables were found, N = 58.

After entry of the four IVs, (Education - time, Education - specific, Experience - time, and Experience - specific) the latent constructs significantly predicted Job Preparation sub-scores from the oral interview, $R = .59$, $R^2 = .35$, Adj. $R^2 = .30$, $F(4, 54) = 7.15$, $p < .001$. Results from this analysis support Hypothesis $H2_a$; see Table 6.

Table 6. Regression of 4 - Factor Model on Structured Oral Interview Job Preparation Sub-Scores

Variables	Job Preparation	F1	F2	F3	F4	R	R^2	Adj. R^2	B	β
F1 (LG10)	.20								2.66	.03
F2	.30*	.31*				.59**	.34	.30	8.60*	.35*
F3	.42**	.12	-.16						7.20	.26
F4	.45**	.10	-.07	.74*					8.54	.28
Means	89.34	.06	.64	.59	.63					
Standard Deviation	6.92	.07	.28	.24	.23					
Constant	73.99									

N = 60
Note: * = p < .05
** = p < .001

Analysis of the standardized beta weights for each factor resulted in only F2 being significant at $\beta = .35$ $p < .05$. That is, for every one-unit increase in Education

- specific scores, Job Preparation scores increased 8.60. All other Factor beta weights were non-significant.

After regressing the latent factors onto the dependent variable - Work Management - the constructs Education time and specific and Experience time and specific significantly predicted Work Management sub-scores from the oral interview, $\underline{R} = .55$, $\underline{F}(4, 54) = 6.02$, $p < .001$, $\underline{R}^2 = .30$, Adj.$\underline{R}^2 = .25$. Results support Hypothesis $H2_b$; see Table 7.

Table 7. Regression of 4 - Factor Model on Structured Oral Interview Work Management Sub-Scores

Variables	Work Management	F1	F2	F3	F4	R	R^2	AdjR^2	B	β
F1 (LG10)	.33**					.55	.30**	.25	18.69	.20
F2	.22*	.33*							5.19	.20
F3	.43**	.13	-.14						10.12*	.34*
F4	.39**	.13	-.04	.74*					3.64	.12
Means	88.16	.07	.64	.59	.63					
Standard Deviation	6.92	.07	.28	.24	.23					
Constant	75.21									

Note: N = 60, * = p < .05, ** = p < .001

In analyzing the Beta weights for each Factor, only F3 (Experience - time) significantly predicted Work Management Sub-Scores at $\beta = .34$, $p < .05$. That is, for every one unit increase in Factor 2 (Education - specific) scores, Work management sub-scores increased 10.12.

After regressing the latent factors onto the dependent variable - Oral Communication - the latent constructs Education - time and specific and Experience - time and specific significantly predicted Oral Communication sub-scores from the oral interview, R = .51, F(4, 54) = 4.80, p < .005, R^2 = .26, AdjR^2 = .21. Results do not support Hypothesis $H2_c$; see Table 8.

Table 8. Regression of 4 - Factor Model on Structured Oral Interview Communication Sub-Scores

Variables	Oral Communication	F1	F2	F3	F4	R	R^2	AdjR^2	B	β
F1 (LG10)	.22*								18.67	.20
F2	.21	.33*							5.19	.21
F3	.40**	.13	-.15			.51	.26**	.21	10.11*	.35*
F4	.42**	.13	-.04	.74*					3.64	.12
Means	88.35	.07	.65	.59	.63					
Standard Deviation	7.33	.08	.28	.24	.23					
Constant	75.21									

Note: N = 60, * = p < .05, ** = p < .001

Analysis of the Beta weights for each Factor resulted in only F3 (Experience - time) significantly predicting Oral Communication sub-scores, β = .35, p < .05. That is, for every one unit increase in Experience - time scores, Oral Communication sub-scores increased 10.11.

Hypotheses $3_{a,b}$:
Programmer Analyst COBOL

Sequential regression was employed to determine if addition of latent constructs (Experience - time, Experience - specific) from Model CFA-4F improved prediction of written test scores beyond that afforded by latent constructs (Education - time, Education - specific) from CFA-4F Model. Analysis was performed using SPSS REGRESSION and SPSS FREQUENCIES for evaluation of assumptions.

The two independent variables were normally distributed and the assumptions of normality, linearity, and homoscedasticity of residuals were met. Further, with the use of a $p < .001$ criterion for Mahalanobis distance, one multivariate outlier among the cases was identified and this case was eliminated. No cases had missing data and no suppressor variables were found, N = 72.

Table 9 displays the results according to each step. Step 1 (where F1 and F2 were entered into the equation) displays R, R^2, Adjusted R^2, the unstandardized regression coefficients (B), the standardized regression coefficients (β), and intercept. Step 2 displays (where all four factors were entered into the equation) the correlations between the variables, R, R^2, Adjusted R^2, change in R^2

(R^2_{change}), the unstandardized regression coefficients (B), the standardized regression coefficients (β), Means, Standard Deviations, and intercept.

Table 9. Sequential Regression of 4 – Factor Model on Programmer Analyst – COBOL Written Test Scores

Variables Step 1	Written Test	F1	F2	F3	F4	R	R^2	Adj. R^2	R^2 Change	B	β
F1						.14	.02	-.01		.87	.02
F2										-.69	-.14
Constant	76.97										
Step 2											
F1	.00					.14	.02			2.81	.06
F2	-.13	.14								-.76	-.15
F3	.51**	-.08	.01			.53	.28*	.24	.26	18.41	.51*
F4	.05	.12	.29*	.12						1.59	.03
Means	75.11	.54	.34	.68	.37						
Standard Deviation	11.76	.24	.23	.33	.18						
Constant	62.96										

Note: N = 72, * = $p < .05$, ** = $p < .001$

After entry of the two constructs - CFA-4F (Education - time and Education - specific) – into the first step of the sequential regression model (Step 1), results did not predict written test scores, $\underline{R} = .14$, $\underline{R}^2 = .02$, $\underline{F}(2, 69) = .64$, $p = .53$; these results do not support hypothesis $H3_a$. In addition, for the first step, Beta coefficients for each Factor (F1 & F2) did not statistically predict Written Test scores; $p > .05$.

After step 2, with CFA-4F (Experience – time and Experience - specific) added to the model, prediction of

Written test scores significantly improved with $\underline{R}^2_{change}$ = .26, $\underline{F}_{change}(2, 67)$ = 12.277, $p < .001$. Addition of construct CFA-4F (Experience - time and Experience - specific) to the equation did significantly improve $\underline{R}^2$; thus, results support $H3_b$.

After entry of the two IVs, R was significantly different than zero at the end of the final step. With all four factors entered into the analysis, the four constructs significantly predicted written test scores, $\underline{R}$ = .53, $\underline{F}(4, 67)$ = 6.57, $p < .001$, $\underline{R}^2$ = .28, Adjusted $\underline{R}^2$ = .24

For Step 1 of the sequential regression analysis, no Factor Beta weights significantly predicted COBOL written test scores.

Step 2 standardized Beta weights (β) associated with each construct - F1, F2, F3, and F4 - were .06, -.15, .51, and .03 respectively. Only F3 (Experience - time) with β = .51 was significant at $p < .05$. Thus for every one unit increase in Experience - time scores, COBOL written test scores increased 18.41.

CHAPTER FOUR

DISCUSSION

As presented in the introduction, the impetus of this study was driven by a ubiquitous demand for organizations to produce more products and services at lower costs and with fewer resources. As such, this demand has forced personnel selection professionals to seek out and develop selection measures that satisfy Federal selection guidelines while also being cost effective. Thus, Common Format Biodata (CFB) may be the selection tool of choice for many reasons. For example, Biodata is one of the best predictors of job performance across a variety of job dimensions (Eberhardt & Muchinsky, 1982; Mumford, Stokes, & Owens, 1992; Mumford, Constanza, Connelly, & Johnson, 1996; Mitchell, 1994). Further, employing a Common Format Biodata instrument to pre-screen large applicant pools within a public sector environment facilitates the selection process and leverages data readily available on common employment applications.

However, empirically, Common Format Biodata (CFB) surveys have little construct validity evidence to ensure item - dimension consistency. Further, there is an absence of relational evidence connecting the CFB instrument with structured oral interviews. More importantly though, there is a degree of ambiguity when it comes to scientific understanding of the constructs that drive job performance and therefore a corresponding need to uncover the operative behaviors behind job performance (Hough & Paullin, 1994). Thus, the research question and subsequent hypotheses were spawned from an applied and scientific need with intent to objectively quantify the findings.

Research Question

Accordingly, in an attempt to fill the need and answer the questions, the research question asked: Which hypothesized model - either CFA 4F or CFA 2F - will be statistically consistent with the actual data? That is, which model will produce an estimated population covariance matrix that is most consistent with the sample (observed) covariance matrix? The model chosen was then confirmed in a second sample.

Results from the confirmatory factor analyses performed on the Assistant Programmer Analyst CFB instrument revealed that the four-factor model was a much better fit than the two factor model. Even though the 4 - Factor Model did not fit very well statistically and only marginally descriptively, modification may have improved fit. Further, in comparing the two Models together statistically, results indicated that there was a significant difference between the two (see Table 1), with the 4 - Factor model fitting significantly better.

In an attempt to confirm the aforementioned findings, a confirmatory factor analysis was performed on the Programmer Analyst - COBOL CFB exam. Results revealed that the 4-Factor Model fit reasonably good, which provided optimism that the four constructs were indeed salient behavioral constructs. Further, evidence suggest (via the Lagrange Multiplier Test) that if modification was attempted, improvement in the 4-Factor Model's fit may have brought RMSEA within the .08 tolerance level as prescribed by Ullman (2001).

<u>Alpha Coefficient Discussion</u>

In examining the Alpha reliability levels for each CFB instrument, inter item convergence appears to be strongest for the two experience constructs and weaker for thee two Education constructs.

Reviewing the item statistics for each factor and CFB test, Alpha levels could not be improved by removing any of the Factor related items for the APA and PAC CFB inventory. However, Alpha could be improved in the CT CFB inventory if items within Factors 1, 2, and 4 were deleted.

Interestingly, the strength of the inter-item correlation of PAC Factor 3 items equals .96. Here, the average response for the Factor was .68 and the standard deviation was .33. Thus, candidates for this job position had a reasonably high level of task-related job experience and consistency of response was very high.

In direct contrast, Candidates' average response on APA Factor 3 (F3), Experience - time, was .12 and the standard deviation = .19. Thus, even though the standard deviation was smaller for this Factor as compared to the same factor for the PAC CFB inventory, inter-item response was less consistent ($\alpha = .79$ compared to $\alpha = .96$) and the average experience was dramatically less; .68 for the PAC CFB compared to .12 for the APA CFB.

Statistically, the Alpha coefficients for Computer Technologist Common Format Biodata inventory were consistently strong across all latent factors. These results suggest that although the items were fundamentally similar, the specific differences caused a more reliable response rate.

Overall, alpha coefficients for Factors F1 and F2 imply multidimensionality for both instruments. That is according to Nunnally (1978), a commonly agreed cut-off of 0.70 and above is acceptable. Thus, the low alpha coefficients for the two constructs reflect a lack of consistency among the relative items. This does not necessarily indicate a poor scale; rather, it indicates the possible presence of an additional latent construct.

The low alpha is apparently contributing to the poor fit in the APA instrument and affecting the fit of the PAC instrument, especially the descriptive fit index RMSEA, which is an estimate of fit in a model compared to a perfect (saturated) model. Low "N" (N = 72) might be the culprit for the PAC instrument due to an increase in the probability of a spurious effect, but doubtful for the APA instrument. The indication suggests that the Education - time and Education - specific construct has not been reliably assessed and thus may need to be further refined.

Two significant problems exist within the data and distributions that affected the outcome of these analyses. That is, the majority of the variable distributions for the Assistant Programmer Analyst position were significantly skewed. Specifically, all of the variables that defined the Experience - time Factor were positively skewed to the point where transformation was required. Further, after attempting transformation, all these variables were still significantly skewed, Z > 3.3. The somewhat "sloppy fit" may be an artifact from this distribution problem.

As was mentioned earlier in this discussion, the Assistant Programmer Analyst's entrance qualifications were minimal at best, in that only a college degree or 30 semester hours of specific programming courses were required. Therefore, most applicants who applied for the position had college degrees and little or no experience or had the requisite 30 semester hours of relative course work and little to no experience.

In contrast, the entrance qualifications for the Programmer Analyst - COBOL position required one year of programming experience, which apparently directly affected the distribution. That is, the pool of applicants was more normally distributed among the Education and Experience Factors compared to the Assistant Programmer Analyst applicant pool.

The other main problem that existed pertained to the low number of participants who completed the Programmer Analyst - COBOL Common Format Biodata survey. Thus, this low number, (N = 72) inherently causes the Maximum Likelihood solution to become unstable. However, remarkably, before modification, the CFI for the 4-Factor model was strong, CFI = .913. In addition RMSEA = .104, which indicates a modest fit, may be distorted due to the fact that in small samples RMSEA over rejects the true model; according to Ullman (2001). Thus, one reason for the relatively "Good" fit identified by the CFI index may be directly attributable to the item distributions. That is, all the distributions were normal except for variable 13 (level of experience programming in Visual Basic), which was transformed using the LOG10 function. Thus, after this one transformation, all of the variables were approximately normally distributed.

The overall analyses suggest that there are four distinct factors that predict the scores on the associated items. In Figure 6, all of the estimated regression coefficients were significant (except for the fixed variables V1, V4, V7, & V12). Also of note, the Experience - time Factor (F3) had the highest collective coefficient strengths, which implies that the latent Factor is well represented; α = .795. In addition, the correlation between the Factors is very interesting as well (see Figure 6, CFA Model 4F). That is, F1 (Education - time) and F2 (Education - specific) correlated at .22. This was expected since both Factors were Education constructs. However, the strength of the correlation was still weak enough to extract two separate factors. Factors 3 and 4 (the Experience Factors) were negatively correlated at -.12, which infers orthogonality. Factor 2 (F2), and Factor 4 (F4) were correlated at r = .507. This infers that the "Specific" constructs assessed had somewhat similar characteristics, but not necessarily to the point where they would merge into one factor.

In contrast, analyzing Figure 5, (CFA Model 4F: Assistant Programmer Analyst) correlations between the factors suggest that three factors might be afoot. That is, all the Factor correlations are weak or marginal except for the correlation between F3 and F4. As can be seen, Factors 3 and 4 are strongly correlated at .80, which implies convergent validity. Thus the assumption drawn from these results might suggest that a 3 - Factor model rather than a 4 - Factor model could statistically be a better fit. That is, the three factors might be Education, Vocation, and Experience. In this case though, caution must be prescribed due to the fact that the distributions were so skewed for the Assistant Programmer Analyst position. It may be that an entry level job position with low entrance qualifications is better suited with three constructs (Education, Vocation, and Experience) and a job position that requires more experience fits better with 4 constructs as empirically demonstrated.

In summary, the statistical analyses marginally support the 4 - Factor Model over the 2 - Factor Model. However, due to the small sample size and skewed distributions, results should be confirmed on another sample and cross-validated to support any possible modifications. Further, due to the stronger statistical support for the 4 - Factor Model, this paradigm was used to analyze the seven remaining hypotheses.

Hypothesis $1_{a,b}$: Computer Technologist Structured Oral Interview Scores

Hypothesis 1_a theorized that the latent construct Education - time (F1) and Education - specific (F2) would significantly predict oral interview scores. After analysis, results revealed that prediction was significant thus supporting hypothesis $H1_a$.

Accordingly, the implications suggest that the combined influence of the two independent variables (Education - time and Education - specific) predict candidates' performance on the Computer Technologist structured oral interview. Thus the evidence suggest that the more time applicants spend on a formal education and the more specific task related courses an applicant completes, subsequently improves their structured oral interview scores.

These results support the assertion that length of education and amount of specific education play a significant role in an applicant's ability to perform the critical competencies as defined by the job analysis. Further, the two constructs, Education - time, Education - specific, demonstrate that a specific behavioral pattern may manifest job related performance.

An argument put forth in Chapter I suggested that as specificity and complexity of job related tasks increase so does the need for education and experience increase. Thus, hypothesis $H1_a$ implies support for the first half of this assertion and suggests a possible linear relation between complexity of task and formal and specific education. That is, as the combined behavioral dimensions defined by F1 and F2 increase so does job related performance increase.

Correspondingly, one might say that computer related jobs require a high level of task specific knowledge and could imply that specific education would correlate strongly with the performance variable - oral interview scores. However, the beta weights associated with each Factor, F1 and F2, suggest differently. That is, Factor 1 significantly predicts oral interview performance, but Factor 2 does not. This suggests that for this position, broad computer related knowledge was more important than specific related knowledge; in terms of success on the oral interview.

Additionally, $H1_b$ hypothesized that by adding the Experience constructs (Experience - time (F3) and Experience - specific (F4)) to the model, we could incrementally increase our ability to predict oral interview scores. As hypothesized, the latent constructs significantly increased our ability to predict the dependent variable - oral interview scores

Finally, with all factors added into the model, we hypothesized that the latent constructs Education time (F1) and specific (F2) and Experience time (F3) and specific (F4) would predict oral interview scores. After analysis, the model was found to be statistically significant too.

Of interest are the Beta weights associated with each latent factor and their significance in predicting structured oral interview scores. As mentioned in the results section, in the first and second step of the sequential regression analyses only F1 (Education - time) in Step 1, significantly predicted oral interview scores and only F2 (Education - specific) and F3 (Experience - time) in Step 2, came close to significantly predicting oral interview scores (p = .07 and p = .07 respectively). Thus, one might infer that pre-screening applicants via a CFB assess some global aspect of job competency that's largely related to general education (F1), task education (F2), and task experience (F3).

Therefore, as proposed, Common Format Biodata (CFB) statistically predicted Computer Technologist's oral structured interview scores for each hypothesized analysis. Interestingly, the variance accounted for by the Education time (F1) and specific (F2) constructs (11.3%) was substantially less than the unique variance accounted for by the Experience constructs, F3 and F4, $R^2_{inc.}$ = .23. This suggests that for this job, raters may have felt that experience weighed heavier than education when evaluating applicant's ability to perform on the job. Notably, this was the same feedback that was provided by the SMEs when items for the CFB inventory were developed.

Moreover, the results partially support the following two assertions. That is, Quinones et al. (1995) stated that experience (time & specificity) plays a significant role in job performance and Cook and Taffler's (2000) statement that Common Format Biodata significantly predicts job related performance.

Additionally, recall in the first chapter of this thesis stating there was no empirical evidence linking Common Format Biodata scores with structured oral interview scores. Review the following Figure:

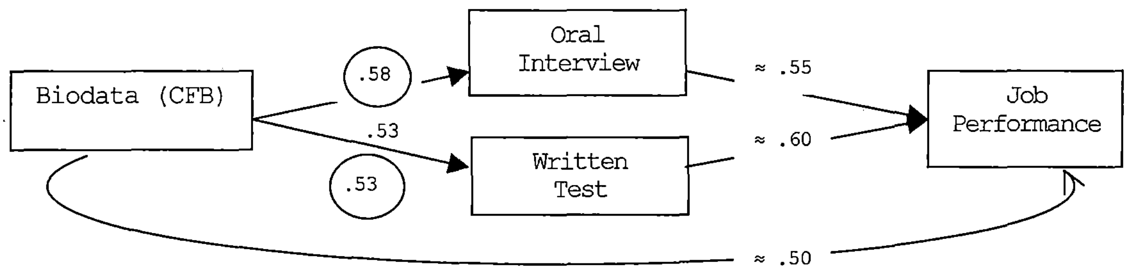


Figure 7. Modification of Independent and Dependent Variable Relationships

Now, however, we can complete the model (circled correlation are findings from this study) and see that the CFB instrument relates to the oral interview and written test in the same relative pattern that the oral and written exams compare to job performance. Even though this is only one study suggesting that the shared variance is the same, it does partially support SMEs' assertion that higher scores on the Common Format Biodata instrument are predictive of job related performance. Moreover, one might posit that using oral interview and written tests as proxies for job performance may be a viable strategy to predict job performance given the results.

Hypothesis $2_{a,b,c}$: Computer Technologist Oral Interview Sub-Scores

The second hypothesis ($H2_a$) posited that the combined four latent factors - F1, F2, F3, and F4 - would predict Job Preparation sub-scores. Results indicate that the hypothesis is supported. Specifically, 35% of the variance in actual Job Preparation sub-scores was accounted for by the four latent factors, while 30% of the variance in theoretical Job Preparation is accounted for by the four Latent factors.

Descriptive statistics for this dependent variable - Job Preparation - tell a remarkable story too (see Table 5). For example, Factors 2, 3, and 4 resulted in significant correlations. Additionally, examining the Beta weights for the four Factors, Factor 2 was the only factor that significantly predicted Job Preparation sub-scores. This suggests that for Job Preparation, raters were very concerned with the applicants' vocational aptitude and fidelity of specific experience with the Computer Technologist I position. That is, candidates who had taken many hours of vocational classes and specific computer classes (MCSE and MCP) scored remarkably well on the sub domain - Job Preparation. Thus, in contrast to hypothesis $H1_a$ and $H1_b$ where Education - specific did not play a significant role in predicting overall oral interview score, this Factor (F2) did play a significant role in predicting the Job Preparation sub-score.

At face value, this seems to make a great deal of sense. That is, one might expect that an applicant who has undertaken the effort to ascertain specific knowledge related to a position has been more richly prepared and therefore would score higher on a Job Preparation indicant.

The second hypothesis ($H2_b$) stated that the combined four latent factors would predict Work Management sub-scores. Results indicate that the hypothesis is supported. That is, 30% of the variance in observed Work Management sub-scores was accounted for by the combined four latent factors, while 25% of the variance in theoretical Work Management was accounted for by the four latent factors.

Additionally, for the dependent variable Work Management, significant correlations were discovered for all four extracted factors (see Table 7). However, only Factor 3 (Experience - Time) significantly predicted Work Management sub scores. This suggests that, for the raters, actual time on the job was the most relevant factor contributing to appropriate work management skills.

$H2_c$ hypothesized that the combined four latent factors would not predict Oral Communication sub-scores. Results indicate that the hypothesis is not supported. Specifically, 26% of the variance in observed Oral Communication sub-scores was accounted for by the four latent factors, while 21% of theoretical Oral Communication was accounted for by the four latent factors.

Unexpectedly, the four latent factors played a significant role in predicting candidates' ability to respond to questions that are intended to assess their ability to communicate orally.

As mentioned, we did not expect to statistically predict "Oral Communication" sub-scores from the extracted Biodata factors - Education - time (F1) and specific (F2), and Experience - time (F3) and specific (F4). Face validity would suggest that Oral Communication skills might share only a small amount of variance with Education and Experience. However, it may be that within this environment, an applicants' ability to convey oral communication skills depended upon a general knowledge of the main subject area -computers. Thus, if an applicant could not convincingly speak about computers in general, then that inability may have proportionally affected raters' opinions about oral communication skills.

In Evaluating the descriptive statistics (see Table 8), results indicate that the relative correlation of F1, F3, and F4 with the dependent variable were all statistically significant. Here, only F2, Education - specific was not significant - though very close at $p = .06$.

Additionally, examining the Beta coefficients for all extracted factors, only one standardized beta coefficient F3: Experience - time, significantly predicted Oral Communication sub-scores. That is, Applicant's with more time at related job tasks were significantly more likely to score higher on the Oral Communication sub-domain. Thus one might posit that the ability to effectively communicate orally depended on how long an applicant had performed tasks related to the job.

In summary, for $H2_{a,b,c}$, the four latent behavioral constructs predicted performance on all three sub dimensions of the structured oral interview. Further, Hypothesis 2_a and Hypothesis 2_b were supported, but the null Hypothesis $H2_c$ was not supported. The results suggest that the CFB assesses global behavioral dimensions associated with the general fitness dimensions assessed in a structured oral interview.

Further, after analysis of the Beta weights associated with each Oral Interview sub-dimension, results show that Education - specific significantly predicted Job Preparation sub-scores on the structured oral interview. This suggests that as task specific vocational training increased so did relative scores on the Job Performance indicant. Further, the Beta weight for Experience - time factor significantly predicted scores on the Work Management sub-score; which implies length of experience performing tasks influenced raters perception of an applicant's ability to organize, prioritize, and complete assigned duties.

The differential effects of the two factors on the two sub-dimension scores (Job Preparation and Work Management) implies a complex relationship between job performance and Education/Experience. That is, only one Factor (F1) for Job Preparation in Step 1 significantly predicted oral interview scores; and additionally, only one Factor (F2) for Job Preparation and one Factor (F3) for Work Management in Step 2 significantly contributed to predicting respective oral interview dimensions. Here, our predicted behaviors were represented by sub-factors of

Education and Experience, which empirically manifested scores on the structured oral interview sub-domains. Thus, Edwin Henry's (1966) following statement seems to apply: "...with very few exceptions [Biodata] has been found to be the best single predictor of future behavior where the predicted behavior is of a total or complex nature."

Hypothesis 3: Programmer Analyst - COBOL

The third hypothesis proposed ($H3_{ab}$) that Education - time and Education - specific and Experience - time and Experience - specific would sequentially predict performance on the COBOL written exam. This hypothesis partially replicates Cook and Taffler's (2000) study, but adds the two Experience (time and specific) dimensions.

Results support the second hypothesis, but not the first. That is, it was hypothesized that the two latent factors Education - time and Education - specific would predict performance on the COBOL written exam. Results indicated that the hypothesis was not supported. The primary reason for this may be based on the fact that the written exam tested skills most likely learned on the job. Specifically, COBOL is an *old* programming language and as such, COBOL programmers probably learned most of their trade skills *on the job* rather than at a university. Thus, this is in contrast to Cook and Taffler (2000) research that found a reasonably strong correlation between a written exam and Education - r_{pbi} = .53. However, in Cook and Taffler's (2000) study, their written exam was a comprehensive entrance exam that tested general financial knowledge, which was probably taught at the university.

Results from the analyses supported the final hypotheses - $H3_b$. After adding the latent constructs Experience - time (F3) and Experience - specific (F4) to the regression equation, both $R^2_{inc.}$ and Multiple R^2 were statistically significant. Thus, the results partially support Quinones et al.'s (1995) finding that experience time and specific predicts job performance - albeit a cognitive component rather than some other job performance criteria (e.g., supervisor ratings).

In evaluating the descriptive statistics for this analysis, only F3 (Experience - time) resulted in a significant r. That is, F1, F2, and F4 were not significantly correlated indicating that for this COBOL exam, only experience on the job mattered. Further, F3's beta weight was the only factor that significantly predicted COBOL written test scores. An explanation for this may be in the fact that there are few vocational schools and even fewer formal schools that teach COBOL programming skills in the 21st century. Thus, the use of

Common Format Biodata (in its current form) may be contingent upon the type of job position or type of job related performance criteria. For example, Common Format Biodata (Education - time and specific and Experience - time and specific) predicts applicant's scores differentially, depending on type of job position (Computer Technologist, Programmer Analyst - COBOL) or type of performance evaluation (Oral Interview, Written Test).

In comparison to hypothesis $H1_a$ (model containing the combined Education Factors predicting oral interview performance), hypothesis $H3_a$ had a significantly weaker variance associated with the performance criterion (written test scores). The difference between the two is that the combined Education Factors predicted performance on the oral interview, but not on the COBOL written test. Based on the findings from Cook and Taffler's (2000) study, a significant predictive relationship was expected between the combined Education Factors and written test scores.

This lack of significance might imply that the CFB - in its present form, may be more useful in capturing variance associated with overall job performance that's typically gleaned from interviews rather than a distinct or cognitive related job performance competency that is demonstrated on a written test. That is, the oral interview attempts to assess the "General Fitness" of the applicant by asking questions relating to job relative behavioral constructs (e.g., Job Preparation, Oral Communication, and Work Management skills and abilities), which is broad in its spectrum in relation to a job knowledge cognitive ability test.

However, this may also suggest that a written test may need to be evaluated to determine degree of relatedness to the associated factors. That is, whether or not a written test assess skills learned from on the job training or learned from a pedagogical institution.

In summary of Hypothesis $H3_{a,b,c}$, $H3_a$ was not supported, but $H3_b$ and $H3_c$ were supported. Although the overall results duplicate the Cook and Taffler study (2000) with $r = .53$ for their study and R = .53 for this study, closer scrutiny of the analyses reveal that Education -time and Education - specific were not responsible for the significant findings. That is, Experience - time was the construct driving performance on the Written COBOL exam. These findings suggest that for a written exam, performance may be dependent upon type of written test taken.

Limitations

Several limitations exist for this research. Of course, the most notable is the fact that all of the research was conducted on job positions associated with a computer classification and within a public sector environment. Thus, transporting the CFB instrument to other job classifications may result in spurious results. Further, implications suggest that caution should prevail when attempting to pre-screen employees for other classifications such as maintenance and operations or finance using CFB inventories. Moreover, due to the skewed variables associated with the Assistant Programmer Analyst CFB and low N (N = 72) associated with the Programmer Analyst - COBOL CFB, CFA results should be interpreted with caution. That is, CFA results indicate only a modest fit for the Programmer Analyst - COBOL CFB inventory; thus, it is difficult to state with robust conviction that the four latent behavioral constructs do in fact manifest scores on their respective Common Format Biodata items. Though the CFI index results were reasonably strong before modification, further research should be conducted to affirm these results.

Another limitation may include the rational scale methodology that was used to develop these CFB inventories. That is, there may be some latent bias that affected development of the CFB items and/or the way they were classified under each particular dimension. Thus, the use of an alternative item or scale development methodology may result in better or worse results.

Summary

We asked the question: Which hypothesized model - either the 2 - Factor or the 4 - Factor model will be statistically consistent with the actual model. Results indicated that the 4 - Factor model statistically fit the actual model best. These findings provide crucial (albeit limited) support for the behavioral constructs that are indicative of job performance as defined by the subject matter experts.

Further, we hypothesized that the 4 - latent factors would predict performance on the Computer Technologist I structured oral interview and the Programmer Analyst - COBOL written exam. After analysis, support for these hypotheses were significant except for hypothesis $H3_a$, which was not supported. The belief is that the CFB may have to be amended or empirically scaled depending on the type of written test taken.

Finally, we hypothesized that the Common Format Biodata instrument would predict Job Preparation sub scores and Work Management sub scores, but not communication sub-scores. Results supported the first two hypotheses, but not the last one - $H2_c$. These findings indicate that all three-sub dimensions share substantial variance with the four latent factors. This implies that the Common Format Biodata instrument may be a general fitness test that assesses some global job competency, which is the intent of the structured oral interview.

Therefore, the Common Format Biodata may indeed be an excellent tool for selection professionals to employ to pre-screen applicants for competencies related to job performance. Application of the tool is cost effective and somewhat innocuous in that information found on typical employment applications is fully disseminated and assessed. Further, the behavioral constructs that drive job related performance are generally consistent with those found in this research and identified by England (1971) and Quinones et al. (1995); that is, Education - time, Education - specific, Experience - time, and Experience - specific. Given this evidence, future research should concentrate on the boundaries of these four constructs.

APPENDIX A

ASSISTANT PROGRAMMER ANALYST - CFB

Book I
Assistant Programmer Analyst

Instructions:

Read each question very carefully. select only one answer for EACH QUESTION and CLICK (or place a checkmark) on the corresponding box to the left of the appropriate response.

Before you begin, PLEASE note:

» *"Field of study" **is defined here as Computer Information Systems, Computer Science, or other related field.***

» ***Degree, curriculum** and **other response information** are subject to verification*

Formal Education

1. What is your highest degree earned from a college or university?
   - ☐ Doctorate
   - ☐ Master of Arts/Science
   - ☐ Bachelor of Science/Bachelor of Art
   - ☐ Associate degree or completion of at least 60 semester units, or 90-quarter units
   - ☐ Some or no college units completed (less than 60-semester units or less than 90-quarter units)

V_1

1_b. Please indicate the year in which you received your degree ________ (If no degree, write "none")

2. Was your declared major in Computer Information Systems, Computer Science, or other highly related field? (You must have an Associate of Bachelor's degree to consider the Yes option)
   - ☐ My declared major was in Management Information Systems or Computer Science.
   - ☐ My declared major was in a highly related field (math, Science).
   - ☐ My declared major was in a field that is not related to Computer Science (e.g., Management, Business, or Psychology)
   - ☐ I have not completed my Bachelor's degree yet and/or I have more than 60 semester units.
   - ☐ I have less than 60 semester units or I have not taken any formal college or university classes.

V_2

2_b. ____________________ (Please print your major here. If no major write "**none**")

Note: Question 5 relates to formal education received after completing a Bachelor's degree. Formal education means courses taken at a recognized college or university and a grade was received.

3. In the **"Fields of Study"** defined above, how many college or university units, have you earned after completing your **Bachelor's degree**? (*Only include units verifiable on a college or university transcript.*)

V_3

- ☐ 45 or more semester units (60 quarter units)
- ☐ 30 to 44 semester units (40 to 59 quarter units)
- ☐ 15 to 29 semester units (20 to 39 quarter units)
- ☐ 1 to 14 semester units (1 to 19 quarter units)

} select only if you have a Bachelor's degree

- ☐ I have not earned a bachelor's degree; or, I have not earned any semester/quarter units after graduation.

3a. Please name the additional classes taken here (must provide proof of course work if successful on the Written exam). If you need additional room, please submit on a separate piece of paper.

Course	College or University	Units	Grade

Note: Question 6 relates to courses taken at a trade technology school like Oracle University. If you received a certificate of attendance for completing course work and the information can be verified then account for those hours below.

4. Above and beyond any formal college or university education, how many hours of instruction or training have you completed in the Computer Science/Information field? For example, additional instruction in PL/SQL, Visual Basic, Web page programming at a trade technology school

V_4

- ☐ 75 or more hours
- ☐ 50 to 74 hours
- ☐ 25 to 49 hours
- ☐ 1 to 24 hours
- ☐ I have received no additional education or training

4a. Please name the additional courses taken here (must provide proof of course work if successful on the Written exam).

Course	Trade Technology School	Hours

5. Have you passed Microsoft Certified Systems Engineer exam?

V5

- ☐ Yes I have passed the certification exam
- ☐ I have taken the course (certificate available) but I have not passed the exam
- ☐ I have taken some of the core class components, but I do not have a certificate nor have I passed the exam
- ☐ I have experience in this operating system, but I have not taken the courses and I have not passed the exam
- ☐ I have not received education or training in this operating system

6. Have you passed Microsoft Certified Professional exam?

V6

- ☐ Yes I have passed the certification exam
- ☐ I have taken the course (certificate available) but I have not passed the exam
- ☐ I have taken some of the core class components, but I do not have a certificate nor have I passed the exam
- ☐ I have experience in this operating system, but I have not taken the courses and I have not passed the exam
- ☐ I have not received education or training in this operating system

PROFESSIONAL EXPERIENCE

PLEASE NOTE: ***<u>ON THE JOB EXPERIENCE</u> CAN ONLY BE COUNTED IF AT LEAST 50% OF YOUR PROFESSIONAL WORK RESPONSIBILITIES IN A GIVEN YEAR OF EXPERIENCE IS RELATED TO THE TYPE OF BACKGROUND SPECIFIED IN THE QUESTION.*** **ALL RESPONSES ARE SUBJECT TO VERIFICATION AND FALSE STATEMENTS OR EXAGGERATIONS MAY RESULT IN APPLICANT BEING PERMANENTLY BARRED FROM COMPETING FOR POSITIONS.**

7. Within the last **five years,** how many years of **"ON THE JOB experience"** do you have as a Visual Basic programmer within an IBM Mainframe or Unix environment?

V7

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one years, but less than two years
- ☐ Limited or no experience in this area

8. Within the last **five years,** how many years of **"ON THE JOB experience"** do you have as an Oracle Programmer within an IBM Mainframe or Unix environment?

V8

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one years, but less than two years
- ☐ Limited or no experience in this area

9. Within the last **five years,** how many years of **"ON THE JOB experience"** do you have utilizing DB2/SQL within an IBM Mainframe or Unix environment?

V9

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one years, but less than two years
- ☐ Limited or no experience in this area

10. Within the last **five years,** how many years of **"ON THE JOB experience"** do you have programming in Access within an IBM Mainframe or Unix environment?

V10

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one years, but less than two years
- ☐ Limited or no experience in this area

11. Within the last **five years,** how many years of **"ON THE JOB experience"** do you have Programming Web Pages in HTML, Java, ASP, XML, or other web language within an IBM Mainframe or Unix environment?

V11

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one years, but less than two years
- ☐ Limited or no experience in this area

12. According to the following standards, please indicate your level of skill programming in visual basic within an IBM mainframe or Unix environment

V12

I have no experience in this Language	☐
I have created and developed programs in Visual Basic within a team environment, at home or at school and I am reasonably proficient at the task	☐
I have developed basic to medium complex programs in Visual Basic at the department level (50+ employees) and I am proficient at the task	☐
I have developed medium to complex block Visual Basic programs at the small to medium company level (500+ employees) and the programs that I have created have been used or implemented organizational wide	☐
I have programmed complex visual basic projects in a Unix and/or IBM environment at the system level. That is, the visual basic programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

13. According to the following standards, please indicate your level of skill programming in Oracle within an IBM mainframe or Unix environment

V_{13}

I have no experience in this Language	☐
I have created and developed programs in Oracle within a team environment, at home or at school and I am reasonably proficient at the task	☐
I have developed basic to medium complex programs in Oracle at the department level (50+ employees) and I am proficient at the task	☐
I have developed medium to complex Oracle programs at the small to medium company level (500+ employees) and the programs that I have created have been used or implemented organizational wide	☐
I have programmed complex Oracle projects in a Unix and/or IBM environment at the system level. That is, the Oracle programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

14. According to the following standards, please indicate your level of skill programming in PL/SQL within an IBM mainframe or Unix environment

V_{14}

I have no experience in this language	☐
I have some Oracle Application Developer and Database Administrator experience, but I have not worked professionally programming in this language	☐
I have programmed basic to medium complex projects in PL/SQL at the department level (50+ employees) and I am proficient at programming in this language	☐
I have programmed medium to complex projects in PL/SQL at the small to medium company level (500+ employees) and the programs/projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for programming very complex projects in PL/SQL in a Unix and/or IBM environment at the system level. That is, the PL/SQL programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

15. According to the following standards, please indicate your level of skill programming in Access within an IBM mainframe, Unix, or Windows 2000 environment

V_{15}

I have no experience in this language	☐
I have some Access experience, but I have not worked professionally programming in this language	☐
I have programmed basic to medium complex projects in Access at the department level (50+ employees) and I am proficient at programming in this language	☐
I have programmed medium to complex projects in Access at the small to medium company level (500+ employees) and the programs/projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for programming very complex projects in Access in a Unix and/or IBM environment at the system level. That is, the Access programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

16. According to the following standards please indicate your level of skill with relational databases other than PL/SQL within an IBM mainframe or Unix environment. For example Microsoft SQL Server

V_{16}

I have no experience in this language	☐
I have some relational data base experience, but I have not worked professionally programming or mining relational data bases	☐
I have developed basic to medium complex relational data base projects at the department level (50+ employees) and I am proficient working at these tasks	☐
I have developed medium to complex relational data base projects at the small to medium company level (500+ employees) and the projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for developing very complex relational data base projects in a Unix and/or IBM environment at the system level. That is, the relational database projects that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

Please save this document and email the completed form to:

By typing or writing my name into the BOX below, I affirm that all response information on this background questionnaire is true to the best of my knowledge.

☐

APPENDIX B

COMPUTER TECHNOLOGIST I - CFB

Book I
Computer Technologist I

Instructions:

Read each question very carefully. Select only one answer for EACH QUESTION and CLICK (or place a checkmark) on the corresponding box to the left of the appropriate response.

Before you begin, PLEASE note:

"Field of study" is defined here as Computer Information Systems, Computer Science, or other related field. Degree, curriculum and other response information are subject to verification

CANDIDATE'S NAME: ______________________________

Date: ____________________

Formal Education

1. What is your highest degree earned from a college or university?

V_1

- ☐ Doctorate
- ☐ Master's of Arts/Science
- ☐ Bachelors of Science/Bachelors of Arts
- ☐ Associate degree or completion of at least 60 semester units, or 90-quarter units
- ☐ Some or no college units completed (less than 60-semester units or less than 90-quarter units)

2. Was your declared major in Computer Information Systems, Computer Science, or other highly related field? (You must have an Associate of Bachelor's degree to consider the Yes option)

V_2

- ☐ My declared major was in Management Information Systems or Computer Science.
- ☐ My declared major was in a highly related field (math, Science).
- ☐ My declared major was in a field that is not related to Computer Science (e.g., Management, Business, or Psychology)
- ☐ I have not completed my Bachelor's degree yet and/or I have more than 60 semester units.
- ☐ I have less than 60 semester units or I have not taken any formal college or university classes.

2a.______________________________ (Please print your major here – print NONE if no major)

3. How many college or university units, above and beyond your-Bachelor's degree, have you earned in the "Fields of Study" as defined above? (Only include units verifiable on a college or university transcript.)

V_3

- ☐ 45 or more semester units (60 quarter units)
- ☐ 30 to 44 semester units (40 to 59 quarter units)
- ☐ 15 to 29 semester units (20 to 39 quarter units)
- ☐ 1 to 14 semester units (1 to 19 quarter units)
- ☐ I have not earned a bachelor's degree; or, I have not earned any semester/quarter units after graduation.

<u>Vocational Training</u> (training hours and certifications are subject to verification)

4. Besides any formal college or university education, how many hours of instruction or training have you completed in the Computer Science/Information field? For example, additional vocational instruction in Microsoft 2000 (MCP, MCSE), PL/SQL, Visual Basic, Web page design, etc.

V_4

- ☐ 75 or more hours
- ☐ 50 to 74 hours
- ☐ 25 to 49 hours
- ☐ 1 to 24 hours
- ☐ I have received no additional education or training

5. Have you passed Microsoft's certified professional exam (MCP)?

V_5

- ☐ Yes I have passed this certification exam
- ☐ I have taken the course (certificate available) but I have not passed the exam.
- ☐ I have taken some of the core class components, but I do not have a certificate nor have I passed the exam.
- ☐ I have experience in this area, but I have not taken the courses and I have not passed the exam.
- ☐ I have not received education or training in this area.

6. Have you passed Microsoft's Certified Systems Engineer exam (MCSE)?

V_6

- ☐ Yes I have passed this certification exam.
- ☐ I have taken all 7 of the course (certificate available) but I have not passed the exam.
- ☐ I have taken at least two of the core courses, but I do not have a certificate nor have I passed the exam.
- ☐ I have experience in this area, but I have not taken two or more of the core courses and I have not passed the exam.
- ☐ I have not received education or training in this area.

Professional Experience

(PLEASE NOTE: On the job experience can only be counted if at least 50% of your professional work responsibilities in a given year of experience are related to the type of background specified in the question. All responses are subject to verification and false statements or exaggerations may result in applicant being permanently Barred from competing for positions.

7. Within the last five years, how many years of professional experience do you have installing, configuring, IBM desktop computers (Professional experience means paid work?

V_7

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one year, but less than two years
- ☐ Limited or no experience in this area

8. Within the last five years, how many years of "on the job" professional experience do you have installing, configuring, Apple/Macintosh desktop computers?

V_8

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one year, but less than two years
- ☐ Limited or no experience in this area

9. Within the last five years, how many years of "on the job" professional experience do you have diagnosing, servicing, and repairing IBM desktop computers?

V_9

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one year, but less than two years
- ☐ Limited or no experience in this area

10. Within the last five years, how many years of "on the job" professional experience do you have diagnosing, servicing, and repairing Apple/Macintosh desktop computers?

V_{10}

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one year, but less than two years
- ☐ Limited or no experience in this area

11. Within the last five years, how many years of "on the job" professional experience do you have diagnosing, and repairing printers?

V_{11}

- ☐ Four or more years
- ☐ At least three years but less than four years
- ☐ At least two years, but less than three years
- ☐ At least one year, but less than two years
- ☐ Limited or no experience in this area

12. According to the following standards, please indicate your level of skill in installing and configuring IBM/Compatible computers (This does not include any type of phone support).

V_{12}

I have limited or no experience at the task	☐
I have installed and configured IBM/Compatible computers at home, for friends, or at school and I am reasonably proficient at the task.	☐
I have installed and configured IBM/Compatible computers at the department or small company level (5+ clients) and I am proficient at the task.	☐
I have installed and configured IBM/Compatible computers at the medium organizational level (50+ clients) and I am proficient at the task.	☐
I have installed and configured IBM/Compatible computers at the large organizational level (100+ clients) and I am proficient at the task.	☐

13. According to the following standards, please indicate your level of skill in installing and configuring Apple/Macintosh computers (This does not include any type of phone support).

V_{13}

I have limited or no experience at the task	☐
I have installed and configured Apple/Macintosh computers at home, for friends, or at school and I am reasonably proficient at the task.	☐
I have installed and configured Apple/Macintosh computers at the department or small company level (5+ clients) and I am proficient at the task.	☐
I have installed and configured Apple/Macintosh computers at the medium organizational level (50+ clients) and I am proficient at the task.	☐
I have installed and configured Apple/Macintosh computers at the large organizational level (100+ clients) and I am proficient at the task.	☐

14. According to the following standards please indicate your level of skill in diagnosing and repairing IBM/Compatible computers (This does not include any type of phone support). Specifically, this entails the actual disassembly of equipment, repairing or replacing electronic components, and reassembly.

V_{14}

I have limited or no experience at the task	☐
I have diagnosed and repaired IBM/Compatible computers at home, for friends, or at school and I am reasonably proficient at the task.	☐
I have diagnosed and repaired IBM/Compatible computers at the department or small company level (5+ clients) and I am proficient at the task.	☐
I have diagnosed and repaired IBM/Compatible computers at the medium organizational level (50+ clients) and I am proficient at the task.	☐
I have diagnosed and repaired IBM/Compatible computers at the large organizational level (100+ clients) and I am proficient at the task.	☐

15. According to the following standards please indicate your level of skill in diagnosing and repairing Apple/Macintosh computers (This does not include any type of phone support). Specifically, this entails the actual disassembly of equipment, repairing or replacing electronic components, and reassembly.

V_{15}

I have limited or no experience at the task	☐
I have diagnosed and repaired Apple/Macintosh computers at home, for friends, or at school and I am reasonably proficient at the task.	☐
I have diagnosed and repaired Apple/Macintosh computers at the department or small company level (5+ clients) and I am proficient at the task.	☐
I have diagnosed and repaired Apple/Macintosh computers at the medium organizational level (50+ clients) and I am proficient at the task.	☐
I have diagnosed and repaired Apple/Macintosh computers at the large organizational level (100+ clients) and I am proficient at the task.	☐

By typing or writing my initials into the BOX below, I affirm that all response information on this background questionnaire is true to the best of my knowledge. _________

APPENDIX C

PROGRAMMER ANALYST - COBOL

Book I
Programmer Analyst, COBOL

Instructions:

READ EACH QUESTION VERY CAREFULLY. **SELECT ONLY** ONE **ANSWER FOR EACH QUESTION AND CLICK (OR PLACE A CHECKMARK) ON THE CORRESPONDING BOX TO THE LEFT OF THE APPROPRIATE RESPONSE.**

Before you begin, PLEASE note:
- » "Field of study" **is defined here as *Computer Information Systems, Computer Science, or other related field.***
- » ***Degree, curriculum*** *and* ***other response information*** *are subject to verification*

CANDIDATE'S NAME: ______________________________

Date:	Day:	Time:

Formal Education

1. What is your highest degree earned from a college or university?

V1
- ☐ Doctorate
- ☐ Master of Arts/Science
- ☐ Bachelor of Science/Bachelor of Arts
- ☐ Associate degree or completion of at least 60 semester units, or 90-quarter units
- ☐ Some or no college units completed (less than 60-semester units or less than 90-quarter units)

2. Was your declared major in Computer Information Systems, Computer Science, or other highly related field? (You must have an Associate of Bachelor's degree to consider the Yes option)

V2
- ☐ My declared major was in Management Information Systems or Computer Science.
- ☐ My declared major was in a highly related field (math, Science).
- ☐ My declared major was in a field that is not related to Computer Science (e.g., Management, Business, or Psychology)
- ☐ I have not completed my Bachelor's degree yet and/or I have more than 60 semester units.
- ☐ I have less than 60 semester units or I have not taken any formal college or university classes.

2b. ______________________________ (Please print your major here – print NONE if no major)

3. How many college or university units, "above and beyond" your **Bachelor's degree** have you earned in the **"Fields of Study"** as defined above? (*Only include units verifiable on a college or university transcript.*)

V3

- ☐ 45 or more semester units (60 quarter units)
- ☐ 30 to 44 semester units (40 to 59 quarter units)
- ☐ 15 to 29 semester units (20 to 39 quarter units) bachelor's degree
- ☐ 1 to 14 semester units (1 to 19 quarter units)

Must have a

- ☐ I have not earned a bachelor's degree; or, I have not earned any semester/quarter units after graduation.

Vocational Training (training hours and certifications are subject to verification)

4. Besides any formal college or university education, how many hours of instruction or training have you completed in the Computer Science/Information field? For example, additional vocational instruction in PL/SQL, Visual Basic, Web page design, etc..

V4

- ☐ 75 or more hours
- ☐ 50 to 74 hours
- ☐ 25 to 49 hours
- ☐ 1 to 24 hours
- ☐ I have received no additional education or training

4_b. Please name the additional vocational classes taken here (must provide proof of course work if successful on the Written exam).

____
____
____
____
____

5. Have you passed the Oracle Application Developer and Database Administrator certification exam (Exam #1Z0-001)?

V5

- ☐ Yes I have passed the certification exam
- ☐ I have taken the course (certificate available) but I have not passed the exam
- ☐ I have taken some of the core class components, but I do not have a certificate nor have I passed the exam
- ☐ I have experience in this language, but I have not taken the courses and I have not passed the exam
- ☐ I have not received education or training in this programming language

6. Have you passed any other certification exam related to relational databases or database management?

V6

- ☐ Yes I have passed the certification exam
- ☐ I have taken the course (certificate available) but I have not passed the exam
- ☐ I have taken some of the core class components, but I do not have a certificate nor have I passed the exam
- ☐ I have experience in this language, but I have not taken the courses and I have not passed the exam
- ☐ I have not received education or training in this programming language

PROFESSIONAL EXPERIENCE

PLEASE NOTE: ON THE JOB EXPERIENCE CAN ONLY BE COUNTED IF AT LEAST 50% OF YOUR PROFESSIONAL WORK RESPONSIBILITIES IN A GIVEN YEAR OF EXPERIENCE IS RELATED TO THE TYPE OF BACKGROUND SPECIFIED IN THE QUESTION. ALL RESPONSES ARE SUBJECT TO VERIFICATION AND FALSE STATEMENTS OR EXAGGERATIONS MAY RESULT IN APPLICANT BEING PERMANENTLY BARRED FROM COMPETING FOR POSITIONS.

7. Within the last **ten years,** how many years of **"ON THE JOB experience"** do you have as a Cobol programmer in an IBM mainframe or Unix environment?

V_7

- ☐ Eight or more years
- ☐ At least five years but less than eight years
- ☐ At least three years, but less than five years
- ☐ At least one year, but less than three years
- ☐ Limited or no experience in this area

8. Within the last **ten years,** how many years of **"ON THE JOB experience"** do you have utilizing DB2/SQL or CICS within an IBM Mainframe or Unix environment?

V_8

- ☐ Eight or more years
- ☐ At least five years but less than eight years
- ☐ At least three years, but less than five years
- ☐ At least one year, but less than three years
- ☐ Limited or no experience in this area

9. Within the last **ten years,** how many years of **"ON THE JOB experience"** do you have using TSO?

V_9

- ☐ Eight or more years
- ☐ At least five years but less than eight years
- ☐ At least three years, but less than five years
- ☐ At least one year, but less than three years
- ☐ Limited or no experience in this area

10. Within the last **ten years,** how many years of **"ON THE JOB experience"** do you have using JCL?

V_{10}

- ☐ Eight or more years
- ☐ At least five years but less than eight years
- ☐ At least three years, but less than five years
- ☐ At least one year, but less than three years
- ☐ Limited or no experience in this area

11. Within the last **ten years,** how many years of **"ON THE JOB experience"** do you have using ISPF?

V_{11}

- ☐ Eight or more years
- ☐ At least five years but less than eight years
- ☐ At least three years, but less than five years
- ☐ At least one year, but less than three years
- ☐ Limited or no experience in this area

12. According to the following standards, please indicate your level of skill in creating block diagrams and flow charts

V_{12}

I have limited or no experience at the task	☐
I have created and developed block diagrams and flow charts at home, at school, or in a small team level environment and I am reasonably proficient at the task	☐
I have developed block diagrams and flow charts at the department level (50+ employees) and I am proficient at the task	☐
I have developed medium to complex block diagrams and flow charts at the small to medium company level (500+ employees) and the items that I have created have been used organizational wide.	☐
I have created complex block diagrams and flow charts at the system level. That is, block diagrams and flow charts that I have developed have been used in a large organization consisting of 1000 or more employees	☐

13. According to the following standards, please indicate your level of skill programming in visual basic within an IBM mainframe or Unix environment

V_{13}

I have limited or no experience in this environment	☐
I have created and developed programs in Visual Basic within a team level environment, at home or at school and I am reasonably proficient at the task	☐
I have developed basic to medium complex programs in Visual Basic at the department level (50+ employees) and I am proficient at the task	☐
I have developed medium to complex block Visual Basic programs at the small to medium company level (500+ employees) and the programs that I have created have been used or implemented organizational wide	☐
I have programmed complex visual basic projects in a Unix and/or IBM environment at the system level. That is, the visual basic programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

14. According to the following standards, please indicate your level of skill programming in PL/SQL within an IBM mainframe or Unix environment

V_{14}

I have limited or no experience in this language	☐
I have some Oracle Application Developer and Database Administrator experience, but I have not worked professionally programming in this language	☐
I have programmed basic to medium complex projects in PL/SQL at the department level (50+ employees) and I am proficient at programming in this language	☐
I have programmed medium to complex projects in PL/SQL at the small to medium company level (500+ employees) and the programs/projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for programming very complex projects in PL/SQL in a Unix and/or IBM environment at the system level. That is, the PL/SQL programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

15. According to the following standards, please indicate your level of skill programming in Cobol within an IBM mainframe or Unix environment

V_{15}

I have limited or no experience in this language	☐
I have some Cobol experience, but I have not worked professionally programming in this language	☐
I have programmed basic to medium complex projects in Cobol at the department level (50+ employees) and I am proficient at programming in this language	☐
I have programmed medium to complex projects in Cobol at the small to medium company level (500+ employees) and the programs/projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for programming very complex projects in Cobol in a Unix and/or IBM environment at the system level. That is, the Cobol programs that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

16. According to the following standards please indicate your level of skill with relational databases other than PL/SQL within an IBM mainframe or Unix environment. For example: Oracle, DB2, Access, and SQL Server.

V_{16}

I have limited or no experience in this language	☐
I have some relational data base experience, but I have not worked professionally programming or mining relational data bases	☐
I have developed basic to medium complex relational data base projects at the department level (50+ employees) and I am proficient working at these tasks	☐
I have developed medium to complex relational data base projects at the small to medium company level (500+ employees) and the projects that I have developed have been used or implemented organizational wide	☐
I have been responsible for developing very complex relational data base projects in a Unix and/or IBM environment at the system level. That is, the relational database projects that I have developed have been used in a large organization consisting of 1000 or more employees.	☐

By typing or writing my initials into the BOX below, I affirm that all response information on this background questionnaire is true to the best of my knowledge.

APPENDIX D

ASSISTANT PROGRAMMER ANALYST COMPETENCY MODEL

EDUCATION - TIME

Assistant Programmer Analyst Education - time													
A		B		C		D		E		F		G	
Reasoning		Occupational		Personal Effectiveness		Communication		Interpersonal		Group		Organization	
Analysis & Problem Solving	☒	Continuous Learning	☒	Self Management	☒	Oral Communicat-ion	☒	Conflict Management	☐	Developing others	☐	Customer Focus	☐
Decision Making	☒	Using Technology	☒	Initiative & Innovativeness	☐	Listening	☒	Influencing	☐	Delegating	☐	Leveraging Technology	☐
Math Skills	☒	Professional Technical Expertise	☒	Flexibility	☐	Writing	☒	Negotiating	☐	Group Facilitati on	☐	Managing Change	☐
Reading Comprehension	☒	Industry Knowledge	☒	Diligence	☒	Informing	☐	Relationship Building	☐	Involving Others	☐	Organization al Savvy	☐
				Dependability	☒	Presentat-ion Skills	☐	Service Orientation	☐	Leadership	☐	Planning & Organizing	☒
				Action & Results	☒					Teamwork	☐	Process Management	☐

APPENDIX E

ASSISTANT PROGRAMMER ANALYST COMPETENCY MODEL

EDUCATION - SPECIFIC

Assistant Programmer Analyst Education - specific													
A		B		C		D		E		F		G	
Reasoning		Occupational		Personal Effectiveness		Communication		Interpersonal		Group		Organization	
Analysis & Problem Solving	☒	Continuous Learning	☒	Self Management	☒	Oral Communication	☐	Conflict Management	☐	Developing others	☐	Customer Focus	☐
Decision Making	☐	Using Technology	☒	Initiative & Innovativeness	☐	Listening	☒	Influencing	☐	Delegating	☐	Leveraging Technology	☒
Math Skills	☐	Professional Technical Expertise	☒	Flexibility	☐	Writing	☐	Negotiating	☐	Group Facilitation	☐	Managing Change	☐
Reading Comprehension	☐	Industry Knowledge	☒	Diligence	☒	Informing	☐	Relationship Building	☐	Involving Others	☐	Organizational Savvy	☐
				Dependability	☒	Presentation Skills	☐	Service Orientation	☐	Leadership	☐	Planning & Organizing	☒
				Action & Results	☒					Teamwork	☐	Process Management	☐

APPENDIX F

ASSISTANT PROGRAMMER ANALYST COMPETENCY MODEL

EXPERIENCE - TIME

Assistant Programmer Analyst: Experience - time													
A		B		C		D		E		F		G	
Reasoning		Occupational		Personal Effectiveness		Communication		Interpersonal		Group		Organization	
Analysis & Problem Solving	☒	Continuous Learning	☐	Self Management	☒	Oral Communicat-ion	☒	Conflict Management	☐	Developing others	☐	Customer Focus	☒
Decision Making	☒	Using Technology	☒	Initiative & Innovativeness	☒	Listening	☒	Influencing	☐	Delegating	☐	Leveraging Technology	☒
Math Skills	☐	Professional Technical Expertise	☒	Flexibility	☒	Writing	☐	Negotiating	☐	Group Facilitati on	☐	Managing Change	☒
Reading Comprehension	☐	Industry Knowledge	☒	Diligence	☒	Informing	☐	Relationship Building	☒	Involving Others	☐	Organization al Savvy	☐
				Dependability	☒	Presentat-ion Skills	☐	Service Orientation	☒	Leadership	☐	Planning & Organizing	☒
				Action & Results	☒					Teamwork	☒	Process Management	☒

APPENDIX G

ASSISTANT PROGRAMMER ANALYST COMPETENCY MODEL

EXPERIENCE - SPECIFIC

Assistant Programmer Analyst: Experience - specific

A	B	C	D	E	F	G
Reasoning	Occupational	Personal Effectiveness	Communication	Interpersonal	Group	Organization
Analysis & Problem Solving ☒	Continuous Learning ☐	Self Management ☒	Oral Communication ☐	Conflict Management ☐	Developing others ☐	Customer Focus ☐
Decision Making ☒	Using Technology ☒	Initiative & Innovativeness ☐	Listening ☐	Influencing ☐	Delegating ☐	Leveraging Technology ☒
Math Skills ☐	Professional Technical Expertise ☒	Flexibility ☒	Writing ☐	Negotiating ☐	Group Facilitation ☐	Managing Change ☐
Reading Comprehension ☐	Industry Knowledge ☒	Diligence ☒	Informing ☐	Relationship Building ☐	Involving Others ☐	Organizational Savvy ☐
		Dependability ☐	Presentation Skills ☐	Service Orientation ☐	Leadership ☐	Planning & Organizing ☒
		Action & Results ☒			Teamwork ☒	Process Management ☒

APPENDIX H

INSTRUCTION TO CANDIDATES - COMPUTER

TECHNOLOGIST I

Instruction to Candidates

For

Computer Technologist I

Today's testing process consists of one test part, an interview. The interview is worth 100% of your overall score.

INTERVIEW PROCESS

You will spend about 20 minutes with the interviewers during which time they will question you about your background and preparation for the job of Computer Technologist I. As you respond to interview questions, keep in mind that statements such as "I've done that" and "Everybody likes me" do not provide enough information to the raters, who must compare your experiences with that of other candidates. You will present your qualifications in the best way if you provide specific examples of your past experience when responding to each question. Remember also that time is limited. Answer the questions concisely and stick to the point.

You will be assessed on the following job-related competencies:

1. Job Preparation
2. Interpersonal/Communication Skills
3. Work Management Skills

Please do not discuss the content of this examination with anyone. If you discuss the test, you may unfairly advantage candidates who participate in the test after you. Additionally, you may also jeopardize your status as a candidate in this examination and future examinations.

Please sign below to affirm that you have read these instructions and agree to comply with them.

Candidates Name (print): ____________________________________

Today's Date: _________________

Signature: ____

APPENDIX I

FACTOR SCORING SHEET - COMPUTER TECHNOLOGIST I

Factor Scoring Sheet

Computer Technologist I
Final Score ______
(In Pen)

Candidate's Name (Last)________________________(First) ___________
(Last 4 digits of SS#) __________ Rater Number ____________

Job Preparation (Computer Technologist I)

	Acceptable										Good										Excellent										
65	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Comments ____
Comments ____

Interpersonal/Communication Skills

	Acceptable										Good										Excellent										
65	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Comments ____
Comments ____

Work Management Skills

	Acceptable										Good										Excellent										
65	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

Comments ____
Comments ____

Computer Technologist I
Job Preparation ______(+) Interpersonal/Communication Skills ______ (+) Work Management Skills ______ (=) Total______ / 3 = _____

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