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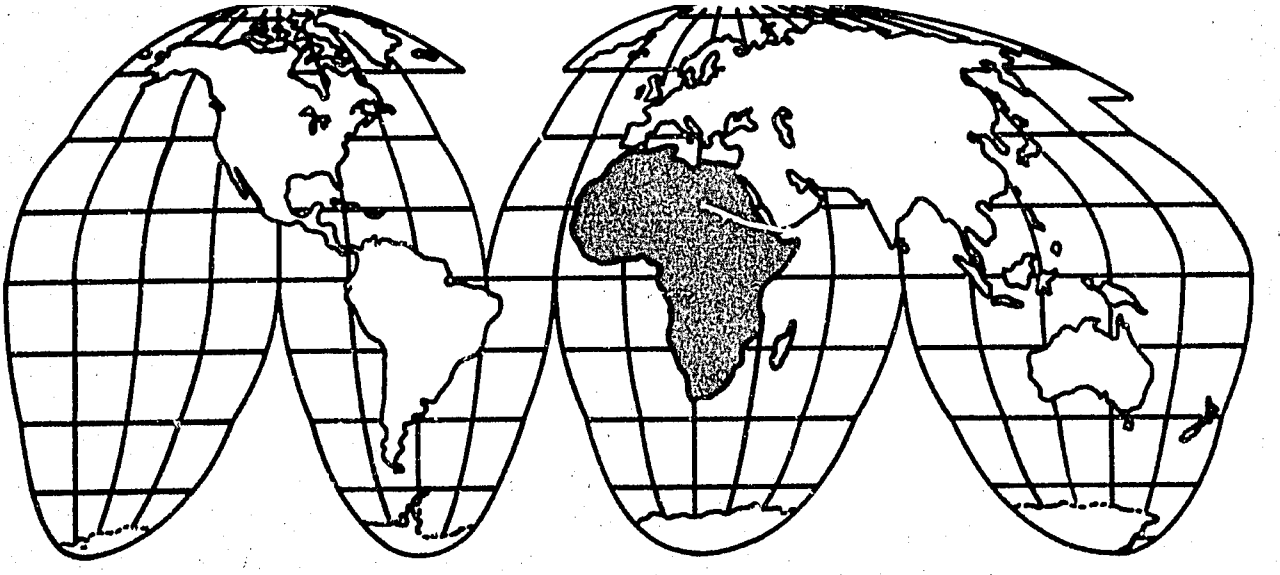

American Institutes for Research • Pittsburgh • Pennsylvania 15232 • USA

DEVELOPMENT OF MANPOWER SCREENING TESTS FOR THE DEVELOPING NATIONS

Paul A. Schwarz

A technical manual and report submitted to the United States Agency for International Development

American Institutes for Research in the Behavioral Sciences
Contract ICAc-2155 AIR-C71-6/64-TR

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INTRODUCTION

The *I-D* tests are aptitude tests specifically designed for use in Africa. They were built during 1960-64 in a project supported by the U.S. Agency for International Development, and carried out under A.I.D. contract by the American Institute for Research.

This Manual summarizes the technical data so far compiled on the *I-D* aptitude tests. It is intended as a guide for deciding which of the twenty-one *I-D* tests to apply in a given situation, and for estimating how effective this application is likely to be.

The Manual begins with a brief description of each test and of the series into which the individual tests are usually combined. The next Section gives reliability data for male and female examinees at different levels of education. The third Section describes the standardization data, which are published in a separate pamphlet titled *I-D Test Norms*. The last and longest Section reports results from the validity studies carried out in five African countries. An appendix summarizes the *I-D* test intercorrelations.

Detailed instructions for the administration of the tests are given in the *I-D Examiner's Manual*. This document is issued to all *I-D* Examiners, and arrangements for inspecting the instructions (and the actual test papers) may readily be made.

Information about the development of the *I-D* tests is given in the following publications:

American Inst. for Research. *Testing Notes* Number 1. Lagos: December 1963.

American Inst. for Research. *Testing Notes* Number 2. Lagos: February 1963.

Schwarz, P. Adapting tests to the cultural setting. *Educ. pschol. Measmt.*, 1963, 23, 673-686.

Schwarz, P. Aptitude Tests for Use in the Developing Nations. Pittsburgh: American Institute for Research, 1961.

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DESCRIPTION OF TESTS

This Section contains a brief description of each of the twenty-one *I-D* tests and of the basic selection series into which they may be combined. One or more sample problems are included in each description.

It is important to note that the instructions given in the sample problems in this Manual are *not* the instructions used when the tests are actually administered. The *I-D* testing procedure is based on detailed explanations incorporating visual aids, models, and other teaching devices. A single sentence in this Manual may in fact represent twenty minutes of instructions and demonstrations.

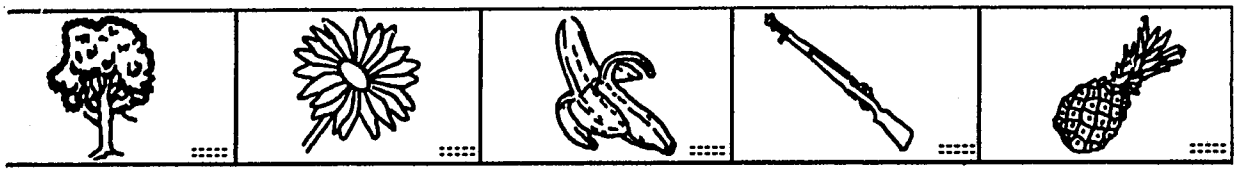
Most of the sample problems in this Section were taken from the actual test papers. In a few instances, however, some modifications have been made to maintain the security of a particular form of the test.

I-D TEST NO. 1 - SIMILARITIES (SIM)

Purpose: A non-verbal test of concept formation. Used as an index of "general intelligence" for examinees with minimal education.

Format: The test is given orally one question at a time. It contains 4 sample, 5 practice, and 30 test problems. Total time to administer the test is 35 minutes.

Sample: Four of these things are in one way the same. Mark the one that is different.



I-D TEST NO. 2 - VERBAL ANALOGIES (VAL)

Purpose: A verbal reasoning test for people with six to eight years of formal education. Used to predict success in school or in a job requiring formal studies.

Format: A power test that most examinees complete in the allotted time. Contains 8 sample, 6 practice, and 40 test problems. Total time to administer the test is 30 minutes.

Sample: Mark the one of the five alternative words that best completes the analogy.

air and bird	fish	man	cow	monkey	pig
water and ?	:::::	:::::	:::::	:::::	:::::

I D TEST NO. 3 - VERBAL ANALOGIES HIGH (VAH)

Purpose: A more advanced form of the above test intended for people with nine to twelve years of formal education.

Format: Same as I-D Test No. 2.

Sample: Same as I-D Test No. 2.

I-D TEST NO. 4 - READING COMPREHENSION (RDL)

Purpose: A test of ability to read and understand written material. Used to predict academic potential for examinees with six to eight years of formal education.

Format: A power test that most examinees complete in the allotted time. Contains 3 sample and 40 test problems. Total time to administer the test is 30 minutes.

Sample: Mark the one of the five alternative words that best completes each sentence.

This is a test of your ability to 1 and understand sentences written in English. A number of 2 have been left out of each sentence, but if you

1.	know	write	read	learn	copy
2.	spaces	words	sentences	letters	things

I-D TEST NO 5 - READING COMPREHENSION (RDH)

Purpose: More advanced form of the above test requiring reasoning as well as comprehension. It can be used up to the University level.

Format: Same as I-D Test No. 4.

Sample: Same as I-D Test No. 4.

I-D TEST NO. 6 - MEMORY (MEM)

Purpose: A test of the ability to learn and remember material organized in a meaningful way. Used mainly for selection of secondary school students.

Format: This is a partly speeded test with separately timed halves. It contains 9 sample, 30 practice, and 80 test problems. Total time to administer the test is 20 minutes.

Sample: Use the chart to find which number goes with the given letter. Try to learn the chart in this part of the test because later it will be taken away.

ABC 12	DEF 11	GH 10	IJK 9
LM 8	NO 7	PQ 6	RS 5
TUV 4	WX 3	Y 2	Z 1

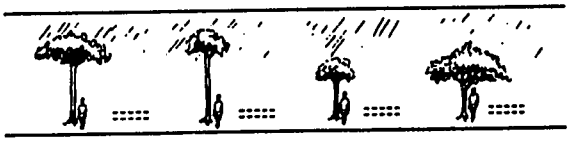
H	1	2	3	4	5	6	7	8	9	10	11	12
T	1	2	3	4	5	6	7	8	9	10	11	12

I-D TEST NO. 7 - MECHANICAL INFORMATION (MEC)

Purpose: An interest and aptitude test for technical occupations. Infers technical inclinations by measuring how much the examinee has learned from the mechanical and scientific phenomena in his everyday life.

Format: This test is given orally one question at a time. It contains 3 sample, 3 practice, and 56 test problems. Total time to administer the test is 35 minutes.

Sample: Four boys are standing under 4 different trees. It is raining. Which boy will remain the most dry while it rains?

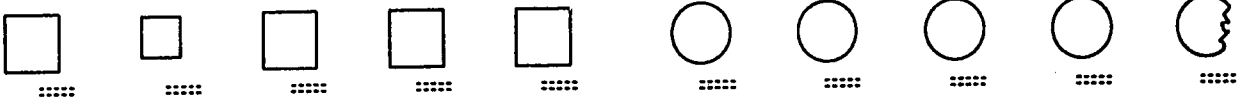


I-D TEST NO. 8 - CHECKING (CHK)

Purpose: A test of speed and accuracy in perceptual discrimination. Used in the selection of certain types of operative or semi-skilled personnel.

Format: This is a speed test with separately timed halves. It contains 3 sample, 6 practice, and 60 test problems. Total time to administer the test is 10 minutes.

Sample: Mark the one of the five pictures that is different.

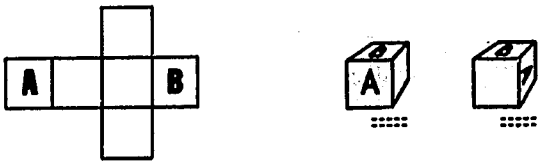


I-D TEST NO. 9 - BOXES (BOX)

Purpose: A test of three-dimensional visualization. Used to determine aptitude for the skilled trades and higher-level technical occupations.

Format: This is a partly speeded test with separately timed halves. It contains 4 sample, 4 practice, and 48 test problems. Total time to administer the test is 40 minutes.

Sample: If this pattern is folded to make a box, which of the two boxes will you see?

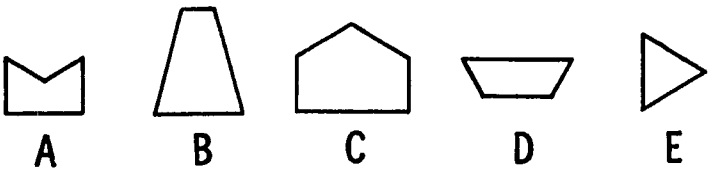


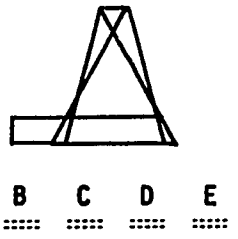
I-D TEST NO. 10 - FIGURES (FIG)

Purpose: A test of flexibility in responding to changing perceptual cues. Used in determining aptitude for the skilled trades and higher-level technical occupations.

Format: This is a partly speeded test with separately timed halves. It contains 4 sample, 4 practice, and 40 test problems. Total time to administer the test is 20 minutes.

Sample: Mark the letter of the figure that is hidden inside each test problem.



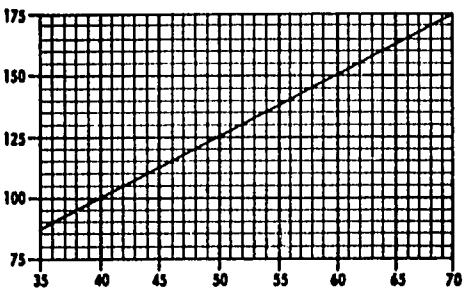


I-D TEST NO. 11 - GRAPHS (GPH)

Purpose: A test of facility in working with a complex graph and thereby of the more general ability to cope with a problem in which a number of variables must be considered and interrelated. Used to predict success in post-secondary training and education.

Format: This is a partly speeded test with separately timed halves. It contains 6 sample, 10 practice, and 60 test problems. Total time to administer the test is 25 minutes.

Sample: Use the graph to determine which of the five choices corresponds to the value given.



52	132.5	127.5	126	130	135
165	70	66	65.5	67.5	64

I-D TEST NO. 12 - CODING (COD)

Purpose: A test of speed and accuracy in encoding data. Used for the clerical occupations.

Format: A speeded test with separately timed halves. It contains 5 sample, 30 practice, and 150 test problems. Total time to administer the test is 15 minutes.

Sample: Using the key at the left, mark the appropriate symbols in the bottom frames.

A	B	C	D	E
⊥	⊏	⊐	I	⊖

C	A	D	C

I-D TEST NO. 13 - NAMES (NAM)

Purpose: A test of speed and accuracy in checking written material. Used for clerical jobs and others requiring attention to detail.

Format: A speeded test with separately timed halves. It contains 3 sample, 10 practice, and 60 test problems. Total time to administer the test is 15 minutes.

Sample: If the names are identical, mark "correct." If they are not identical, mark "different."

Adesola Chizea	Adesola Chizea	CORRECT	DIFFERENT
Friday Ikponmwoba	Fridae Ikponmwoba	CORRECT	DIFFERENT

I-D TEST NO. 14 - ARITHMETIC (RTH)

Purpose: A test of speed and accuracy in doing simple computations. Used whenever general facility with numbers is required.

Format: A speeded test with separately timed halves. It contains 8 sample, 12 practice, and 150 test problems. Total time to administer the test is 20 minutes.

Sample: Mark the correct answer for each problem.

10 + 20 = 40 30 5 12 21 180 ÷ 6 = 240 24 36 38 30

I-D TEST NO. 15 - TABLES (TAB)

Purpose: A test of speed and accuracy in obtaining data presented in tabular form. Used for selection into the clerical occupations.

Format: A speeded test with separately timed halves. It contains 6 sample, 8 practice, and 80 test problems. Total time to administer the test is 20 minutes.

Sample: Using the table at the left, mark the correct number of hours for each problem.

NUMBER OF HOURS WORKED					
NAME	MONTH				
	Jan	Feb	Mar	Apr	May
ABED	138	176	129	142	144
NGOZI	76	82	93	75	85
TAIWO	160	145	128	130	140

PROBLEMS

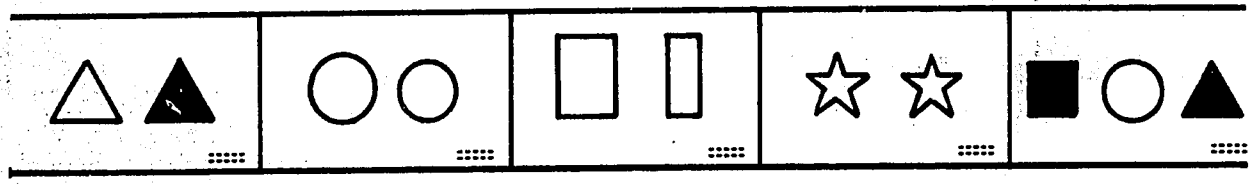
	NAME	MONTH	NUMBER OF HOURS				
1.	NGOZI	Mar	129	93	128	82	75
2.	ABED	Apr	130	75	142	120	144
3.	NGOZI	May	85	75	93	140	144

I-D TEST NO. 16 - SPOKEN ENGLISH (SPK)

Purpose: A test of ability to understand simple oral instructions. Used for low-level screening when the job requires communication in English.

Format: The test is given orally one question at a time. It contains 3 sample, 5 practice, and 40 test problems. Total time to administer the test is 25 minutes.

Sample: Mark the figures at which I am looking when I say: "These two are exactly the same."



I-D TEST NO. 17 - SCIENCE INFORMATION (SCI)

Purpose: A test of interest in science, as shown by the examinee's knowledge of basic facts about a wide range of scientific topics. Used mainly for selection or guidance into post-secondary science training.

Format: A power test that most examinees complete in the allotted time. Contains 3 sample and 40 test problems. Total time to administer the test is 30 minutes.

Sample: Mark the one of the five alternatives that best completes each sentence.

"Orion" and "Big Dipper" are names of star

groups	families	classes	constellations	clusters
:::::	:::::	:::::	:::::	:::::

I-D TEST NO. 18 - WORLD INFORMATION (WLD)

Purpose: A test of interest in business or public affairs, shown by the examinee's knowledge of current events, civic affairs, and elementary economics. Useful for selection or guidance into commerce, government, and similar fields.

Format: Same as I-D Test No. 17.

Sample: Mark the one of the five alternatives that best completes each sentence.

Mogadiscio is the capital city of

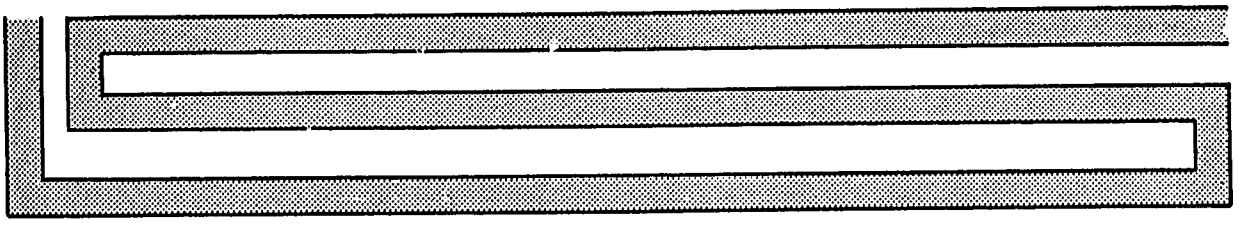
Sudan	Somalia	Malagasy Republic	Chad	Uganda
:::::	:::::	:::::	:::::	:::::

I-D TEST NO. 19 - MANUAL DEXTERITY (MAN)

Purpose: A test of speed and coordination in arm and hand movements. Used as an index of potential for the skilled trades.

Format: A speeded test with separately timed halves. It contains 1 sample, 1 practice, and 2 test problems. Total time to administer the test is 15 minutes.

Sample: Draw a continuous line from the beginning to the end of the path without letting your pencil wander outside the shaded area.



I-D TEST NO. 20 - FINGER DEXTERITY (FIN)

Purpose: A test of speed and dexterity in precise finger movements. Used to predict potential for certain of the skilled trades.

Format: A speeded test with separately timed halves. It contains 45 sample, 45 practice, and 90 test problems. Total time to administer the test is 15 minutes.

Sample: Draw a continuous line from the beginning to the end of each path without letting your pencil wander outside the shaded area.

I-D TEST NO. 21 - MARKING (MRK)

Purpose: A test of speed in performing a simple repetitive task. Intended for the selection of operatives and other semi-skilled personnel.

Format: A speed test with separately timed halves. It contains 100 sample, 100 practice, and 200 test problems. Total time to administer the test is 15 minutes.

Sample: Mark a letter Y inside each box. Do as many as you can in the allotted time.

I-D TEST SERIES

These 21 tests should be regarded as a set of "building blocks" from which a variety of different selection series can be assembled. The procedure is to

1) assemble a trial series made up of as many of the *I-D* tests as seem relevant to the activity to be predicted,

2) subject the trial series to empirical validation, and

3) retain in the final series the tests that proved effective in the validity studies.

Table 1 describes ten basic *I-D* Test Series already developed. These cover scholastic, technical, and clerical abilities; and can be used jointly for guidance as well as singly for selection.

Additional series suitable for other kinds of job functions can readily be constructed.

TABLE 1:
BASIC *I-D* TEST SERIES

Series	*I-D* Tests Included	Education Required
TECHNICAL		
– Semi-Skilled	SIM + CHK + SPK + MRK	None*
– Skilled Trades	SIM + MEC + BOX + FIG + MAN or FIN	6 Years or More
– Technical	VAH + BOX + FIG + GPH	9 Years or More
– Scientific	RDH + GPH + RTH + SCI	11 Years or More
COMMERCIAL		
– Junior Clerical	VAL + COD + NAM + RTH + TAB	6 to 8 Years
– Senior Clerical	VAH + COD + NAM + RTH + TAB	9 Years or More
– Commercial	RDH + GPH + NAM + RTH + WLD	11 Years or More
SCHOLASTIC		
– Academic 1	VAL + RDL + MEM + RTH	6 to 8 Years
– Academic 2	VAH + RDH + GPH + RTH	9 to 10 Years
– Academic 3	RDH + GPH + RTH + SCI + WLD	11 Years or More

**For examinees who do not speak English, the Spoken English test is dropped, and the others are administered with instructions in the vernacular.*

3

STUDIES OF TEST RELIABILITY

If an examinee is tested several times with the same or equivalent tests, he will not get the same score every time. Specific factors in the test problems, in the testing sessions and in his own performance will affect his scores, shifting them sometimes above and sometimes below the "true score" that would best describe his ability level.

The magnitude of these fluctuations varies from test to test. They may be so large as to render a test useless, or negligible to the point that they can be ignored. The greater the stability of a test, the more *reliable* it is said to be.

The reliability of a test can be estimated by giving the examinees two different forms of the test, and then checking the consistency of their scores. The most rigorous check is obtained when these forms are administered on separate days. Because of the practical difficulties of retesting, however, it is more common to administer both forms in a single testing session, and to assume that care in maintaining uniform testing conditions will control day-to-day fluctuations. This latter method was the one used in estimating the reliabilities of the *I-D* tests.

I-D tests that are speeded are given in two separately timed parts, so that the examinee is in effect tested twice. This leads to an immediate reliability estimate, based on the correlation between the two sets of scores.

For the unspeeded *I-D* tests, an appropriate estimate is obtained by regrading each test problem as a separate form of the test, and checking the consistency of the examinees'

performance from problem to problem. This method results in coefficients of correlation that are comparable to coefficients obtained from the above split-half technique.

Results

Reliability studies were carried out as part of the standardization testing in Nigeria and Liberia. Tables 3, 4, and 5 give the results for samples of male and female students at varying levels of education. Table 2 shows the findings for the major *I-D* Test Series.

Evaluation

In general, the reliabilities obtained for the *I-D* tests are comparable to the findings in the United States for standard tests of equal length. Revised forms have been developed for the few tests (e.g., *Science Information)* that gave disappointing results.

Since the *I-D* tests are almost always used in Series, the coefficients in Table 2 are of special importance. They show that all *I-D* Test Series have the stability necessary for effective practical use.

TABLE 2:

ESTIMATES OF RELIABILITY OF *I-D* TEST SERIES*

Trade Series	.85
Jr. Clerical Series	.94
Sr. Clerical Series	.92
Academic Series 1	.91
Academic Series 2	.90
Academic Series 3	.87
Technical Series	.88
Scientific Series	.86
Commercial Series	.90

* Computed by formula from the results for boys for the individual tests and the test intercorrelations.

TABLE 3:

ESTIMATES OF TEST RELIABILITY FOR EXAMINEES
WHO HAVE COMPLETED SIX-SEVEN YEARS OF PRIMARY EDUCATION

I-D TESTS	BOYS r	N	Mean	SD	GIRLS r	N	Mean	SD
1: SIM*	.56	5186	14.54	3.8	.51	1281	13.86	3.8
2: VAL*	.87	374	13.60	7.9	.86	58	14.36	8.3
3: VAH				not used				
4: RDL*	.73	1572	14.24	5.6	.72	563	14.07	5.5
5: RDH				not used				
6: MEM	.90	2771	15.54	11.5	.92	440	16.33	12.5
7: MEC*	.79	2033	29.06	9.5	.68	730	24.40	7.9
8: CHK	.72	2920	27.69	8.1	.68	520	30.39	8.2
9: BOX	.72	3460	110.03	11.3	.68	883	107.32	10.4
10: FIG	.70	3978	16.71	5.9	.68	799	16.29	5.7
11: GPH				not used				
12: COD	.87	3770	71.59	18.9	.86	831	76.33	20.1
13: NAM	.73	3675	117.36	8.0	.79	789	119.02	8.6
14: RTH	.88	3684	131.90	21.3	.89	835	127.45	20.6
15: TAB	.91	362	124.98	14.3	.83	50	125.34	14.2
16: SPK*	.78	306	18.00	6.2	.61	89	19.50	4.7
17: SCI				not used				
18: WLD				not used				
19: MAN	.83	2422	100.00	32.6	.80	529	94.17	31.5
20: FIN	.89	2335	32.22	16.0	.86	563	28.58	15.7
21: MRK	no data				.87	44	177.20	20.7

*Estimated KR-20 coefficients. Others are separately-timed halves, Spearman-Brown adjusted.

TABLE 4:

ESTIMATES OF TEST RELIABILITY FOR EXAMINEES
WHO ARE SECONDARY SCHOOL STUDENTS

ONE-TWO YEARS SECONDARY SCHOOL

I-D TESTS	BOYS r	N	Mean	SD	GIRLS r	N	Mean	SD
1: SIM				not used				
2: VAL*	.81	415	26.64	9.3	.82	98	21.34	9.7
3: VAH*				not used				
4: RDL*	.72	1147	24.71	7.6	.75	362	21.94	8.3
5: RDH*				not used				
6: MEM	.90	977	24.73	14.8	.90	315	24.43	14.2
7: MEC*	.78	851	40.91	11.3	.71	126	26.18	9.5
8: CHK				not used				
9: BOX	.76	1050	117.16	11.9	.80	273	110.35	11.8
10: FIG	.72	1282	21.65	6.6	.62	354	21.67	6.0
11: GPH				not used				
12: COD	.86	895	91.40	18.7	.82	312	94.88	19.2
13: NAM	.76	976	128.21	8.1	.74	314	129.82	9.7
14: RTH	.86	1266	156.30	17.9	.82	351	151.39	18.5
15: TAB	.87	497	137.27	14.9	.85	47	136.58	14.7
16: SPK				not used				
17: SCI				not used				
18: WLD				not used				
19: MAN				no data				
20: FIN				no data				
21: MRK				not used				

*Estimated KR-20 coefficients. Others are separately-timed halves, Spearman-Brown adjusted.

(TABLE 4 continued on next page)

TABLE 4: (continued)

ESTIMATES OF TEST RELIABILITY FOR EXAMINEES
WHO ARE SECONDARY SCHOOL STUDENTS

THREE-FOUR YEARS SECONDARY SCHOOL

I-D TESTS	BOYS r	N	Mean	SD	GIRLS r	N	Mean	SD
1: SIM				not used				
2: VAL*				not used				
3: VAH*	.75	282	24.86	6.8	.85	54	19.19	7.4
4: RDL*				not used				
5: RDH*	.69	256	15.70	5.8	.67	54	12.60	5.0
6: MEM	.92	475	28.43	16.4	.93	135	29.55	15.5
7: MEC*				no data				
8: CHK				not used				
9: BOX	.78	401	121.50	11.7	.85	103	112.58	12.5
10: FIG	.79	556	24.65	7.3	.79	140	25.28	6.9
11: GPH	.83	147	122.30	14.5			no data	
12: COD	.86	476	99.90	19.8	.88	135	107.30	18.7
13: NAM	.73	476	132.39	8.2	.75	135	136.19	9.2
14: RTH	.86	532	165.89	18.4	.82	130	162.76	18.0
15: TAB	.88	197	150.74	11.2			no data	
16: SPK				not used				
17: SCI				not used				
18: WLD				not used				
19: MAN				not used				
20: FIN				not used				
21: MRK				not used				

*Estimated KR-20 coefficients. Others are separately-timed halves, Spearman-Brown adjusted.

TABLE 5:

ESTIMATES OF TEST RELIABILITY FOR BOYS
WHO ARE SECONDARY SCHOOL GRADUATES OR ABOVE

I-D TESTS	SECONDARY GRADUATES r	N	Mean	SD	1-2 YEARS POST-SECONDARY r	N	Mean	SD
1: SIM				not used				
2: VAL				not used				
3: VAH*	.73	154	28.83	5.6		not used		
4: RDL				not used				
5: RDH*	.76	154	22.07	5.9	.71	141	27.69	5.5
6: MEM				not used				
7: MEC				not used				
8: CHK				not used				
9: BOX	.82	138	124.47	10.3	.77	158	126.14	9.0
10: FIG	.81	138	27.57	6.6	.81	158	28.12	6.9
11: GPH	.79	135	129.71	11.8	.68	157	133.95	9.5
12: COD	.83	137	104.02	17.6	.86	158	109.22	18.7
13: NAM	.81	137	132.53	8.4	.74	158	135.98	7.5
14: RTH	.88	138	166.36	19.2	.85	158	174.69	17.0
15: TAB	.91	137	151.45	10.8	.89	158	155.61	10.3
16: SPK				not used				
17: SCI*	.54	188	19.35	4.1	.73	105	22.08	4.5
18: WLD*	.73	188	14.82	4.9	.74	105	20.26	5.9
19: MAN				not used				
20: FIN				not used				
21: MRK				not used				

*Estimated KR-20 coefficients. Others are separately-timed halves, Spearman-Brown adjusted.

4

STANDARDIZATION STUDIES

If, on the basis of experience and training, a group of individuals seems to be equally well prepared for a given aptitude test, and if one of them nevertheless outscores all of the others, he is presumed to have a greater amount of "natural ability" for whatever the test measures.

This, in a sentence, summarizes the theory of aptitude tests. It also indicates the only meaningful way to interpret the test scores. The examinee is evaluated by comparing his score against standards set by his peers.

Such standards or *norms* are established by giving the test to a large sample of people typical of the kinds of examinees for which it is intended. So that examinees of varying backgrounds can be evaluated, it is usually necessary to include a number of "different" groups, and to establish separate norms for each one. For standardization purposes two groups are different if they consistently get different scores on the test; groups that get similar scores can clearly be evaluated with the same set of norms.

Thus, it may or may not prove necessary to develop separate norms for groups different in age, sex, education, national origin, and other such factors. Whether any or none of these characteristics affects the results of a test must be empirically determined.

This Section describes some of the studies carried out in the standardization of the *I-D* tests. It is intended as a brief introduction to Nigeria-Liberia norms already developed, and as a guide to the development of norms for other African countries.

DATA COLLECTION

The first *I-D* standardization study was set in Northern Nigeria for students in the final (seventh) year of primary schooling. During February-April 1962 a sample including one of every twelve such students was tested on ten *I-D* tests. The 67 schools participating in this study represented all provinces and various types of schools, and provided data on 2364 male and 356 female examinees.

In July-August, a similar study was carried out in the Eastern Nigeria primary schools. Here, a total of 2516 boys and 761 girls was tested on twelve *I-D* tests.

Soon thereafter, the Liberia standardization studies were completed. Fourteen *I-D* tests were given to 1893 boys and girls from the sixth, ninth, and twelfth grades.

Next, data were compiled on students in the Nigerian secondary (grammar) schools. The students of fifteen grammar schools from the North, East, West, and the Federal Territory were tested on all the *I-D* tests used at this level. Altogether, the sample included 4023 students representing the six classes of the Nigerian grammar school system.

Finally, an additional set of fourteen North Nigeria primary schools was tested on tests developed after the first study. This added 475 cases to the primary school sample.

In none of these studies did each examinee take all the tests being normed. To reduce fatigue, tests were administered in rotation averaging 7.3 tests per student.

The entire sample includes 12,388 students from 215 schools. Participating schools are listed in Appendix B.

FINDINGS

Sex

In general, boys get somewhat higher scores on technical and scholastic aptitude tests, while girls do better on clerical skills. The differences are quite large for such tests as *Boxes, Dexterity,* and *Mechanical* (on which boys are much superior), but small for most others. On balance, it seemed best to begin with separate sex norms, but to expect that for some tests these norms would eventually be combined.

Education

Even when a test measures aptitudes rather than attainment, scores are expected to rise with increased amounts of formal education. One reason is that the advanced people are older. A second is that they have had more experience in problem-solving situations. A third is that only the more able people reach the higher educational levels.

The findings in West Africa conform to this expectation. On most *I-D* tests, the average score jumps one full standard deviation from primary to secondary school, and then rises more slowly throughout the secondary years. In the last two years, the curve levels off at a point about two standard deviations above the primary school norm.

This makes separate grade norms essential. *I-D* tests are normed at five levels: primary leaving, early secondary, higher secondary, secondary leaving, and early post-secondary based on the Nigerian system of education.

Age

Because birth registration was only recently introduced in West Africa, it is difficult or impossible to develop age norms. The *I-D* approach is to group examinees according to education as noted above, and to trust that the effects of differences in age are thereby adequately controlled.

The available data support this assumption. In the Northern Nigeria primary schools, the correlations between age and the *I-D* scores were effectively zero.

Ethnic Groups

In the first standardization study, data were collected on tribal affiliations, and the test scores of the largest groups were compared. Since no consistent differences were found, this factor was disregarded thereafter.

Geography

It was taken for granted that norms would be established (or at least checked) separately in each country in which the *I-D* tests are to be used. What was not known was whether there are significant differences also among regions within a country or among provinces within a region.

The first check was among the provinces of Northern Nigeria. No large differences were found, even between provinces substantially different on the English and Math attainment tests of the Common Entrance Examination used by the Northern secondary schools. It was concluded that separate province norms were not needed.

Next, Northern and Eastern Nigeria primary school student averages were compared. On eight of the ten tests given in both studies, the averages were within a single raw-score point of each other. The other two averages differed about one-fourth standard deviation unit, one in favor of the Northern and one in favor of the Eastern students. Accordingly, it was decided to establish a single set of Nigeria-wide norms.

Although the Liberia findings did show that separate norms are required, their deviation from the Nigeria results was much less than expected. On the above ten tests, three of the averages were substantially different in the two countries, three were only slightly different, and four led to equivalent norms. The *Reading* test, which is presumably the one most sensitive to past education, gave average scores of 14.4 and 14.6 for Eastern Nigeria Standard 6 students and for Liberian sixth graders.

Until local norms are developed for a given country, therefore, it may prove efficient to check the present West African norms on a relatively small sample, and to adopt those that seem to apply. For this purpose, a set of pooled Nigeria-Liberia norms is included in the separate booklet of *I-D Test Norms*. But, clearly, these are approximations to be used only until the extensive data required for local norms have been assembled.

THE *I-D* TEST NORMS

Organization

For each test, a number of norm tables has been prepared. There is one table for boys at each level of education at which the test is used, and (wherever adequate data have been collected) a comparable table for girls. The sex and the education of the examinee determine which table is to be used.

In the light of the preceding discussion, it should be clear that the use of education as a control variable does not limit the norms to school applications. This is done so as to compare the examinee to a group similar in background, irrespective of the particular type of job for which he is being tested.

Stanine Scores

The norm tables convert the examinee's raw score into a *standard* score that shows his standing in the comparison group. For the *I-D* tests, the *stanine* system is used.

In this system, the span from the lowest to the highest test scores is divided into nine equal segments. An examinee whose score is in the lowest segment receives a stanine score *1*, an examinee in the highest segment a stanine score *9*, an examinee in the center (average) segment a stanine score *5*, and so on for all nine divisions.

Because the distribution of the test scores is bell-shaped, relatively few examinees get the extreme stanine score of *1* or *9*. If the distribution is "normal," only the examinees with scores equal to the top four percent of the comparison group receive a *9;* only the lowest four percent get a *1*. The complete distribution is shown in Table 6 as a guide to the interpretation of stanine scores.

One of the advantages of the stanine system (as compared to percentiles, for example) is that the two-point difference between scores of, say, *7* and *9* is equivalent to any other two-point difference, such as between *2* and *4*. This means that stanines may be added together to obtain a Series score, multiplied by differential weights, or subjected to any other arithmetic or statistical operation.

TABLE 6:

DISTRIBUTION OF STANINE SCORES
WHEN TEST SCORES ARE NORMAL

Stanine Score	Percent of Examinees With This Score	Percent of Examinees With Higher Scores	Percent of Examinees With Lower Scores
9	4%	0%	96%
8	7%	4%	89%
7	12%	11%	77%
6	17%	23%	60%
5	20%	40%	40%
4	17%	60%	23%
3	12%	77%	11%
2	7%	89%	4%
1	4%	96%	0%

5

STUDIES OF TEST VALIDITY

- The Skilled Trades
- Clerical Occupations
- Scholastic Success
- Higher-Level Careers

A score on an aptitude test is, in effect, a prediction. A high score suggests that the examinee will do well in a certain career; a low score suggests he is likely to fail. The value of the test for selection and guidance depends on the accuracy of its predictions.

This Section provides data on the accuracy or *validity* of the *I-D* aptitude tests. In the following studies, the test scores obtained by more than 4000 examinees are compared with independent evaluations of their actual job skills. The results show the degree to which people do prove to be as successful or unsuccessful as their *I-D* scores suggest.

Each study is summarized as follows:

The description of the *sample* indicates the kinds of groups tested, and the sources from which they were drawn. The five countries (Nigeria, Liberia, Ghana, Tunisia, and Mali) represented in the sample are designated by their initial letters.

The section on *criteria* describes the kinds of data (e.g., marks, ratings, or examination results) that were applied as indices of the examinees' relative success. Whether these evaluations were obtained in a concurrent or follow-up study also is noted.

The *results* consist of validity coefficients for individual tests and for appropriate test combinations. These are the coefficients of correlation between the test scores and the criterion data.

The significance of the validity coefficients obtained in each study is shown graphically in the section on the *implications*. A chart indicates the levels of proficiency that may be expected from individuals selected by an *I-D* Test Series.

Studies Of Test Validity

THE SKILLED TRADES

The *I-D Trade Series* has been validated for two types of practical applications.

One application is assessing an examinee's aptitude for learning the kinds of skills that most trade jobs require. Such information is important in vocational guidance, and in the selection of trainees for preparatory courses prior to specialization. The accuracy of the tests for this type of application is reported in the first of the studies summarized on the following pages.

The second application is the evaluation of individuals who have applied for training in a specific trade. Illustrative data are given for the three trades – mechanic, electrician, machinist – for which the largest samples have been tested to date.

The results show that the *I-D Trade Series* is effective for both types of applications, adding materially to the accuracy of current evaluation procedures.

A STUDY OF GENERAL APTITUDE FOR THE SKILLED TRADES

PURPOSE To evaluate the accuracy of the *I-D Trade Series* in measuring an examinee's general aptitude for the skilled trades.

SAMPLE A total of 285 students and trainees, distributed as follows:

Institution and Country		Level	N
Shell-B.P. Technical Training School	(N)	Year 1	50
Shell-B.P. Technical Training School	(N)	Year 1	45
P.H. Comprehensive Secondary School	(N)	Year 1	55
P.H. Comprehensive Secondary School	(N)	Year 2	56
Booker Washington Institute	(L)	Year 1	79

Each of these examinees had taken courses (and been evaluated) in more than one type of trade.

CRITERIA Average grade in three or more shop courses. In the middle three of the above studies the criterion data were collected as part of a follow-up one year or more after testing. In the other two, the evaluations were obtained at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Trade Series:*

Test	N[1]	r
Similarities	79	.28
Mechanical	220	.45
Boxes	273	.33
Figures	273	.35
Manual	273	.38
Finger	221	.26

Apparently, the *Manual Dexterity* test is superior to the test of *Finger Dexterity* in measuring over-all aptitude for the skilled trades. For such applications, the *Finger Dexterity* test should be dropped from the *Series*.

The combined validity of the remaining five tests is .57 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from the use of the *I-D Trade Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	59%
Pr. St. *and* I-D Stanine 5	65%
Pr. St. *and* I-D Stanine 6	73%
Pr. St. *and* I-D Stanine 7	81%
Pr. St. *and* I-D Stanine 8	87%
Pr. St. *and* I-D Stanine 9	93%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The above findings suggest that there is a central set of aptitudes common to most of the skilled trades, and that the *I-D Trade Series* provides a useful index of these basic skills. The *Series* is ready for use in selection and guidance, whenever it is important to evaluate an individual's potential for a career in the skilled trades.

Effective test weights should be developed separately by each institution using the *Series*. For the interim, a trial scheme of double weight to the *Mechanical* and *Manual* stanines, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR THE MECHANIC TRADE

PURPOSE To evaluate the accuracy of the *I-D Trade Series* in measuring an examinee's aptitude for the mechanic trade.

SAMPLE A total of 134 mechanic trainees, distributed as follows:

Institution and Country		Level	N
Yaba Trade Centre	(N)	Year 1	25
Yaba Trade Centre	(N)	Year 2	37
Army Base Workshops	(N)	Year 1	14
Booker Washington Institute	(L)	Year 2	16
UAC Motors School	(G)	Year 1	14
UAC Motors School	(G)	Year 1	13
Ariana Automotive Training Centre	(T)	Year 1	15

CRITERIA Average of practical-work grades and/or proficiency tests. Criterion data were collected at the time the aptitude tests were given, or shortly thereafter.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Trade Series:*

Test	N[1]	
Similarities	60	.43
Mechanical	39	.43
Boxes	116	.31
Figures	116	.39
Manual	115	.42
Finger	93	.20

The findings are quite similar to those from the general trade aptitude studies, and the use of *Manual Dexterity* rather than *Finger Dexterity* is again indicated. For the selection of mechanics, *Finger Dexterity* is dropped from the *Series*.

The combined validity of the remaining five tests is .63 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from the use of the *I-D Trade Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	55%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	67%
Pr. St. *and* I-D Stanine 6	76%
Pr. St. *and* I-D Stanine 7	85%
Pr. St. *and* I-D Stanine 8	90%
Pr. St. *and* I-D Stanine 9	96%


Proportion who will perform *above* average of present trainees


Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Trade Series* is ready for use in the selection of mechanic trainees. As shown in the above table, it can provide a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Mechanical* and *Manual* stanines, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR THE ELECTRICIAN TRADE

PURPOSE To evaluate the accuracy of the *I-D Trade Series* in measuring an examinee's aptitude for the electrician trade.

SAMPLE A total of 93 electrician trainees, distributed as follows:

Institution and Country		Level	N
Yaba Trade Centre	(N)	Year 2	32
C.I.P.E. Training Centre	(T)	Sem. 1	33
C.I.P.E. Training Centre	(T)	Sem. 2	28

CRITERIA End-of-term grades. In the Yaba study, criterion data were collected more than one year after testing. In Tunisia the tests were administered shortly before the end of the term.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Trade Series:*

Test	N[1]	r
Similarities	58	.21
Mechanical	58	.53
Boxes	87	.47
Figures	87	.30
Manual	87	.16
Finger	32	.37

For electricians, the *Finger Dexterity* test is superior to *Manual Dexterity,* as might have been expected from the kinds of manipulative skills required for this job. The *Manual Dexterity* test is dropped from the *Series.*

The combined validity of the remaining five tests is .59 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from the use of the *I-D Trade Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	66%
Pr. St. *and* I-D Stanine 6	74%
Pr. St. *and* I-D Stanine 7	82%
Pr. St. *and* I-D Stanine 8	88%
Pr. St. *and* I-D Stanine 9	94%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Trade Series* is ready for use in the selection of electrician trainees. As shown in the above table, it provides a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Mechanical* and *Boxes* stanines, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR THE MACHINIST TRADE

PURPOSE To evaluate the accuracy of the *I-D Trade Series* in measuring an examinee's aptitude for the machinist trade.

SAMPLE A total of 87 machinist-fitter trainees, distributed as follows:

Institution and Country		Level	N
Yaba Trade Centre	(N)	Year 1	27
Yaba Trade Centre	(N)	Year 2	34
S. F. Railway Training Centre	(T)	Year 1	26

CRITERIA End-of-term grades at Yaba; composite rating of three to five instructors in the Tunisia study. All criterion data were obtained soon after the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Trade Series:*

Test	N[1]	r
Similarities	26	.28
Mechanical	26	.43
Boxes	81	.30
Figures	81	.32
Manual	81	.37
Finger	58	.09

The findings are highly similar to those from the general trade aptitude and the mechanic studies. The *Manual Dexterity* test is superior to *Finger Dexterity,* which should be dropped from the *Series* for selecting machinists.

The combined validity of the remaining five tests is .54 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from the use of the *I-D Trade Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	59%
Pr. St. *and* I-D Stanine 5	65%
Pr. St. *and* I-D Stanine 6	72%
Pr. St. *and* I-D Stanine 7	79%
Pr. St. *and* I-D Stanine 8	86%
Pr. St. *and* I-D Stanine 9	91%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Trade Series* is ready for use in the selection of machinist and fitter trainees. As shown in the above table, it provides a considerable improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Mechanical* and *Manual* stanines, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

Studies Of Test Validity

CLERICAL OCCUPATIONS

The *I-D Clerical Series* have been validated for both junior and senior clerical jobs.

A junior clerk was defined as an individual whose educational qualification at the point of selection is at or near the primary school graduate level; a senior clerk has completed his secondary school education. These are the two levels at which clerical applicants are typically recruited.

The *I-D Junior Clerical* and *Senior Clerical* Series are similar in that they both measure the same types of aptitudes. They differ in that the advanced *Verbal* test is used at the senior level, and that a separate set of test norms is applied to each *Series*.

It will be seen that the tests were effective for both the junior and senior clerk samples. The validities for the advanced group were especially high.

A STUDY OF APTITUDE FOR JUNIOR CLERICAL POSITIONS

PURPOSE To evaluate the accuracy of the *I-D Junior Clerical Series* in measuring clerical aptitude at the primary school graduate level.

SAMPLE A total of 179 junior clerks, consisting of 115 employed clerks and 64 clerical trainees, distributed as follows:

Institution and Country		Level	N
East Nigeria Inst. of Administration	(N)	Empl.	15
Firestone Plantation	(L)	Empl.	75
Department of Public Works	(L)	Empl.	25
Lycee Technique	(M)	Year 1	24
Lycee Technique	(M)	Year 1	23
Lycee Technique	(M)	Sem. 1	17

CRITERIA Ratings by immediate supervisor in the Liberia studies; grades in the refresher course at the Institute of Administration; end-of-term grades for the trainees. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Junior Clerical Series:*

Test	N[1]	r
Verbal[2]	70	.55
Coding	164	.29
Names	164	.34
Arithmetic	164	.35
Tables	70	.35

The combined validity of these five clerical tests is .54 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Jr. Clerical Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	59%
Pr. St. *and* I-D Stanine 5	65%
Pr. St. *and* I-D Stanine 6	72%
Pr. St. *and* I-D Stanine 7	79%
Pr. St. *and* I-D Stanine 8	86%
Pr. St. *and* I-D Stanine 9	91%


Proportion who will perform *above* average of present trainees


Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Jr. Clerical Series* is ready for use in the selection of junior clerical trainees. As shown in the above table, it provides a considerable improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* stanine, single weight to the other four stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

[2] Because the *Verbal* test was developed after these studies, these data are an estimate based on the *Reading* test formerly used. The two tests are closely related, and it will be seen that the above estimate corresponds almost exactly to the findings for the *Verbal* test in the following study.

A STUDY OF APTITUDE FOR SENIOR CLERICAL POSITIONS

PURPOSE To evaluate the accuracy of the *I-D Senior Clerical Series* in measuring clerical aptitude at the post-secondary school level.

SAMPLE A total of 335 senior clerks, including 181 employed clerks and 154 advanced clerical trainees, distributed as follows:

Institution and Country		Level	N
East Nigeria Inst. of Administration	(N)	Empl.	24
Firestone Plantation	(L)	Empl.	82
Department of Public Works	(L)	Empl.	45
U.S.A.I.D. Mission to Liberia	(L)	Empl.	30
Federal Clerical Training Centre	(N)	Year 1	18
Federal Clerical Training Centre	(N)	Year 1	29
Federal Clerical Training Centre	(N)	Year 2	34
Bida Clerical Training Centre	(N)	Year 1	73

CRITERIA Ratings by immediate supervisor in the Liberia studies; grades in the refresher course at the Institute of Administration; ratings or grades for the trainees. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Senior Clerical Series:*

Test	N[1]	r
Verbal (High)	145	.54
Coding	314	.37
Names	314	.42
Arithmetic	314	.43
Tables	166	.49

The combined validity of these five clerical tests is .66 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Sr. Clerical Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	55%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	68%
Pr. St. *and* I-D Stanine 6	78%
Pr. St. *and* I-D Stanine 7	87%
Pr. St. *and* I-D Stanine 8	92%
Pr. St. *and* I-D Stanine 9	97%

Proportion who will perform *above* average of present trainees

Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Sr. Clerical Series* is ready for use in the selection of senior clerical trainees. As shown in the above table, it provides a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* stanine, single weight to the other four stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

Studies Of Test Validity

SCHOLASTIC SUCCESS

Tests of a student's scholastic aptitude are useful at all stages of the secondary school cycle. They may be used first as selection devices; later, for guidance as to choice of career. In a comprehensive school, or other institution that offers alternative patterns of study, periodic testing is an integral part of the educational programme.

Accordingly, *I-D Academic Series* have been developed to span the full secondary cycle. The following studies describe the findings for students in the first two years, based on the *I-D Academic Series 1;* and for students in the final two or three years, based on the *I-D Academic Series 2.* Separate results are reported for boys and for girls.

Because the pattern of secondary education varies among different countries, it was not possible to pool all of the available validity data, and the findings from only Nigeria are shown. These are based on large samples, and are illustrative of the excellent results generally obtained.

A STUDY OF APTITUDE FOR SECONDARY SCHOOL EDUCATION (BOYS)

PURPOSE To evaluate the accuracy of the *I-D Academic Series 1* in measuring aptitude for secondary school studies.

SAMPLE A total of 1113 male Nigerian students, distributed as follows:

Institution and Region		Level	N
Afikpo Gov't Secondary Schcol	(E)	Yr 1-2	113
Aiyetoro Comp. Secondary School	(W)	Year 1	81
Gindiri Boys' Secondary School	(N)	Yr 1-2	60
Kaduna Government College	(N)	Yr 1-2	114
Kagoro S.I.M. Secondary School	(N)	Yr 1-2	49
Mayflower School	(W)	Yr 1-2	89
Military School	(N)	Yr 1-2	101
Okene Prov. Secondary School	(N)	Yr 1-2	121
Owerri Gov't Secondary School	(E)	Yr 1-2	80
P.H. Comp. Secondary School	(E)	Yr 1-2	111
Umuahia Government College	(E)	Yr 1-2	110
Zaria Government College	(N)	Year 1	84

CRITERIA Ratings of two to four instructors at Okene; average of three final examinations at Mayflower; average of up to nine course grades at other schools. Criterion data at the Military School and the Port Harcourt School were collected as part of a follow-up more than one year after testing. The other criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Academic Series 1:*

Test	N[1]	r
Verbal	558	.45
Reading	939	.45
Memory	1038	.20
Arithmetic	1041	.32

The combined validity of these four separate tests is .56 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Academic Series 1* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	59%
Pr. St. *and* I-D Stanine 5	65%
Pr. St. *and* I-D Stanine 6	73%
Pr. St. *and* I-D Stanine 7	81%
Pr. St. *and* I-D Stanine 8	87%
Pr. St. *and* I-D Stanine 9	93%

Proportion who will perform *above* average of present trainees

Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Academic Series 1* is ready for use in the selection of secondary school students. As shown in the above table, it provides a considerable improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* and *Reading* stanines, single weight to the others is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR SECONDARY SCHOOL EDUCATION (GIRLS)

PURPOSE To evaluate the accuracy of the *I-D Academic Series 1* in measuring aptitude for secondary school studies.

SAMPLE A total of 296 female Nigerian students, distributed as follows:

Institution and Region		Level	N
Aiyetoro Comp. Secondary School	(W)	Year 1	45
Anglican Girls' Secondary School	(F)	Yr 1-2	117
Mayflower School	(W)	Yr 1-2	50
Queen's School	(E)	Yr 1-2	84

CRITERIA Ratings of three instructors at Anglican; average of three final examinations at Mayflower; average of course grades at Aiyetoro and Queen's. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Academic Series 1:*

Test	N[1]	r
Verbal	144	.57
Reading	278	.53
Memory	275	.31
Arithmetic	278	.32

The combined validity of these four separate tests is .64 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Academic Series 1* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	55%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	68%
Pr. St. *and* I-D Stanine 6	77%
Pr. St. *and* I-D Stanine 7	85%
Pr. St. *and* I-D Stanine 8	91%
Pr. St. *and* I-D Stanine 9	97%


Proportion who will perform *above* average of present trainees


Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Academic Series 1* is ready for use in the selection of secondary school students. As shown in the above table, it provides a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* and *Reading* stanines, single weight to the others is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR ADVANCED SECONDARY SCHOOL EDUCATION (BOYS)

PURPOSE To evaluate the accuracy of the *I-D Academic Series 2* in measuring aptitude for advanced secondary school studies.

SAMPLE A total of 733 male Nigerian students, distributed as follows:

Institution and Region		Level	N
Afikpo Gov't Secondary School	(E)	Yr 3-4	83
Gindiri Boys' Secondary School	(N)	Year 5	27
Kaduna Gov't College	(N)	Yr 3-5	64
Kagoro S.I.M. Secondary School	(N)	Yr 3-5	77
Mayflower School	(W)	Yr 3-5	122
Military School	(N)	Year 3	47
Okene Prov. Secondary School	(N)	Yr 3-5	139
Owerri Gov't Secondary School	(E)	Yr 3-4	53
Umuahia Government College	(E)	Yr 3-4	78
Zaria Government College	(N)	Year 5	43

CRITERIA Ratings of two to four instructors at Okene; average of three final examinations at Mayflower; average of up to nine course grades at other schools. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Academic Series 2:*

Test	N[1]	r
Verbal (High)	467	.49
Reading (High)	403	.49
Graph	379	.37
Arithmetic	669	.33

The combined validity of these four separate tests is .62 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Academic Series 2* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	67%
Pr. St. *and* I-D Stanine 6	76%
Pr. St. *and* I-D Stanine 7	84%
Pr. St. *and* I-D Stanine 8	90%
Pr. St. *and* I-D Stanine 9	96%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Academic Series 2* is ready for use in the guidance of secondary school students. As shown in the above table, it identifies those who will be the most successful in completing the formal academic programme.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* and *Reading* stanines, single weight to the others is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR ADVANCED SECONDARY SCHOOL EDUCATION (GIRLS)

PURPOSE To evaluate the accuracy of the *I-D Academic Series 2* in measuring aptitude for advanced secondary school studies.

SAMPLE A total of 209 female Nigerian students, distributed as follows:

Institution and Region		Level	N
Anglican Girls' Secondary School	(F)	Yr 3-5	78
Mayflower School	(W)	Yr 3-5	73
Queen's School	(E)	Yr 3-4	58

CRITERIA Ratings of three instructors at Anglican; average of three final examinations at Mayflower; average of course grades at Queen's. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Academic Series 2:*

Test	N[1]	r
Verbal (High)	67	.52
Reading (High)	67	.38
Graph	67	.39
Arithmetic	188	.38

The combined validity of these four tests is .62 when the tests are all equally weighted[2]. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Academic Series 2* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	67%
Pr. St. *and* I-D Stanine 6	76%
Pr. St. *and* I-D Stanine 7	84%
Pr. St. *and* I-D Stanine 8	90%
Pr. St. *and* I-D Stanine 9	96%


Proportion who will perform *above* average of present trainees


Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Academic Series 2* is ready for use in the guidance of secondary school students. As shown in the above table, it identifies those who will be the most successful in completing the formal academic programme.

Until institutional test weights are developed, a trial scheme of double weight to the *Verbal* stanine, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

[2] Because of the small number of girls tested at this level, the intercorrelations for male students were used in computing the composite.

Studies Of Test Validity

HIGHER-LEVEL CAREERS

A number of the *I-D* Series are specifically intended for selection or guidance decisions in post-secondary training institutions. The four studies in this section are illustrative of applications at these higher levels.

The first study is concerned with academic performance in a post-secondary curriculum, and presents the findings for *I-D Academic Series 3*. The second study, an application of the *I-D Technical Series,* reports validity data for technician trainees. The third and fourth studies give data for university-level testing with the advanced *I-D Scientific* and *I-D Commercial Series*.

It will be seen that significant results were obtained in all of these studies. Certain of the *I-D* tests – *Reading, Arithmetic, Graph,* and one or both tests of *Information* – were consistently valid, and are probably useful for also other post-secondary applications.

A STUDY OF APTITUDE FOR POST-SECONDARY EDUCATION

PURPOSE To evaluate the accuracy of the *I-D Academic Series 3* in measuring aptitude for post-secondary school studies.

SAMPLE A total of 226 University and Sixth Form (Arts) students, distributed as follows:

Institution and Country		Level	N
Okene Prov. Sec. School – Form 6	(N)	Yr 1-2	31
Zaria Government College – Form 6	(N)	Year 2	9
Cuttington College	(L)	Yr 1-4	82
University of Liberia	(L)	Year 1	51
University of Liberia	(L)	Year 3	30
University of Liberia	(L)	Year 4	23

CRITERIA Average of grades in three or more courses. All criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Academic Series 3:*

Test	N[1]	r
Reading (High)	199	.52
Graph	152	.39
Arithmetic	104	.37
Science Info	149	.36
World Info	149	.31

The combined validity of these five tests is .61 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Academic Series 3* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	66%
Pr. St. *and* I-D Stanine 6	75%
Pr. St. *and* I-D Stanine 7	84%
Pr. St. *and* I-D Stanine 8	89%
Pr. St. *and* I-D Stanine 9	95%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Academic Series 3* is ready for use in the selection of Sixth Form and University students. As shown in the above table, it can provide a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Reading* stanine, single weight to the other four stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less then the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR TECHNICIAN CAREERS

PURPOSE To evaluate the accuracy of the *I-D Technical Series* in measuring aptitude for the technician occupations.

SAMPLE A total of 231 students in mechanical, electrical, civil engineering and similar courses, distributed as follows:

Institution and Country		Level	N
School of Mines	(N)	Year 1	17
School of Mines	(N)	Year 2	8
Yaba Technical Institute	(N)	Year 2	52
Enugu Technical Institute	(N)	Year 1	48
Enugu Technical Institute	(N)	Year 2	23
Public Works School	(M)	Year 1	41
Public Works School	(M)	Year 2	30
Public Works School	(M)	Year 3	12

CRITERIA Average grade in two to eight technical courses. Criterion data were collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Technical Series:*

Test	N[1]	r
Verbal (High)	118	.23
Boxes	180	.29
Figures	180	.28
Graph	180	.32

The combined validity of these four separate tests is .40 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Technical Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	53%
Pr. St. *and* I-D Stanine 4	57%
Pr. St. *and* I-D Stanine 5	61%
Pr. St. *and* I-D Stanine 6	66%
Pr. St. *and* I-D Stanine 7	72%
Pr. St. *and* I-D Stanine 8	78%
Pr. St. *and* I-D Stanine 9	83%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The findings for the *I-D Technical Series* are less striking than for the other I-D Series. But, as shown in the above table, it nevertheless provides a significant improvement over current selection procedures.

Two possible modifications should be evaluated. One is to substitute the more difficult *Reading* test for the *Verbal* test now used. The second is the addition of the *Arithmetic* test.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR SCIENTIFIC CAREERS

PURPOSE To evaluate the accuracy of the *I-D Scientific Series* in measuring aptitude for advanced science training.

SAMPLE A total of 52 Sixth Form (Science) students, distributed as follows:

Institution and Country		Level	N
Okene Prov. Secondary School	(N)	Year 1	18
Okene Prov. Secondary School	(N)	Year 2	18
Zaria Government College	(N)	Year 2	16

CRITERIA Average grades, collected at about the same time that the tests were given.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Scientific Series:*

Test	N[1]	r
Reading (High)	45	.37
Graph	31	.33
Arithmetic	46	.46
Science Info	45	.32

The combined validity of these four separate tests is .54 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Scientific Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	59%
Pr. St. *and* I-D Stanine 5	65%
Pr. St. *and* I-D Stanine 6	72%
Pr. St. *and* I-D Stanine 7	79%
Pr. St. *and* I-D Stanine 8	86%
Pr. St. *and* I-D Stanine 9	91%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Scientific Series* is ready for use in the selection of advanced science students. As shown in the above table, it provides a considerable improvement over current selection procedures.

Until more definitive data are compiled, the assignment of equal weight to each of the four tests is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

A STUDY OF APTITUDE FOR COMMERCIAL CAREERS

PURPOSE To evaluate the accuracy of the *I-D Commercial Series* in measuring aptitude for a commercial or administrative career.

SAMPLE A total of 72 students in university-level business and administration courses, distributed as follows:

Institution and Country		Level	N
University of Lagos	(N)	Year 1	43
Ahmadu Bello University	(N)	Year 1	29

CRITERIA Average of grades in relevant courses. The tests were given when the students entered the University, and criterion data were collected as part of a follow-up one term or more later.

RESULTS The following set of validity coefficients was obtained for the individual tests in the *I-D Commercial Series:*

Test	N[1]	r
Reading (High)	42	.30
Graph	69	.41
Names	68	.36
Arithmetic	43	.44
World Info	69	.39

The combined validity of these five separate tests is .58 when the tests are all equally weighted. Since the use of differential weights is intended, this may be taken as a conservative estimate of the *Series'* validity for future applications.

IMPLICATIONS

The improvement to be expected from use of the *I-D Commercial Series* depends on how high a score is required for admission to training. The following table shows anticipated improvements for progressively higher selection standards:

Minimum Requirement For Admission	Expected Quality Of The Trainees Selected
Present Standards Only	50%
Pr. St. *and* I-D Stanine 3	54%
Pr. St. *and* I-D Stanine 4	60%
Pr. St. *and* I-D Stanine 5	66%
Pr. St. *and* I-D Stanine 6	74%
Pr. St. *and* I-D Stanine 7	82%
Pr. St. *and* I-D Stanine 8	88%
Pr. St. *and* I-D Stanine 9	94%

■ Proportion who will perform *above* average of present trainees

□ Proportion who will perform *below* average of present trainees

CONCLUSIONS

The *I-D Commercial Series* is ready for use in the selection of administration or business students. As shown in the above table, it can provide a substantial improvement over current selection procedures.

Until institutional test weights are developed, a trial scheme of double weight to the *Arithmetic* and *World Info* stanines, single weight to the other three stanines is recommended.

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[1] The value of N in this column reflects the fact that the results from a number of smaller samples were averaged. It is less than the number of people actually tested, but is the correct value to use in computing the standard errors of the corresponding validity coefficients.

6

APPENDICES

APPENDIX A:
TEST INTERCORRELATIONS

Test intercorrelations indicate the extent to which different tests provide different kinds of information. The higher the correlations, the greater the overlap among the tests; the lower the correlations, the more each test is unique. Low intercorrelations are desirable since they indicate that the various tests of a Series are providing complementary rather than duplicate information.

One important use of intercorrelation data is in weighting the tests of a Series according to their individual contributions. The large weight given *Manual Dexterity* in the Trade Series, for example, results mainly from its low correlations with the other four tests.

This Appendix gives intercorrelation results for boys at four levels of education. Since too few girls were tested at the upper levels to permit similar computations, the data for only primary school girls are included.

It will be seen that the *I-D* intercorrelations are satisfactorily low. Median coefficients are .26 at the primary school level, and .22 for the secondary school graduate group.

TABLE A-1:

I-D TEST INTERCORRELATIONS FOR
BOYS WITH SIX-SEVEN YEARS PRIMARY EDUCATION*

	SIM	VA	RD	MEM	MEC	CHK	BOX	FIG	COD	NAM	RTH	TAB	SPK	MAN	FIN	MRK
Similarities		**	34	21	47	30	24	23	31	30	19	**	51	13	16	−05
Verbal			44	35	36	**	28	19	26	35	34	35	**	**	**	**
Reading	1413	374		26	54	27	19	24	33	37	31	33	55	16	20	−04
Memory	2757	159	813		31	20	25	22	34	22	28	42	24	16	14	03
Mechanical	2036	122	765	723		33	28	36	40	35	32	29	**	20	23	**
Checking	2913	**	317	1781	274		18	30	34	37	20	**	35	11	20	**
Boxes	3442	243	823	1290	1869	1830		23	23	17	22	16	16	13	15	**
Figures	3963	243	1033	2618	995	2756	2302		34	27	19	25	42	14	15	−02
Coding	3760	243	1143	2123	654	2643	2085	3114		42	31	43	40	24	28	26
Names	3669	159	1501	2126	697	2634	2044	3057	3166		39	45	28	20	25	03
Arithmetic	3674	255	893	2008	678	2590	2172	3146	3495	3146		34	22	07	20	00
Table Reading	**	362	362	147	122	**	243	243	243	147	243		**	**	**	**
Spoken English	306	**	306	305	**	118	91	188	303	306	188	**		35	24	−10
Manual	2412	**	406	1840	540	2012	1238	1992	2177	1872	2232	**	117		47	**
Finger	2328	**	401	972	473	1979	2022	1961	2889	1842	2146	**	118	1364		**
Marking	149	**	149	149	**	**	**	149	148	149	149	**	149	**	**	

*Coefficients are shown above diagonal; corresponding N's below. All decimal points omitted.
**No data available.

TABLE A-2:

I-D TEST INTERCORRELATIONS FOR
GIRLS WITH SIX-SEVEN YEARS PRIMARY EDUCATION*

	SIM	VA	RD	MEM	MEC	CHK	BOX	FIG	COD	NAM	RTH	TAB	SPK	MAN	FIN	MRK
Similarities		**	39	24	40	29	22	24	30	32	25	**	47	14	18	–08
Verbal			60	45	09	**	30	22	27	48	52	45	**	**	**	**
Reading	508	58		34	40	13	20	18	34	34	24	45	58	05	13	–28
Memory	439	44	172		33	16	25	21	39	34	38	32	33	17	28	29
Mechanical	730	21	303	109		21	21	38	43	28	31	–06	**	15	08	**
Checking	520	**	76	245	136		09	33	30	38	25	**	54	11	16	**
Boxes	882	26	230	165	635	348		04	20	14	24	44	30	27	24	**
Figures	798	26	266	416	312	489	409		26	24	23	00	10	05	04	00
Coding	831	26	289	344	290	383	442	574		49	32	20	32	30	29	34
Names	789	44	481	344	277	384	421	547	570		42	59	35	18	26	07
Arithmetic	834	37	175	321	313	476	539	594	717	482		63	30	15	16	09
Table Reading	**	47	47	33	21	**	26	26	26	33	26		**	**	**	**
Spoken English	89	**	89	89	**	24	21	65	88	88	65	**		15	33	–22
Manual	529	**	119	265	234	375	311	396	401	292	492	**	24		41	**
Finger	563	**	119	148	217	393	471	413	434	309	526	**	24	330		**
Marking	44	**	44	44	**	**	**	44	44	43	44	**	44	**	**	

*Coefficients are shown above diagonal; corresponding N's below. All decimal points omitted.

**No data available.

TABLE A-3:

I-D TEST INTERCORRELATIONS FOR
BOYS WITH ONE-TWO YEARS SECONDARY EDUCATION*

	VA	RD	MEM	MEC	BOX	FIG	COD	NAM	RTH	TAB
Verbal		43	11	38	38	23	15	17	23	25
Reading	560		10	43	22	21	16	23	17	27
Memory	547	551		09	16	12	26	18	17	23
Mechanical	422	424	424		41	35	17	09	05	22
Boxes	546	547	547	420		35	12	08	11	17
Figures	479	480	480	353	479		20	20	09	24
Coding	550	551	551	424	547	460		37	34	43
Names	550	551	551	424	549	480	551		40	47
Arithmetic	550	551	548	424	547	480	551	551		43
Table Reading	545	546	546	419	571	479	546	550	526	

TABLE A-4:

I-D TEST INTERCORRELATIONS FOR
BOYS WITH THREE-FOUR YEARS SECONDARY EDUCATION*

	VAH	RDH	MEM	BOX	FIG	GPH	COD	NAM	RTH	TAB
Verbal (High)		46	16	30	29	35	20	12	18	22
Reading (High)	214		01	02	21	17	04	19	16	21
Memory	214	214		04	07	26	34	06	23	30
Boxes	214	214	215		20	22	14	−14	−04	−03
Figures	214	214	215	215		24	27	16	10	21
Graph	191	191	192	192	192		34	34	34	42
Coding	214	214	215	215	215	192		27	35	50
Names	168	168	168	168	168	145	168		41	56
Arithmetic	214	214	215	215	215	192	215	168		52
Table Reading	214	214	214	214	214	191	214	168	214	

*Coefficients are shown above diagonal; corresponding N's below. All decimal points omitted.

TABLE A-5:

I-D TEST INTERCORRELATIONS FOR
BOYS WHO ARE SECONDARY SCHOOL GRADUATES*

	VA	RD	MEM	BOX	FIG	GPH	COD	NAM	RTH	TAB	SCI	WLD
Verbal (High)		46	09	38	43	32	16	16	25	30	37	12
Reading (High)	154		20	17	31	34	14	23	14	29	36	49
Memory	157	157		16	15	18	31	26	19	36	−06	06
Boxes	154	186	157		35	18	20	00	14	−03	23	01
Figures	126	158	157	127		39	31	22	11	15	36	27
Graph	153	153	157	153	125		33	46	58	53	18	14
Coding	125	125	157	157	158	157		32	35	36	09	−11
Names	125	125	157	157	157	125	127		47	70	−19	03
Arithmetic	154	154	157	186	158	153	127	127		55	10	−03
Table Reading	125	125	157	157	157	157	127	127	127		00	21
Science	124	146	96	124	96	145	96	96	146	96		34
World	124	146	96	124	96	145	96	118	151	96	146	

*Coefficients are shown above diagonal; corresponding N's below. All decimal points omitted.

APPENDIX B: STANDARDIZATION GROUPS

SENIOR PRIMARY SCHOOLS – EASTERN NIGERIA

Location	Name of School	N
Aba	St. Mary's	10
Aba	St. Michael's	66
Aba	Seventh Day Adventist	34
Aba	Umuaro (Q.I.C.)	32
Abagana	C.M.S. Central School	35
Abak	County Council School	35
Abakaliki	Methodist Ezzamgbo	34
Abiakpo	Methodist School	32
Adazi	St. Andrew's	36
Afikpo	Presbyterian School	62
Aguleri	St. Joseph's Catholic School	27
Agulu	St. Mary's Practising School	25
Ahoada	St. Paul's Anglican	51
Akokwa	St. Peter's Anglican	33
Akpugo	Sacred Heart School	62
Aku	St. Thomas C.M.S.	17
Alayi	St. Joseph's R.C.M.	36
Amaezu	St. Kevin's R.C.M.	32
Amaifeke	St. Mary's	67
Awaka	C.M.S. School	22
Bori Ogoni Khana	County Council School	57
Calabar	Akim Qua Presbyterian School	50
Calabar	St. Joseph's Central School	33
Eha Amufu	St. Philip's	32
Enugu	St. Brigids R.C.M.	80
Enugu	Methodist School Ogui	36
Enugu	St. Michael's School	35
Enugu	Holy Cross R.C.M.	32
Enugu	C.M.S. Christ Church School Uwani	36
Enugu	St. Mary's R.C.M.	33
Ezeoke	C.M.S.	33
Ihiala	St. Silas Anglican C.M.S.	21
Ihioma	St. Alphonsus' School	63
Ihitte	St. Joseph's	30
Ikot Ambong	St. Lawrence's School R.C.M.	16
Ikot Ekpene	Alacha Central School	11
Mbeke	St. Stephen's	17
Mbiakong	Holy Trinity School	36
Mgbago	St. Francis Catholic School	30
Mgbie	Holy Cross	34
Mgbowo	St. John's	58
Nachi	St. Peter's C.M.S.	34
Nibo	St. Theresa's Catholic School	31
Nkwerre	St. Paul's Anglican C.M.S.	63
Nsukka	St. Joseph's R.C.M.	60
Nsukka	St. Mary's CMS Opi Uno	27
Obohia	St. Peter's School	12
Ogidi	St. Philip's Central School	60
Ogoja	Lutheran School	28
Ogoja	St. Joseph's Catholic School	31
Ohabiam	Central School	33
Okon	St. Joseph's R.C.M.	27
Okrika	Boy's School	71
Onitsha	C.M.S. Central School	63
Onitsha	Holy Trinity R.C.M.	60
Onitsha	Mem. School C.M.S.	60
Onitsha	St. Joseph's Catholic	56
Onitsha	St. Mary's R.C.M.	67
Orlu	Holy Trinity Practicing	32
Oron	St. Mark's R.C.M.	25
Otri	Methodist Central School	29
Owerri	St. Michael's R.C.M.	32
Owerri	All Saints School Egbu	51
Owerri	Our Lady's School	67
Owerri	St. Mary's R.C.M.	30
Owerri	St. Paul's R.C.M.	53
Owerri	St. Theresa's	58
Port Harcourt	Baptist Day School	57
Port Harcourt	St. John's Anglican	62
Uli	St. Thomas C.M.S.	18
Umuabi	C.M.S. Central School	34
Umuaga	St. Peter's R.C.M.	25
Umuahia	Methodist School Afugiri	53
Umuahia	St. Mark's Nsirimo	28
Umuduru	St. Andrew's C.M.S.	56
Uruagu	St. John's R.C.M.	53
Uyo	Holy Trinity Lutheran Itiam	27
Uyo	Oku Group	36
Uyo Etoi	Methodist	63
Uyo Ituk Mbang	Methodist School	32
Uyo Iwok	Central School	23
Uyo Road	St. Michael's R.C.M.	29

SENIOR PRIMARY SCHOOLS – NORTHERN NIGERIA

Location	Name of School	N	Location	Name of School	N
Agaie	Native Authority	33			
Agbaka	Roman Catholic	26	Kano	S.I.M.	28
Ankpa	Qua Eboe	39	Katsina	Provincial Girls School	50
Apir	S.U.M.	38	Kawo-Kaduna	Baptist	33
Ayangba	Native Authority	34	Kontagora	Native Authority	23
Baissa	S.U.M.	31	Kotorkoshi	Native Authority	63
Bakori	Native Authority	16	Lafia	Native Authority	40
Bauchi	Native Authority	73	Laminga	Native Authority	35
Bazza	R.C.M.	34	Makurdi	Woilamayo	37
Bernin Kudu	Native Authority	37	Malete	Native Authority	40
Bida Sabon Gida	Native Authority	38	Malumfashi	Native Authority	32
Biu	Native Authority	34	Mani	Native Authority	37
Boju Ega	R.C.M.	40	Minna	St. Peter's Anglican	63
Dekina	Native Authority	39	Misau	Native Authority	30
Donga	Native Authority	37	Offa	Anglican	100
Ekan-Meje	United Anglican	26	Offa	Ogidiri	38
Ekan-Meje	R.C.M. St. Michael's	25	Offa	Methodist	41
Fadan Kagoma	E.C.W.A.	27	Okene	Native Authority	136
Gaminana	R.C.M.	77	Okene	C.M.S.	85
Garkida	Church of the Brethren	37	Okerimi	R.C.M.	31
Gboko	Native Authority	31	Omu-Aran	Anglican	52
Gusau	Anglican	26	Orukram	R.C.M.	39
Gwarzo	Native Authority	82	Oturkpo	St. Peter's Methodist	67
Igbaja	Native Authority	43	Pankshin	Native Authority	64
Iyeru-Okin	African Church	57	Panyam	S.U.M.	36
Jos	Native Authority	71	Potiskum	Native Authority	37
Jos	Our Lady of Fatima	35	Riyom	Native Authority	37
Kabba	Methodist	46	Uavande	Native Authority	34
Kabba	R.C.M.	125	Ungwar-Rimi	S.I.M.	38
Kaduna	Capital Territory	3	Wukari	Immaculate Heart	38
Kaduna	Local Authority	96	Yola	Native Authority	32
Kafanchan	Holy Trinity Anglican	77	Zaria	St. George's Anglican	40
Kaltungo	S.I.M.	36	Zaria Babbon Dudo	Native Authority	35
Kano	Holy Trinity Anglican	80	Zaria Kofar Doka	Native Authority	39
Kano	Native Authority	46	Zawan	R.C.M.	70

SECONDARY SCHOOLS – NIGERIA

Location	Name of School	N	Location	Name of School	N
	Federal			**West**	
Lagos	City College	946	Aiyetoro	Comprehensive School	130
Surulere	Anglican Girl's School	473	Ikenne	Mayflower School	346
	East			**North**	
			Gindiri	S.U.M. Mission	127
Afikpo	Government	226	Kaduna	Government College	184
Enugu	Queen's School	144	Kagoma	S.I.M.	140
Owerri	Government	133	Okene	Provincial	333
Port Harcourt	Government Technical	168	Zaria	Government	198
Umuahia	Government	219	Zaria	Military School	256

LIBERIA SCHOOLS

Location	Name of School	N
	Primary	
Bahn	Bahn Mission	2
Brewerville	Government School	6
Brewerville	Lott Carey Mission	49
Cape Palmas	Our Lady of Fatima	81
Cape Palmas	Harper (Many Schools)	73
Ganta	Public	27
Ganta	Methodist Mission	20
Gbarnga	Dolokelen Gboffeh Mission	16
Harbel	Firestone Plantation School	29
Kakata	Lango Lippaye Junior High	30
Kakata	St. Augustine's School	9
Kakata	St. Christopher's School	6
Kakata	Bright's Plantation	7
Monrovia	B. W. Harris Elementary School	71
Monrovia	Monrovia Demonstration Elementary School	117
Monrovia	Edwin Barclay School	25
Monrovia	Wilson Afternoon	25
Monrovia	Government Morning School	102
Monrovia	Bassa Comm. A.M.	7
Monrovia	C.D.B. King A.M.	13
Monrovia	D. E. Howard A.M.	67
Monrovia	Monrovia Demonstration Elementary School	20
Monrovia	C.D.B. King	20
Monrovia	Monrovia College Elementary	11
Monrovia	St. Theresa's Convent	38
Monrovia	St. Patrick's Elementary School	26
Monrovia	Assembly of God School	29
Monrovia	Zion Academy	12
Monrovia	N.V.M. West Point (Nathaniel V. Massaquoi)	1
Saclepea	Saclepea Mission	4
Sanniquellie	Sanniquellie Central School	14
Sanniquellie	St. Mary's School	2
Sanniquellie	Martha Tubman Demonstration School	4
Totota	Totota Public School	32
Totota	Totota Mission	42
Zorzor	Central Public School	14
Zorzor	Lutheran Mission	14
	Secondary	
Cape Palmas	Cape Palmas High School	12
Cape Palmas	Our Lady of Fatima	22
Kakata	Booker Washington Institute	316
Monrovia	Monrovia College	51
Monrovia	B. W. Harris Junior High School	56
Monrovia	St. Theresa's Convent	43
Monrovia	College of West Africa	72
Monrovia	St. Patrick's High School	67
Monrovia	Zion Academy	8
Monrovia	Laboratory High School	46
Monrovia	Government Jr. High#2	59
Salayea	Lutheran Training Mission	76