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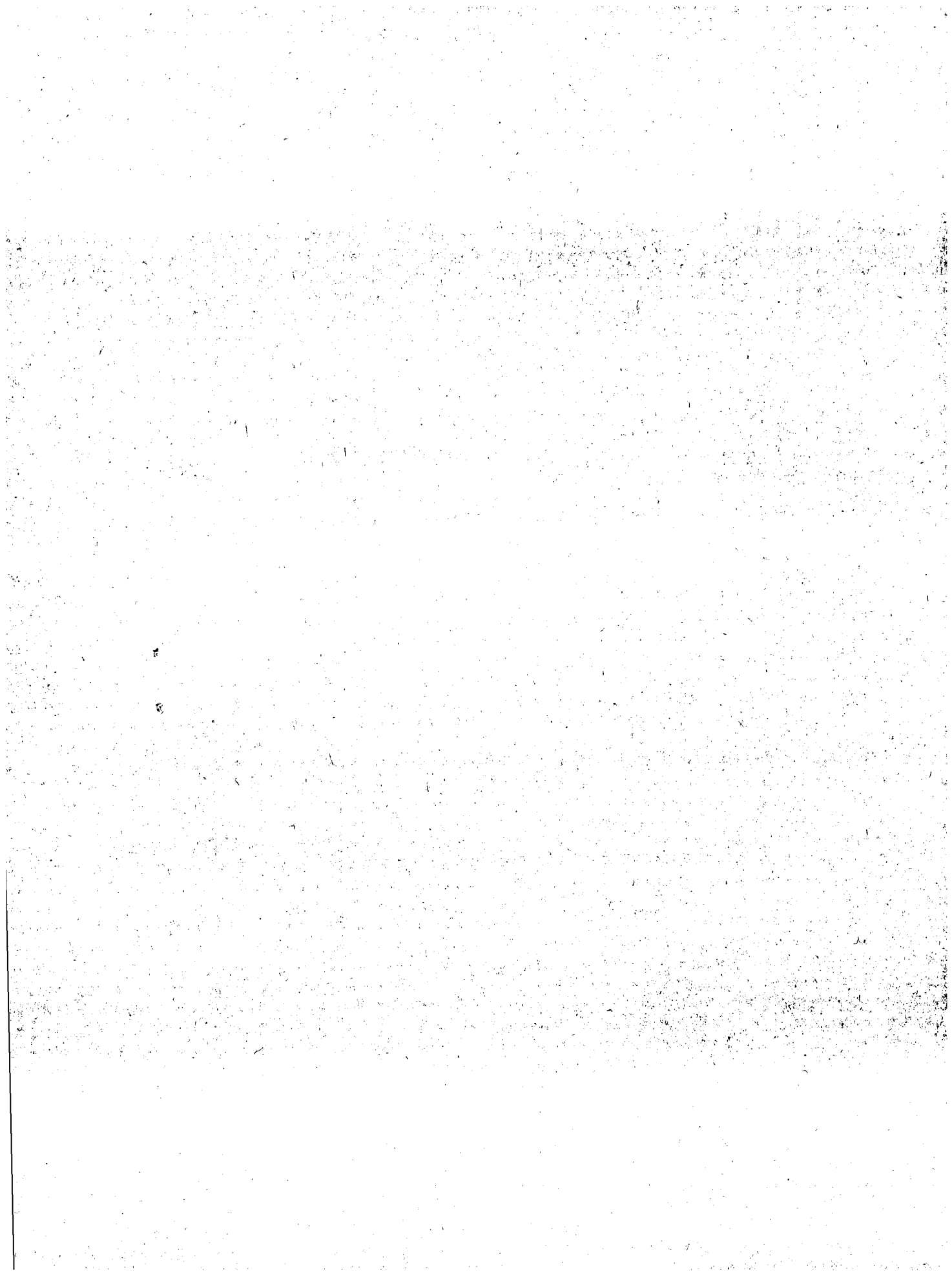
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Estimation of the Adverse Impact of a Police Promotion Examination

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ESTIMATION OF THE ADVERSE IMPACT OF A
POLICE PROMOTION EXAMINATION

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ESTIMATION OF THE ADVERSE IMPACT OF A
POLICE PROMOTION EXAMINATION

ABSTRACT

Sixty-five male sergeants in the U.S. Park Police, Department of the Interior, competed for promotion to lieutenant in the Fall of 1978. Candidates were rank-ordered based on a weighted sum of a written job knowledge test score and an oral interview fitness and merit rating. Five promotions would be made based upon the rank order; the top nine candidates were white. However, there was no difference in mean scores on either the test or the interview score between the group of 52 whites and the group of 12 blacks. There was also a negative relationship between age of candidate and score on written test.

SUMMARY OF DATA SURVEY REPORT 80-2

U.S. Office of Personnel Management
Personnel Research and Development Center

Title: Estimation of the Adverse Impact of a Police Promotion Examination

Author: Hilda Wing

Sixty-five male sergeants in the U.S. Park Police, Department of the Interior, competed for promotion to Lieutenant in the Fall of 1978. Candidates were rank-ordered based on a weighted sum of a written job knowledge test score and an oral interview fitness and merit rating. Five promotions would be based upon the rank order; the top nine candidates were white. However, there was no difference in mean scores on either the test or the interview score between the group of 52 whites and the group of 12 blacks. There were (nonsignificant) differences between blacks and whites on the written test and on the fitness and merit ratings: the blacks were less variable. Such a difference in variability is not explicitly addressed by current Federal regulations on employment decisions; it is most likely an outcome of the small numbers of candidates involved in the population. A related finding was that of a negative relationship between age of candidate and score on written test. It was suggested that this resulted from the self-selected nature of the population trying out for these promotions. The more able, older men had tried out for promotion in prior years, and had succeeded, at a greater rate than the less able, older men.

ACKNOWLEDGEMENTS

Comments by J. D. Kraft, S. Payne, and C. L. Clark on earlier versions of this report were very helpful, as were suggestions from members of the 1978 Examination Board, U.S. Park Police. The opinions expressed are those of the author and do not necessarily reflect those of the U.S. Office of Personnel Management or of the U.S. Park Police, Department of the Interior.

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ESTIMATION OF THE ADVERSE IMPACT OF A
POLICE PROMOTION EXAMINATION

According to the most recent Federal regulations pertaining to procedures used in making employment decisions, "Federal equal employment opportunity law generally does not require evidence of validity for a selection procedure if there is no adverse impact..." (U.S. Equal Employment Opportunity Commission, U.S. Civil Service Commission, U.S. Department of Labor, U.S. Department of Justice, 1978, General Principles, 1, 1978, p. 38293). Further, "A selection rate for any race, sex, or ethnic group which is less than four-fifths (4/5) (or eighty percent) of the rate for the group with the highest rate will generally be regarded by the Federal enforcement agencies as evidence of adverse impact... Greater differences in selection rate may not constitute adverse impact where the differences are based on small numbers and are not statistically significant..." (Section 4. D., p. 38297).

In the Fall of 1978, the U.S. Civil Service Commission (now the Office of Personnel Management) administered examinations for the U.S. Park Police, Department of the Interior, in order to obtain information relevant to promotion actions projected to occur during fiscal years 1980 and 1981. These promotions would be from Sergeant to Lieutenant; the examination was called the Lieutenant's examination. Park Police officials anticipated making five promotions based on the examination.

The examination consisted of two parts: a written test and an oral interview. After the administration of the written test, a candidate for promotion via this examination lodged an official complaint that the test was "arbitrary, ambiguous, discriminatory, and invalid." The alleged discrimination was against minorities, older officers, and officers on certain assignments. There was no black officer among the top scoring on the total examination; the top nine were all white. To support the complaint, the complainant requested certain data including, but not limited to, the performance of all

candidates for promotion to Lieutenant on the written test and on the examination as a whole. The complainant also requested information about the relationship between race, sex, age, and written test scores.

To respond to this complaint, the Park Police Examination Board that had been responsible for developing the written test made available to me certain data pertaining to test performance and other characteristics of all individuals taking the Fall, 1978 examination for promotion to Lieutenant, U.S. Park Police. By making appropriate statistical analyses of these data, I was to evaluate the hypothesis of adverse impact on this examination so as to enable the Park Police to respond to the complaint of discrimination against minorities, older officers and (implicitly) women. (The complaint was subsequently dropped, largely as a result of an earlier draft of this report.)

METHOD

Subjects

The subjects were all of the 65 candidates for promotion to Lieutenant, U.S. Park Police, who sat for the written test portion of the examination in the Fall of 1978 and later completed the oral interview. These candidates, all male, were Sergeants whose duty stations were in Washington, D.C., San Francisco, and New York City. They ranged in age from 28 to 47 years with a mean age of 37. Their lengths of service ranged from 7 to 20 years, with a mean length of service of 12 years. Fifty-two of the candidates were white, 12 were black and one was Hispanic. These racial/ethnic identifications were supplied by the Examination Board; their origin (self-supplied or visual identification by supervisor) was unknown.

Written Test

The written test, consisting of 100 multiple-choice items, was of the job knowledge type. In 1974, psychologists of the staff of the U.S. Civil Service Commission worked with the Park Police to set up procedures for developing and using written tests in the promotion process. The staff assisted the Park Police Examination Board for 1974 in conducting a job analysis study of the job knowledge elements for the Sergeant's and Lieutenant's positions. Job knowledge elements were rated and reviewed in terms of criticality, discriminability between best and poorest candidates, and appropriateness to the work of the duty station. A test plan was developed based on these ratings.

In 1978, an Examination Board of three officers was selected by the Chief, U.S. Park Police. These officers represented the major organizational units and the ethnic composition of the force. The Board reviewed the 1974 job analysis procedures and determined that the knowledge elements were still current and complete. The elements were rerated for criticality and for appropriateness to the work of the duty station. The results were the same as in 1974, so the original test plan was retained. Based on this plan, members of the Board developed test questions and selected them for the written test in conformance to the test plan. The test questions were edited by the psychologists for grammatical and psychometric soundness. After administration of the written test, item statistics were reviewed in order to identify possible ambiguities or other problems with the test questions. All items but one were found to be acceptable; the exception was scored as correct for all candidates.

Oral Interview: Fitness and Merit Ratings

Each candidate was interviewed by an Oral Interview Board consisting of three officers who were not members of the Examination Board responsible for developing the written test. Several different interview boards followed specified procedures in obtaining information from candidates during the interview, in order to arrive at a Fitness and Merit Rating for each candidate.

Total Score and Final Standing

The examination plan called for differential weighting of test scores and fitness and merit ratings. Test scores were to be worth 40 percent and fitness and merit ratings worth 60 percent of the final scores. To scale the test scores, for each candidate the number of test questions answered correctly was multiplied by 0.4, so that the scores could range from 0.0 to 40.0. The fitness and merit ratings were multiplied by an appropriate constant so that they could range from 0.0 to 60.0. These scaled scores were summed to produce total examination scores, which were then rank ordered. Park Police officials stated that the anticipated five promotions from Sergeant to Lieutenant during fiscal years 1980 and 1981 would be based primarily if not totally on examination scores. Probably no more than the top eight candidates would be considered for promotion.

Data Analyses

For the 52 whites, the 12 blacks, and the total group of 65, means and standard deviations were calculated for the written test scores, the fitness and merit ratings, and the total examination scores. (Data from the Hispanic were not analyzed separately.) Tests for significance of differences between whites and blacks were performed for both means and variances of test scores and ratings.

For all 65 candidates, Pearson product moment correlations were calculated between the year of birth and both test scores and ratings, and between the year of entry on the Force and test scores and ratings. These analyses were also performed using the rankings based on the test scores in place of the test scores. Since the correlation between the test scores and their ranks was 0.98, inferences based on ranking would be identical to those based on the scores, so the ranking index was dropped from further consideration.

The racial/ethnic memberships of the eight candidates who had the highest total examination scores were determined in order to evaluate adverse impact based on the probable promotional opportunity.

RESULTS AND DISCUSSION

The weighting of components in a total score ultimately depends on the variability of these components: the components with greater variability carry greater weight. The original test plan called for the weighting ratio of 4:6 for test score to interview, but the actual ratio of the standard deviations for these components turned out to be 4:5. To arrive at the stated weighting of components for both the test and the interview, each score was converted to a z-score by using the total group mean and standard deviation. Then, each test z-score was multiplied by four and each rating z-score was multiplied by six, and these products were summed for each candidate to obtain a revised total examination score. The candidates were then rank ordered on the basis of this revised score, and a Pearson product moment correlation was calculated between this revised and the original total examination rank orders. The composition of the top eight candidates from the revised total examination scores was compared to that from the original.

Summary statistics for blacks, whites, and the total group are displayed in Table 1. As can be seen, there is little difference between black and white candidates in mean score of the written test, the fitness and merit rating, and the total examination, using either the original or the revised scoring. No difference between these means was statistically significant. Statistical significance tests were not performed on the black-white differences in mean values for year of birth or entry on the force; these differences are equally trivial.

The variability of these scores does not appear to be equivalent for blacks and whites; it is much less for blacks. However, statistical tests failed to identify any significant difference (written test: $F = 1.25$; fitness and merit rating: $F = 2.27$; $df = 51, 11$; $p > .05$). It is likely that the small number of black candidates vitiated the power

Table 1

U.S. Park Police Lieutenant Promotion Examination

Fall 1978

Summary Statistics

	<u>Blacks</u>	<u>Whites</u>	<u>Total</u>
Number	12	52	65
Written Test Portion			
Mean	29.07	29.29	29.18
Standard Deviation	3.40	3.80	3.72
Fitness and Merit Rating			
Mean	47.78	47.37	47.45
Standard Deviation	2.96	4.45	4.16
Total Examination (Original)			
Mean	76.84	76.66	76.63
Standard Deviation	4.50	6.20	5.87
Year of Birth			
Mean	1941.25	1941.71	1941.60
Standard Deviation	3.74	4.17	4.04
Year of Entry on Force			
Mean	1967.17	1966.46	1966.63
Standard Deviation	2.76	3.72	3.54

of these statistical tests to verify differences in variances; it is equally likely that, had a larger number of blacks been among the candidates, the variabilities of both tests and ratings would be more alike for blacks and whites.

Intercorrelations among the measures are displayed in Table 2. Year of birth and year of entry on the force are strongly and positively correlated: the younger men entered the force later than the older men. The younger men also earned higher scores on the written test, although age was not related to ratings. The cause of the relationship between test scores and age is not direct, however. Since the more capable police officers probably take the test early in their careers and are promoted, the older candidates in this examination may have been the less capable members of their generation. Similarly, those younger officers who were most confident of their knowledge of the U.S. Park Police officer's job would be more likely to apply for promotion consideration at an earlier date, and so the younger candidates may be the most capable of their generation. Their relative inexperience on the job, compared to the older officers, might lead to lower average fitness and merit ratings, as indicated by the nonsignificant but negative correlation between age and rating. Evaluation of this hypothesis might be

possible via a retrospective study of Park Police promotion examinations. Without such an evaluation, any causal relationship between age and test score is speculative at best.

Based on the original total examination score, the top-ranking eight candidates were identified. All were white; the top-ranking black was in position ten. (The one Hispanic was not within range of consideration.) From the standard deviation statistics displayed in Table 1 it can be inferred that the written test scores and the fitness and merit ratings were not in the prescribed 4:6 weighting ratio as indicated by their standard deviations: the actual ratio was close to 4:5. After rescaling these scores so that their revised standard deviations were in the prescribed ratio, the rescaled scores were summed and candidates were ranked again, based on the revised total score. These rescaled total examination scores were in almost the same rank order as the original scores ($r = 0.98$, $df = 63$, $p < .01$). Seven of those originally in the top eight were in the revised top eight; the candidate originally in the ninth position was moved to position seven after revision, while the candidate originally ranked eighth was number nine after rescaling. The top ranking black candidate was in the tenth position for both orderings. Despite the

Table 2
 U.S. Park Police Lieutenant Promotion Examination
 Fall 1978
 Intercorrelations
 (N = 65)

	Written Test Score	Fitness and Merit Rating	Year of Birth	Year of Entry on Force
Written Test Score		.10	.51**	-.12
Fitness and Merit Rating			-.21	-.13
Year of Birth				.76**
Year of Entry on Force				

** $p < .01$

absence of any black in the top eight rank order positions, analyses of these data indicate that charges of adverse impact against the 1978 promotion examination of U.S. Park Police, or its components, could not be sustained. Charges of racial/ethnic discrimination were unsupportable primarily because the total number of candidates, particularly the number of black candidates, was too small to provide sufficiently powerful statistical significance testing. However, there was no difference between black and white candidates in average level of performance on either the written test or on the fitness and merit rating. The groups did appear to differ in the variability of their scores. It is likely that, with an increased number of minority candidates, the variabilities would be equalized.

The Uniform Guidelines acknowledge that in some circumstances, there may be "...an insufficient number of selections to determine whether there is adverse impact..." (U.S. Equal Employment Opportunity Commission, U.S. Civil Service Commission, U.S.

Department of Labor, U.S. Department of Justice, 1978, Section 15A(2)(c), p. 38304). For such circumstances, the process of collecting and analyzing information should be continued until sufficient data can be accumulated to demonstrate the presence or absence of adverse impact.

The significant relationship between age and test score probably deserves further study, although it is likely that the relationship is spurious. Older and younger candidates for promotion may not be representative of their groups in the same way.

REFERENCE

U.S. Equal Employment Opportunity Commission, U.S. Civil Service Commission, U.S. Department of Labor, U.S. Department of Justice. Uniform Guidelines on Employee Selection Procedures. Federal Register, 1978, 43, 38290-38315.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud.

2. The second part of the document outlines the various methods used to collect and analyze data. It describes the use of statistical techniques to identify trends and anomalies in the data, and the importance of using reliable sources of information.

3. The third part of the document discusses the role of the auditor in the financial reporting process. It highlights the need for auditors to exercise professional judgment and to maintain independence and objectivity in their work.

4. The fourth part of the document discusses the importance of transparency and accountability in the financial system. It emphasizes that stakeholders should have access to accurate and timely information about the financial performance of the organization.

5. The fifth part of the document discusses the role of the regulatory body in the financial system. It highlights the need for the regulatory body to monitor and enforce the rules of the financial system, and to take action against any violations.

6. The sixth part of the document discusses the importance of risk management in the financial system. It emphasizes that organizations should identify and assess the risks they face, and should take steps to mitigate those risks.

7. The seventh part of the document discusses the importance of ethical behavior in the financial system. It emphasizes that all participants in the financial system should act in a fair and honest manner, and should avoid any conflicts of interest.

8. The eighth part of the document discusses the importance of innovation in the financial system. It emphasizes that the financial system should be able to adapt to changing market conditions and to provide new and improved services to its customers.

9. The ninth part of the document discusses the importance of international cooperation in the financial system. It emphasizes that the financial system is a global system, and that all countries should work together to ensure its stability and integrity.

10. The tenth part of the document discusses the importance of public participation in the financial system. It emphasizes that the public should have a voice in the financial system, and that their views should be taken into account in the development of financial policy.

11. The eleventh part of the document discusses the importance of education and training in the financial system. It emphasizes that all participants in the financial system should have the necessary skills and knowledge to perform their roles effectively.

12. The twelfth part of the document discusses the importance of research and development in the financial system. It emphasizes that the financial system should be able to stay ahead of the curve by investing in new technologies and ideas.

13. The thirteenth part of the document discusses the importance of the future of the financial system. It emphasizes that the financial system will continue to evolve, and that all participants should be prepared for the challenges of the future.

