# A Holland Perspective on the U.S. Workforce from 1960 to 1990: Technical Report No. 33[1]

By

Robert C. Reardon, Ph.D.
Stacie H. Vernick, Ed.S.
Corey A. Reed, M.S.

Center for the Study of Technology in Counseling and Career Development
The Florida State University
Tallahassee, FL 32306-2490

Abstract: This paper analyzes civilian employment data collected by the Census Bureau in 1960, 1970, 1980, and 1990 with respect to six kinds of work (Holland classification), occupation, employment, gender, occupational level, and income over four decades. Implications for further research, employment policy, and career services are offered.

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**A Holland Perspective on U.S. Workforce from 1960 to 1990**

Abstract

Some career theorists and researchers view the occupational world as increasingly unstable and unpredictable. Indeed, they view the concept of job or occupation as less than useful in thinking about work and career guidance. Such a view appears to call into question the appropriateness of an approach to career guidance that seeks to link personal characteristics to jobs in a time of rapid labor market changes. Holland's typological theory (Holland, 1997) specifies a connection between vocational personalities and work environments that makes it possible to use the same RIASEC classification system for both persons and jobs. Beginning in the 1960s and 1970s, a small group of researchers began to examine the labor market using Holland's typological system. Altogether, these studies examined a variety of variables with respect to Holland codes, including percentage of men and women in occupations, ethnicity of workers in occupations, salaries earned by occupational incumbents during the preceding year, educational and training levels associated with occupations, and complexity ratings for occupational activities.

The present study examined trends in labor market characteristics using census data from 1960 to 1990. We found stability in the census data for the use of occupational constructs for six kinds of work from 1960-1990, e.g., the Realistic area includes many more named occupations in the census than the other five areas, averaging between 46% and 50% of all occupations included over the 40 year period. Regarding levels of cognitive complexity associated with occupations, we found Investigative and Artistic areas were associated with the highest Cx ratings, and Conventional was associated with the lowest ratings. We found that employment trends did not support claims of a major shift in employment across the six kinds of work. While employment declined by 18% in the Realistic area relative to other Holland types, it remained the largest area of employment through 1990 and actually increased in real numbers. Only 1% of employment was in the Artistic area. There were marked differences in employment between men and women across the six areas from 1960-1990, e.g., between 79% and 85% of male workers were in the Realistic and Enterprising areas and only 15% to 21% of men were employed in the other four areas, while women were employed in more varied kinds of work, including Conventional, Realistic, Social, and more recently, Enterprising areas. Regarding cognitive complexity and kinds of work, we found employment in the Investigative area occurred only at the highest two levels. The other four areas, Realistic, Social, Enterprising, and Conventional, showed employment in all six levels of Cx ratings. We found that employment was related to the level of cognitive complexity of work, and that employment was also unevenly distributed across the six areas of work in relation to gender. Finally, we examined income and gender by kinds of work and found the average income profile for six kinds of work ranging from lowest to highest was CRASEI. The discrepancy across the six areas was very large, with the average Investigative income more than two times larger than the average Conventional income.

Our study suggested that there was considerable stability in the nature of occupations used to report employment in the census with respect to Holland codes. The often discussed dramatic shift in the nature of work, and by implication the occupations that encompass work, was not apparent in these data, although there was considerable variability in the numbers of occupations across the RIASEC areas. Our findings did not indicate a dramatic shift in employment across the six areas of work. Although employment in the Investigative area doubled over the 40 year period of our study, it remained only 6% of employment in 1990. Career guidance programs could use census information to show the relationships between kinds of work, cognitive skill development, gender, and financial income.

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## Introduction

In recent years the career counseling literature has been filled with warnings about dramatic shifts in the economy and the implications for changes needed in career services and theory. Some career theorists and other professionals have sounded these alarms, and government officials have echoed the need to prepare citizens for a dramatically different world-of-work. In this article, we use census data from 1960, 1970, 1980, and 1990 to examine employment trends in the workforce from the perspective of Holland's typological theory (Holland, 1997). We begin with a review of some of the warnings about socioeconomic changes, followed by a review of prior research on this topic and a statement of the research questions explored in this study.

What are some examples of warnings in recent literature? Bridges (1994) was one of the first authors to call attention to what he characterized as a dramatic shift in working and the nature of jobs. ". . . what is disappearing today is not just a certain number of jobs, or jobs in certain industries, or jobs in some part of the country—or even jobs in America as a whole. What is disappearing is the very thing itself: the job" (Bridges, 1994, p. viii). Mitchell and Krumboltz (1996) indicated that people need to prepare for changing work tasks and not assume that occupations will remain stable. According to Mitchell and Krumboltz (1996, p. 251), "A radical restructuring is ongoing in the workforce. Employees are increasingly expected to use different skills to accomplish whatever work needs to be accomplished rather than meet a written job description. . . . Career counselors who see their role as merely matching individuals on the basis of their current characteristics with existing occupations will soon be as obsolete as the occupations themselves." Elsewhere, Krumboltz and Ranieri (1996, p. 32) argued that in today's workplace "occupations and the settings in which they're performed change rapidly," and Mitchell, Levin, and Krumboltz (1999, p. 116) noted that "In virtually every employment sector, job descriptions are changing, some occupations are becoming obsolete, and unforeseen occupations are being created (e.g., web page designer)." Such views appear to call into serious question the whole matter of stability in the workforce with respect to interests and work activities, and question the effectiveness of an approach to career guidance that seeks to match personal characteristics and occupations in a time of rapid labor market changes.

Adding an international perspective from the United Kingdom, Hirsh, Kidd, and Watts (1998) analyzed the constructs and frameworks used to describe the world of work and in providing career guidance services. This work was based on desk research and interviews with more than 50 international, expert researchers and practitioners. Taking a somewhat pessimistic view of the concept of occupation, Hirsh, Kidd, and Watts (1998, p. 5) noted that ". . .although occupational classifications have the power of using existing job titles, they do not reflect the world of work in a wholly accurate or helpful way".

Later, they concluded that "Any occupational classification based on lists of job titles is more vulnerable to labour market change, and with careers increasingly crossing occupational boundaries, occupation in this sense may now be a less sufficient basis for career decision-making than in the past" (Hirsh, Kidd, & Watts, 1998, p. 24).

Sounding a similar theme, practitioners and researchers in the U.S. have described a major dramatic shift in occupational life. For example, R. Scott Gledhill (1997), the President of Action Career Management, argued in Counseling Today that "Essentially, everything we thought we knew about career choice and development is obsolete. We must reinvent our thinking about occupational choice, career development and how we get jobs and implement careers" (Gledhill, 1997, p. 54). He continued, "The bad news is that little remains of our once relatively stable and predictable vocational world" (p. 54). Richard Judy (2000), Senior Fellow and Director of the Center for Workforce Development at the Hudson Institute, noted that career counseling will become even more important in a world of work that is changing rapidly. "Counselors need to be on the cutting edge: they need to be closely attuned to the changes in the world of work—how job requirements are changing, how the mix of occupations is changing, and what this implies for the kinds of skills and knowledge future job applicants will need to have" (Judy, 2000, p. 1).

Another area of concern involves gender and kinds of work. Betz and Fitzgerald (1987) described the impact of occupational stereotypes and sex bias in interest inventories as barriers to women in entering nontraditional occupations. They identified Holland's (1997) Realistic, Investigative, and Enterprising kinds of work as nontraditional for women. More recently, Russell and Burgess (1998) have described the movement of women into entrepreneurial careers (Enterprising area) and the need for more research on this population. In reality, some of the most segregated occupations by gender are those dominated by women, including social work, nursing, elementary school teaching, and office work. Unlike women, most men have been unwilling to move into nontraditional occupations, and this tends to limit their occupational alternatives (Zaldivar, 1996). A related issue involves differences in income for men and women in the same kinds of work, with women earning only 76% compared to men (Gilbert & Brownson, 1998).

In summary, these authors and other observers indicate that counselors need to prepare their clients for a new economy and for new kinds of jobs in the labor market. However, these authors provide few specific suggestions on exactly how counselors might proceed and what theory and materials might be useful. We believe that Holland's person-environment model (1997) remains helpful to counselors for analyzing labor market information, and we will present information in this paper that we believe supports its utility.

Holland's typological theory (Holland, 1997) specifies a theoretical connection between vocational personalities and work environments that makes it possible to use the same RIASEC classification system for both persons and jobs. Many inventories and career assessment tools use the typology to enable individuals to categorize their interests

and personal characteristics in terms of the six types and combinations of the types. In Holland's theory, persons can be categorized as one of six personality types: Realistic, Investigative, Artistic, Social, Enterprising, or Conventional. These six types are briefly defined here (See Holland, 1997 for additional information about the types).

Realistic (R) types are found in occupations such as auto mechanic, aircraft controller, surveyor, electrician, and farmer. The R type usually has mechanical and athletic abilities, and likes to work outdoors and with tools and machines, and might be described as conforming, frank, hardheaded, honest, humble, materialistic, natural, normal, persistent, practical, shy, and thrifty.

Investigative (I) types like occupations such as biologist, chemist, physicist, geologist, anthropologist, laboratory assistant, and medical technician. The I type usually has math and science abilities, and likes to work alone and to solve problems. They might be described as analytical, complex, critical, curious, independent, intellectual, introverted, pessimistic, precise, and rational.

Artistic (A) types are found in occupations such as composer, musician, stage director, dancer, interior decorator, actor, and writer. The A type usually has artistic skills, enjoys creating original work, and has a good imagination. They may be described as complicated, disorderly, emotional, idealistic, imaginative, impulsive, independent, introspective, nonconforming, and original.

Social (S) types like occupations such as teacher, speech therapist, religious worker, counselor, clinical psychologist, and nurse. The S type generally likes to help, teach, and counsel people, and may be described as cooperative, friendly, generous, helpful, idealistic, kind, responsible, sympathetic, tactful, understanding, and warm.

Enterprising (E) types like occupations such as buyer, sports promoter, television producer, business executive, salesperson, travel agent, supervisor, and manager. The E type usually has leadership and public speaking abilities, is interested in money and politics, and likes to influence people. The E type is described as acquisitive, agreeable, ambitious, attention-getting, domineering, energetic, extroverted, impulsive, optimistic, self-confident, and sociable.

Finally, Conventional (C) types are found in occupations such as bookkeeper, financial analyst, banker, tax expert, and secretary. The C type has clerical and math abilities, likes to work indoors and to organize things. The C type is described as conforming, careful, efficient, obedient, orderly, persistent, practical, thrifty, and unimaginative.

In a similar way, the environments of college campuses, fields of study, work positions, and occupations can be classified using the RIASEC system. For example, G. D. Gottfredson, Holland, and L. S. Gottfredson (1975) used 1970 census data to show that over half of U.S. jobs can be classified as Realistic and less than 2% are classified as Artistic.

Beginning in the early 1970s, Gary D. Gottfredson, Linda S. Gottfredson, and others began to examine the labor market using the Holland typological system. This work was important for both theoretical and practical reasons. For example, if the number of annual job openings is strongly related to the number of people working in that area, then knowing the number of persons employed is of practical importance in job hunting. In a series of studies, G. D. Gottfredson and Daiger (1977); G. D. Gottfredson and Holland, (1975); G. D. Gottfredson and Holland (1989, 1996); G. D. Gottfredson, Holland, and L. S. Gottfredson (1975); G. D. Gottfredson, Holland, and Ogawa (1982); L. S. Gottfredson and Brown (1978); L. S. Gottfredson (1978); and L. S. Gottfredson (1980) analyzed U.S. employment using data provided by the decennial census over 1960, 1970, and 1980. In similar fashion, Arbona (1989) examined 1980 census data to explore gender, educational level, and ethnicity, e.g., Black, Hispanic, and White, with respect to employment distribution of the population. Altogether, these studies examined a variety of variables with respect to the Holland classification, including percentage of men and women working in hundreds of occupations, ethnicity of workers in occupations, salaries earned during the preceding year by incumbents, educational and training levels associated with occupations, and complexity ratings for occupations. These studies examined six kinds of work in the Holland classification for level of occupation, income, and gender. The present study further examines level, gender, and income in terms of the 1990 census data.

The data included in these studies are unique in several ways and have special implications for career counselors. First, these data are derived from the census, not the U.S. Department of Labor, which is the source of much labor market information used by counselors. As an independent branch of the federal government, the Census Bureau reports actual numbers of people working in different occupations based on an accounting of persons in households. Second, these data provide a retrospective look at the labor markets, and by examining them over time it is possible to examine changes in the economic lives of persons in the United States. Third, the occupational titles included in the census have changed slightly over the years, and the authors exercised some limited interpretation in assigning Holland codes to occupations. Related to this, codes for occupations have also changed somewhat (G. D. Gottfredson & Holland, 1996). However, we believe this third factor has had a minimal impact on our findings.

Taking a different Holland-based perspective on labor market information, Reardon, Lenz, Sampson, and Peterson (2000) examined labor market projections from 1996 through 2006 using data from the Occupational Outlook Quarterly (U.S. Department of Labor, 1997-1998) and the Dictionary of Holland Occupational Codes (G. D. Gottfredson & Holland, 1996). They found that the 20 occupations with the largest projected increase in employment, i.e., increased number of jobs, had a Holland summary profile in the order of ESRICA, and the 20 occupations with fastest projected employment growth i.e., percentage of job growth, had a profile of SIERCA. Analysis of these profiles suggests that the service economy (S and E codes) is flourishing, and that the occupations growing most rapidly also involve independent, conceptually oriented problem-solving traits (I code) somewhat more than mechanical traits (R code). Further,

Reardon et al. (2000) noted that the 25 occupations having projected fast growth, high earnings, and low unemployment had a Holland profile of SEIRAC. Such analyses demonstrate how the typology can be applied to labor market projections of occupational growth. Such findings can, in turn, be used to help individuals examine their interests, skills and training goals in light of the projected realities of economic life in the workplace provided by the Bureau of Labor Statistics.

The purpose of the present study was to examine employment trends reported in earlier research using census data and to add new analyses based on the 1990 census. By examining employment data provided by census reports, we can see how employment patterns changed over four, ten-year periods from 1960 to 1990. We wanted to investigate occupational demography over 40 years in relation to Holland's occupational classification to investigate trends in six areas. Our research questions included:

1. What were the numbers and percentages of census occupational titles listed in 1960, 1970, 1980, and 1990 in relation to six different kinds of work (Holland RIASEC categories)?

2. How was occupational level related to different kinds of work in 1990?

3. What were the numbers and percentages of occupational employment in 1960, 1970, 1980, and 1990 in relation to six kinds of work?

4. What were the numbers and percentages of occupational employment in 1960, 1970, 1980, and 1990 for men and women in relation to six kinds of work?

5. What were the employment percentages of men and women in 1990 in relation to six kinds of work and the level of cognitive complexity (Cx) of the work?

6. What were the incomes for different kinds of work for men, women, and the total population in 1990?

## Methods

In this section, we describe the civilian employment data collected by the U.S. Bureau of the Census in 1960, 1970, 1980, and 1990. These occupational data are based on census researchers' analysis of hundreds of thousands of jobs and employment reported by citizens in each census period. Researchers then categorize the detailed job information into occupational groups using the census occupational codes (Bureau of Census, 1992a). We used the Holland codes assigned to occupations by different researchers at the time the original research was completed in 1960, 1970, 1980, or 1990. It should be noted that the codes were changed for some occupations over the years as additional data were collected and new methods for coding occupations were developed.

Each housing unit in the country received either the short- or long-form census questionnaire. The short form asks a limited number of basic questions of all people and

housing units, and are often referred to as 100-percent questions because they are asked of everyone. The long-form asks more detailed information from a population sample, and includes the 100-percent questions as well as questions on education, employment, income, ancestry, homeowner costs, units in a structure, number of rooms, plumbing facilities, and so forth. The results of the present study are based largely on findings from the long-form questionnaire.

Employment Data

In the 1960 census, the sampling unit was the housing unit, or the person in the case of group housing, which provided information about 297 detailed occupational categories. L. S. Gottfredson and Brown (1978) described the methods they used to derive Holland codes for 1960 census data using 1970 census data as a point of reference. L. S. Gottfredson and Brown also assigned general educational development (GED) level estimates using the Dictionary of Occupational Titles (1965) to each occupation. GED ratings, ranging from one to six, provide an estimate of the general educational level required to perform a job, e.g., levels 5-6 indicating college and postgraduate training. G. D. Gottfredson and Daiger (1977) analyzed 1960 census data based on workers age 16 and over, and their analysis is based on a 5% sample of the population.

In the 1970 census, the sampling unit was the housing unit, and 440 detailed occupational titles were included in these data, 143 more than in 1960. As with the 1960 census, the data included only employed persons and excluded members of the armed forces. L. S. Gottfredson and Brown (1978) provided a detailed explanation of the methods they used to derive Holland codes and GED estimates for 1970 census data. G. D. Gottfredson and Daiger (1977) analyzed 1970 census data based on workers age 16 and over, and their analysis is based on a 5% sample. The noted that the Census Bureau made some changes in the occupational classification between 1960 and 1970, with the former being less detailed. G. D. Gottfredson, Holland, and L. S. Gottfredson (1975) analyzed data from the 1970 census involving 424 occupations, and excluded men (5.6%) and women (6.6%) not classified according to one of the detailed occupations.

Information about the 1980 census was taken primarily from G. D. Gottfredson and Holland (1989) and G. D. Gottfredson (1984). G. D. Gottfredson (personal communication, July, 2000) also provided useful information linked to 3-digit 1980 census codes. The 1980 analysis was based on 503 selected occupations. Information available about each occupation included the census code number, Holland code, number of persons employed, percent of women in the occupation, GED rating, complexity rating, and average annual earnings in 1979.

Comprehensive information about the 1990 census was provided by the Bureau of Census (1992a, 1992b), and was based on 500 selected occupations. The housing unit was the sampling unit and detailed information was obtained about persons aged 16 and over. G. D. Gottfredson and Holland (1996) indicated that this classification is most closely related to the Standard Occupational Classification (SOC; U.S. Department of Commerce, 1980). Three sampling rates were employed in 1990. For slightly more than

one-half of the country, one in every six housing units (about 17 percent) received the long-form or sample questionnaire. In functioning local governmental units (counties and incorporated places, and towns and townships in some parts of the country) estimated to have fewer than 2,500 inhabitants, every other housing unit (50 percent) received the sample questionnaire in order to enhance the reliability of the sample data for these small areas. For census tracts and block numbering areas having more than 2,000 housing units in the Census Bureau's address files, one in every eight housing units (about 13 percent) received a sample questionnaire, providing reliable statistics for these areas while permitting the Census Bureau to stay within a limit of 17.7 million sample questionnaires, or a one-in-six sample, nationwide. The U.S. population count in 1990 was 283,928,233 (Bureau of Census, 1992b).

G. D. Gottfredson and Holland (1996) provided information about 468 occupations, including the code and the cognitive complexity rating of each occupation. Comparing the 1980 and 1990 census data, four new categories of work were added in the 1990 census and six were eliminated from the 1980 census. We collapsed multiple occupation entries into one occupational entry for the "manufacturing and non-manufacturing" occupations because there were a large number of entries that appeared to be very similar in nature. In particular, occupations with census codes 779-782 and 777-778 were collapsed into one entry with the code of 777, Miscellaneous Machine Operators, NEC. This was accomplished by averaging the data for both salary and number of individuals employed across the various entries representative of this occupation to come up with single data points for each of these variables. We also collapsed census codes 889-902 into one entry with the code of 889, Laborers except Construction. Other multiple entry occupations were collapsed into one occupational title by similarly averaging data for salary and number employed. This was done with census code 022 (Managers and Administrators, NEC), and 243-252 (Supervisors and Proprietors, Sales Occupations). Data for individuals who were classified as salaried and self-employed were collapsed into one occupational entry for both of these census codes. In developing the 1990 census data table, we also used the Dictionary of Holland Occupational Codes (G. D. Gottfredson & Holland, 1996) to identify the occupation's Complexity Rating (Cx).

It is important to note that data in this study regarding employment are based on a sampling procedure. The Bureau of Census (1992a) has reported detailed methods for interpreting these data based on procedural errors and standard errors in sampling. Information about confidence intervals in estimates about population characteristics are quite technical and beyond the scope and precision of our study. For these reasons, we have rounded numbers in this report to the nearest percent or thousand in order to avoid communicating a misplaced sense of precision in the findings.

## Results and Discussion

In this section, we present findings for the six questions identified earlier. In each section we summarize the research question and provide the results and a discussion of our findings and analysis.

1. Occupations and Six Kinds of Work, 1960-1990

The first question focused on the numbers and percentages of occupational titles used in the census over four decades for six different kinds of work. Table 1 shows that the distribution of occupations using the Holland classification are extremely skewed in each decade. This table shows that the Realistic area includes many more named occupations in the census than the other five areas, averaging between 46% and 50% of all occupations included over the 40 year period. For example, the 1990 census specifies 241 occupations (48%) in the Realistic area and 259 occupations in the other five areas combined. Only 10 occupations (2%) are identified in the Artistic area. Overall, there was an increase of 300% in occupations in the Enterprising area, from 27 in 1960 to 100 in 1980 and 95 in 1990. Finally, there were 282 occupations included in the 1960 analysis, which increased to 465 in 1970, 502 in 1980, and 500 in 1990.

Inspection of Figure 1 provides a graphic image of these data. Over the 40 year period of this analysis, the number of occupations in the Realistic, Investigative, Artistic, and Conventional areas have remained relatively stable, while the Social area has decreased slightly and the Enterprising area has increased. This indicates that there is considerable stability in the nature of the named occupations used to report employment in the decennial census with respect to Holland codes. However, it is possible that occupations may be shifting among industrial groups, which would suggest less stability in the labor market structure.

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Insert Table 1 and Figure 1 occupations/kinds of work about here

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There are several practical implications of these findings. Holland (1994) has specified important rules in interpreting results from the Self-Directed Search, including the rule of asymmetrical distributions of types and subtypes. This rule states that the distributions of persons across the six types are extremely uneven. Based on these findings, we would add that even the numbers of named census occupations are extremely uneven across the six kinds of work. For example, the cognitive schema based on RIASEC types that were used in 1990 to examine occupations were heavily skewed in the direction of the Realistic area (N = 241), with very few occupational titles associated with the Artistic area (N = 10). It might be noted that Table 1 shows the number of named R occupations actually increased over the four decades of this analysis. In addition, analysis of percentages of occupational titles across the four decades reveals a remarkable stability in the six areas of work used to describe employment in the census, and little evidence of instability and change in the ways in which employment was reported, at least from a Holland perspective.

2. Occupational Level and Kinds of Work, 1990

The second question concerned the relationship between occupational level and kinds of work in the 1990 census. In earlier research in this area, occupational level was described in terms of General Educational Development (GED) and Specific Vocational Preparation (SVP), and more recently occupational level has been described in terms of Cognitive Complexity (Cx). GED levels were assigned to an occupation based on the highest of three ratings of educational development in reasoning, mathematics, and language. These ratings indicated the general educational development typically required to enter or perform well in an occupation. The rating included the formal and informal education required to develop reasoning skills, the ability to follow instructions, and the ability to use language and mathematics. G. D. Gottfredson and Holland (1989) noted that "These general ratings are only estimates, and they should not be regarded as precise requirements" (p. 7).

SVP ratings for occupations were used to indicate the training time required for an occupation, and provided estimates of the time needed to become proficient in an occupation. Ratings ranged from 1 to 10, with the higher number indicating the longest periods, i.e., several years of in-service, on-the-job training (OJT) required for performing proficiently in the occupation (Gottfredson & Holland, 1989).

More recently, G. D. Gottfredson and Holland (1996) created the Complexity Rating (Cx) to estimate the cognitive skill and ability associated with an occupation. In effect, the Cx rating summarizes the GED (General Educational Development Level) and SVP (Specific Vocational Preparation) level ratings used previously. In developing the complexity rating, Gottfredson and Holland wanted to make greater use of job analysis ratings obtained by the Bureau of Labor Statistics and to create a single measure of cognitive or substantive complexity associated with an occupation. They noted that "cognitive complexity of work demands" (G. D. Gottfredson & Holland, 1996, p. 723) might be an appropriate term for the complexity rating. The Cx rating of an occupation includes BLS ratings for Data, GED Reasoning, GED Math, GED Language, SVP, Intelligence, Verbal Aptitude, and Numerical Aptitude. Gottfredson and Holland (1996) reported a correlation of .94 between Cx and GED Reasoning ratings. Cx ratings range from 40 or less to 70 or more. For example, a Cx rating of 65 or higher could be associated with an occupation requiring a college degree and possibly post graduate work and on-the-job training of 4-10 years, while a Cx level of 50 might characterize an occupation requiring a high school degree and a year or more of OJT. The Cx rating for Nuclear-Fuels Research Engineer (IRC) is 80, while Shoe Shiner (CRE) is 37 and Counselor (SAE) is 68.

Table 2 summarizes data for cognitive complexity levels by kinds of work in the 1990 census data using two-letter Holland subcategories. This table shows that four subcategories, RA, IC, AC, and CA, did not capture any named occupations used in the census report. These codes are also rarely attained by people who take the Self-Directed Search (SDS; Holland, Powell, & Fritzsche, 1994). Holland (1997) defined three levels of consistency in an SDS code in terms of the distance between the first two code letters

on the hexagonal model. A high level means that the first two letters are adjacent on the hexagon (e.g., RI) and so forth. High consistency is theoretically positively correlated with predictability and stability in occupations, and the four codes listed above are characterized by average to low consistency.

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Insert Table 2/Figure 2/Figure 3 Cx ratings and kinds of work about here

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We averaged the Cx ratings from the two letter occupational codes across the six kinds of work and found the following average Cx ratings: R = 52; I = 72; A = 69; S = 63; E = 60; and C = 55. Table 2 and Figure 2 show the profile ratings of the six kinds of work in order of lowest to highest Cx rating, i.e., RCESAI.

Finally, Figure 3 graphically presents Cx ratings from lowest to highest for two letter subcategories. Inspection of this figure shows that the Realistic and Enterprising areas are characterized by the most diverse Cx ratings, especially when expressed within the two-letter subcategories. For example, RC has the lowest Cx rating and IR has the fourth highest rating in shown in Figure 3. Not surprisingly, Investigative and Artistic areas are associated with the highest Cx ratings, and Conventional is associated with the lowest ratings. These findings regarding cognitive complexity are consistent with the findings reported earlier by Gottfredson and Holland (1989, 1996) with respect to GED levels and six kinds of work. They found that Investigative work, for example, was associated with GED level six, the highest GED rating. This is consistent with our finding regarding the Cx rating for Investigative work.

There are additional interpretations that can be drawn from these data with respect to the social status or prestige associated with kinds of work. Nafziger, Holland, Helms, and McPartland (1974) reported that GED correlated .82 with the Duncan Socioeconomic Index and .90 with Temme's (1975) Occupational Prestige Index. These two scales provide indices of the status or prestige of an occupation. Indeed, L. S. Gottfredson (1980) noted that GED and occupational prestige (Temme Index) appear to be the same variable ($r$ = .95). Given the correlation of .94 between GED Reasoning (one of eight scales used in Cx) and Cx reported by G. D. Gottfredson and Holland (1996), we suggest that there is a positive relationship between an occupation's complexity rating and the occupation's status or prestige ratings. Moreover, as we will show later, Cx may also be related to level of income. Thus, it may be inferred that the levels of prestige and social status associated with occupations vary across the six areas of work in similar ways as the complexity or GED levels.

L. S. Gottfredson (1980) has suggested that self-direction in work, e.g., the ability of workers to determine how they will spend their time at the job, is also positively related to prestige and GED levels. She noted that taking occupational level into account is important because level is associated with job-related authority and responsibility (e.g., try out own ideas), abstractness of work (e.g., working with data), and autonomy (e.g., self-direction). Given the differences among the six types of work with respect to level,

this helps explain why college students seeking high prestige work might be disappointed with the list of occupations in the Realistic or Conventional areas. A college student seeking a high prestige job in the Realistic area will have a more difficult time fulfilling his or her aspirations than a person exploring the Investigative area (L. S. Gottfredson, 1978). In our analysis, we logically view such self-direction to be related to the level of cognitive complexity in work. Investigative and Artistic kinds of work are closely tied to the highest occupational levels, and by association, to higher levels of prestige and self-direction. Even the adjectives associated with Investigative and Artistic personality types reflect independence, creativity, self-expression, idealism, and the ability to deal with abstractions such as data and symbols.

So far we have analyzed occupations with respect to the area of work and the level of cognitive complexity. In the following sections we shift analyze people and actual employment across the six kinds of work. We will also examine other variables in this regard, including cognitive complexity, gender, and income.

3. Employment in Six Kinds of Work, 1960-1990

The third question concerned the numbers and percentages of persons employed in six kinds of work from 1960 to 1990. Table 3 indicates that the total estimated employment increased over the four decades from 64.1 million in 1960 to 115.7 million in 1990. Table 3 also provides information which is related to information in Table 1 in that actual employment across the six areas resembles the distribution of occupational titles in the census data. For example, the Realistic area had the most occupational titles and the largest number of individuals employed, and Artistic had the fewest occupational titles and the fewest number employed. The profile of kinds of work for occupational titles from highest to lowest in 1990 was REISCA (see Table 1), and the profile of kinds of employment in 1990 was RECSIA (see Table 3). The percentage of Realistic employment declined 18% between 1960-1990, between 5-7% each decade, but it remained the largest area of employment over the four decades, with the actual employment numbers showing an increase over the period, from 35.0 million to 42.7 million. In contrast, employment in the Enterprising area increased by 8% between 1970-1980 (12.2 million to 25.9 million) in relation to the other five areas, and the percentage of individuals employed in the Investigative area doubled between 1960 and 1990 (from 3% to 6%, or 2.0 million to 6.7 million). Employment in the other four areas remained more stable.

The largest area of employment in 1990 was Realistic, followed in order by Enterprising, Conventional, Social, Investigative, and Artistic (RECSIA). This was the same order as in 1980, 1970, and 1960, with the exception that Enterprising and Conventional areas were tied in 1970 and reversed in 1960. This ordering of kinds of work representing 1990 employment (RECSIA) (Bureau of Census, 1992) stands in contrast to the projected order of the 20 occupations identified by the Bureau of Labor Statistics (U.S. Department of Labor, 1997-1998). The BLS projected that the most new jobs through 2006 would follow the pattern noted earlier, ESRICA. Moreover, the actual

increase in employment of 7.7 million over the period in the Realistic area was surprising to us.

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Insert Table 3 and Figure 4 employment/decade about here

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Altogether, analysis of the employment numbers over 40 years does not support claims of a major shift in employment across the six kinds of work. While employment declined by 18% in the Realistic area, it remained the largest area of employment through 1990 and actually increased in real numbers. It is especially noteworthy that the percent of employment in the Investigative area did not increase dramatically, given the apparent rapid growth in information and technology jobs. This finding illustrates the difference between the numbers of jobs or employment and the percent of change or growth in employment. Although employment in the Investigative area doubled over 40 years, it remained only 6% of total employment in 1990.

These data also provide a way to think about employment opportunities in terms of replacements. It is reasonable to expect that the kinds of work with the most employment will also have the most replacements. Mittelhauser (1998) identified three factors influencing the number of job openings: employment growth (new jobs), educational upgrading (organizations increasing educational requirements for existing jobs), and replacement openings. Mittelhauser (1998) indicated that given population changes, the number of job openings attributed to replacements was projected to increase from 21% in 1986-1996 to 34% from 1996-2006. While 2 out of 3 jobs are related to employment growth, a substantial percentage is related to replacement. In this regard, it seems appropriate to consider using the Holland classification to study and describe job openings in the future.

## 4. Employment, Gender, and Kinds of Work, 1960-1990

The fourth question concerned employment for men and women over four decades in six kinds of work. Table 4 shows employment for six kinds of work by gender. For men, most employment was in the Realistic area, followed by the Enterprising area. Over the four decades, between 79% and 85% of male workers were in these two areas. This means that only 15% to 21% of men were employed in the other four areas. Finally, Table 4 shows that male employment in the Realistic area has fluctuated over the four decades, but was 4.2 million higher in 1990 than 1960; more than 50% of men were still employed in the Realistic area in 1990.

Conversely, women have been employed in more varied kinds of work, including Conventional, Realistic, Social, and more recently, Enterprising work. Indeed, the percentage of women in the Enterprising area has almost doubled over the four decades, from 13% to 24%. In contrast, there were slight decreases in the Conventional, Social, and Realistic areas. For example, the percentage of women employed in Realistic occupations decreased from 33% in 1960 to 20% in 1990 in spite of efforts to encourage

nontraditional work for women. The Conventional area of work remained the most common for women in 1990 (16.3 million), and was consistently the area in which most women were employed for four decades. The percent of women employed in the Social area remained relatively constant over the four decades, although the actual number employed increased from 3.8 million in 1960 to 11.2 million in 1990. Investigative and Artistic work consistently showed the smallest percentage of employment for women over 40 years.

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Insert Table 4 and Figure 5 employment, gender, work about here

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Further analysis reveals that although male employment has been concentrated in the Realistic and Enterprising areas, there has been an increase of employment in the Investigative area from 4% to 8% over four decades (1.7 million to 4.8 million). There was a corresponding increase for women from 1% to 4% in the Investigative area (.3 million to 2.0 million). Employment for both men and women remained stable in the Artistic area at 1%. However, it must be noted that in 1990 only 9% of male employment and 5% of female employment was associated with work in the combined Investigative and Artistic areas. Figure 2 indicated these two areas were rated highest in term of complexity. Table 4 and Figure 5 also reveal the wide disparity regarding employment in 1990 for men and women across the six kinds of work, ranging from 52% for men in the Realistic area to 1% for both men and women in the Artistic area.

These findings for gender and employment for four decades suggest that men have been reluctant to move into nontraditional areas of work. Indeed, Figure 5 appears to indicate a relatively stable pattern of employment for men and women in six kinds of work over four recent decades. An analysis of the age composition of workers in occupations would reveal more about the relationships among gender, employment in traditional male or female dominated occupations, and labor force changes across six kinds of work.

5. Employment in Kinds of Work by Gender and Cognitive Complexity

The fifth question focused on the employment of men and women in 1990 in relation to the six areas and the level of cognitive complexity. In order to examine this question, we created six categories of cognitive complexity using five point intervals, ranging from a low of 44 or less to a high of 65 or more. High scores indicate more complex work demands. Table 5 shows how the employment of men and women is structured in relation to kind of work and levels of cognitive complexity (Cx).

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Insert Table 5 gender, kind of work and Cx about here

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Men are heavily employed in Realistic occupations at the three lowest Cx rating categories. Indeed, the largest area of employment for both men and women across all areas, 14.8 million, is represented by the lowest Cx category in the Realistic area. Contrary to widespread beliefs about the intellectual demands of all jobs in the high tech area, this finding suggests that the U.S. economy continues to create many jobs in the Realistic area requiring less cognitive skill. Women's employment (15.1 million) is concentrated in the two mid-Cx categories in the Conventional area. Men and women show more equivalent levels of employment across Cx categories in the Social and Enterprising areas, and relatively higher levels of employment at the highest three Cx levels.

It is noteworthy that overall employment in 1990 in the Investigative and Artistic areas was limited to the highest Cx rating categories of occupations (see Table 5 and Figure 6). Indeed, employment in the Investigative area occurs only at the Complexity rating of 65 or higher, and in the Artistic area it begins at the Cx rating level of 60-64. The other four areas, Realistic, Social, Enterprising, and Conventional, show employment in all six levels of Cx ratings. Among other things, these data suggest that there are abundant work opportunities in the midrange levels of cognitive complexity.

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Insert Figure 6 kind of work and Cx about here

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Over the years, there has been considerable discussion about gender differences in kinds of work, especially in the more prestigious, higher paying jobs. Some have argued that women should seek more employment in nontraditional areas dominated by men, such as the Realistic area. L. S. Gottfredson (1978) noted that it might be more advantageous for women to find increased employment in higher level work by moving to the Investigative and Enterprising areas, where they are underrepresented (see Table 5). Women are already more frequently found in higher level Social jobs, and there are limited job options available in higher level Realistic, Conventional, and Artistic areas.

Taken together, these data show how employment is related to the level of cognitive complexity of work, and that employment is also unevenly distributed across the six areas of work in relation to gender. Data over the four decades (see Table 4 and Figure 5) indicate that the uneven distribution of workers across the six areas has been a continuing condition in national employment.

## 6. Kinds of Work, Gender, and Income in 1990

The sixth question concerned the income for men, women, and the total population in different kinds of work in 1990. Table 6 presents the income levels for men and women in different kinds of work, and Table 7 shows income for 30 kinds of work using two-letter Holland subcategories. No occupations for workers were coded with two-letter codes of AC, CA, RA, and IC in the 1990 census data, and only 10

occupations out of 500 were coded as Artistic. These numbers shows wide variations in income levels among different groups.

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Insert Table 6 and Table 7, kind of work, gender, and income about here

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Figure 7 shows average income profile for six kinds of work ranging from lowest to highest, CRASEI. The discrepancy is very large, with the average Investigative income more than two times larger than the average Conventional income. It may be noted that the profile of kinds of work is similar to the profile of cognitive complexity (see Figure 2), but not identical. Figure 2 showed the profile of the six kinds of work in order of lowest to highest Cx rating was RCESAI, and the profile for income is CRASEI. With respect to income, the Conventional and Realistic areas are lowest, which is similar to their status in terms of cognitive complexity, and Investigative is highest for both income and complexity. Social and Enterprising kinds of work are reversed on the two schemes, with Social higher on complexity and Enterprising higher on income.

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Insert Figure 7 and Figure 8, kind of work and income about here

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Figure 8 illustrates the wide range of incomes associated with kinds of work in 1990. It also shows how the second letter in the occupational code may modify the impact of the first letter. Occupations related to the Conventional area of work generally had the lowest incomes. It is possible that occupations in the Conventional area are characterized by more part time and temporary employment, thus reducing the annual income reported in the census data. Other explanations for lower income in the Conventional area might include less cognitive skill and training of workers, work values other than income, and more women workers (see Table 4 and Figure 5). Table 7 shows the CI area had an average income of $15,481, but the IS and IE areas had incomes of $43,328. This illustrates the relationships of first and second code letters relative to salary. In general, Investigative and Enterprising areas of work, in combination with Artistic, Social, and Realistic areas, were characterized by the highest incomes.

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Insert Figure 9 kind of work, gender, and income about here

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Figure 9 examines employment income across different kinds of work in relation to gender. Figure 9 indicates that the income for women is lower than for men in all six categories, and the discrepancy becomes greater as income levels rise. It is interesting to note the income levels of men and women in relation to employment percentages across the different kinds of work. For example, in 1990 the proportion of men employed in the Realistic area was much greater than women (Figure 5), while the salary difference was proportionally smaller (Figure 9). However, in the Conventional area, where women

workers are proportionally much larger than men (Figure 5), the salary difference was in favor of men (Figure 9).

Table 7 shows 30 kinds of work and the average income for men, women, and the overall population in 1990. In every instance, male income is greater, especially in the IS, IA, EA, IR, and AS areas. These differences ranged from $22,488 to $14,152. Moreover, the area of work in which women significantly outnumber men, Conventional, is generally characterized by lower overall salaries, e.g., CI, SC, CE, RC, and the smallest differences between men and women. These differences ranged from $2,953 to $6,192. Comparing income levels across kinds of work would enrich discussions of types and career choices with students and clients in career services programs, and enhance the application of Holland's theory in practice.

## Implications

In this section we examine the implications of these findings with respect to public policy regarding education and work and the provision of career services.

### Public Policy

The findings of this analysis of kinds of work in relation to gender, cognitive complexity, and income provide some novel and interesting implications for workforce planning policy. For example, men, who are most segregated with respect to the six areas of work (8 out of 10 work in either the Realistic or Enterprising area), might be encouraged to explore occupations that are frequently dominated by women (e.g., Social). Women, on the other hand, who are more equally distributed across the Conventional, Realistic, Social, and Enterprising areas, might be encouraged to pursue occupations associated with higher complexity levels (e.g., Investigative). Scholarships and mentoring programs might encourage more gender diversity in relation to areas of work.

Our findings indicate that most people are employed in Realistic, Enterprising, and Conventional occupations requiring low to medium levels of cognitive complexity. It seems that much of our public discussion of employment and career preparation is directed at occupations with combinations of codes in the Investigative, Artistic, and Social areas, which also require or provide higher levels of cognitive complexity, social prestige, and income. These kinds of work employ few people. It appears that our promotion of occupational pursuits in these areas is somewhat different from what the U.S. economy has actually provided in employment over a 40 year period. However, we noted that the Bureau of Labor Statistics projects that the most new jobs through 2006 will be in the Enterprising and Social areas, followed by the Realistic area. It must be remembered that these are projected new jobs, which seem to capture more public attention and interest than the data regarding the actual employment at the moment. Given that one out of three jobs is related to replacement (Mittelhauser, 1998), it would also appear wise to encourage individuals to consider employment in areas with existing large employment numbers, especially in specific occupations employing more older workers.

The findings replicate the differences found by many other researchers in the employment of men and women. Moreover, these differences have persisted for four decades despite efforts to move women into areas dominated by men, e.g., Realistic, Investigative. While the employment of women in the Enterprising area increased over the decades, women still dominate employment in the Conventional and Social areas. Our findings also indicate that income for men and women is not equitable across the six areas, with men reporting more income in every instance. The analysis of the reasons for these discrepancies in employment and income across the six areas is beyond the scope of this discussion, but it is important to note that Holland's (1997) classification of occupations provides a potentially useful analytical perspective on these social issues.

Income for kinds of work is not equitable; indeed, the average Investigative income is more than two times the average Conventional income. Given that women dominate employment in the Conventional area, the social implications of this finding are noteworthy. The 1990 census results indicate that the ratings of cognitive complexity for six kinds of work from lowest to highest was RCESAI, and the order for income levels was CRASEI. The relationships between cognitive complexity and income are strong.

Hirsh, Kidd, and Watts (1998) suggested that while occupation will probably remain a core construct in describing work and providing career services in the United Kingdom, it should be supplemented by other constructs, e.g., gender, cognitive complexity, income, employment, and time, for exploring individual career progression. We would suggest that Holland's (1997) theory might add some of the characteristics they mentioned, and demographic research such as this study may add both practical and reality dimensions to the understanding of career phenomena.

## Holland's Theory

Our study suggests that there is considerable stability in the nature of occupations used to report employment in the census with respect to Holland codes. The often discussed dramatic shift in the nature of work, and by implication the occupations that encompass work, is not apparent in these data. Indeed, the persistence and stability of occupational titles used to describe work activities reported in the census is striking, although there is considerable variability in the numbers of occupations across the RIASEC areas used in Holland's (1997) theory.

Occupational level has been examined across kinds of work since the early 1970s, and the present study indicates that occupational level remains an important variable in six areas of work. The most recent conceptual measure of the level of skill and knowledge required for different kinds of work is the complexity level introduced by Gottfredson and Holland (1996). It showed a range of complexity ratings from 52 (Realistic) to 72 (Investigative). Given that occupational level correlates positively with occupational prestige, it appears that any analysis of the six kinds of work will reflect the relationships among these variables. These relationships, in turn, appear to be related to income levels across kinds of work.

Our findings show that Investigative work occurs at the highest levels of cognitive complexity, followed by the Artistic area. In contrast, Realistic and Conventional work is associated with the lowest levels of complexity. These findings help us understand more about Holland's theory with respect to level. In addition, gender differences also occur in the distribution of workers across the six areas. We concur with L. S. Gottfredson (1978) that it might be advantageous for women to explore more fully occupations in the Investigative and Enterprising areas where they are underrepresented.

Altogether, our findings do not indicate a dramatic shift in employment across the six areas of work. Although employment in the Investigative area doubled over the 40 year period of our study, it remained only 6% of employment in 1990. This suggests that Holland's (1997) matching model is supported by data and experience related to employment.

Career Services

The findings of this research regarding six kinds of work, income, and levels of cognitive complexity associated with occupations have multiple implications for career services. Career guidance programs in the schools could use this information to show students the relationships between kinds of work, cognitive skill development, and financial income. Students wondering about the relationship between educational achievement and life style would be able to understand this more clearly through an analysis of actual employment data. Occupational information in computer-based guidance systems and other labor market publications, for example, could be redesigned to include census data in the descriptive information provided to users.

Holland (1997) has suggested that scores on the SDS that are low in consistency (first two letters are opposite on the hexagon, e.g., Realistic/Social) may have more difficulty in translating such codes into occupational alternatives. We found that four codes, RA, IC, AC, and CA did not capture any named occupations in the 1990 census report. This underscores the need to provide special career assistance to persons with such codes.

In a similar fashion to L. S. Gottfredson (1978), we found that kinds of work varied widely in complexity ratings. If prestige ratings are highly correlated with complexity, then college students with Realistic and Conventional SDS inventory codes who are seeking high prestige occupations may need special assistance in interpreting inventory results.

Holland's theory suggests that a second or third letter in an occupational code may modify the impact of the first letter with respect to income and cognitive complexity. Counselors might help clients see how adding some Investigative or Enterprising aspects to their occupational pursuits may enhance the income associated with future occupational activities. Moreover, career assessment inventories using Holland codes to

provide occupational information could use census data in the interpretive report information provided to users.

Male students might benefit from seeing the impact of stereotyping associated with kinds of work and their underrepresentation in several areas, e.g., Social. Female students might consider cognitive complexity and salary of occupations in various Holland areas in selecting fields to pursue. This may increase female employment in Investigative, Artistic, and Enterprising areas.

Gottfredson, Holland, and Gottfredson (1975) found that people aspired to Enterprising jobs far below the rate of actual employment in that kind of work. At the same time, they aspired to Social and Artistic jobs at a rate well above the rate of actual employment. Career guidance programs might properly help participants to understand the economic realities of current employment data, rather than relying exclusively on projections of expected future occupational activity (Patterson & Allen, 1996: U.S. Department of Labor, 1997-1998).

Thomas Gutteridge and Raymond Palmer, a researcher and career counselor, respectively, suggested that it is jobs that are changing, not occupations (as cited in Patterson & Allen, 1996). They noted that it is a mistake to consider the occupational world as unstable or unpredictable because the vast majority of occupations change very little. Our findings support their assertion in several ways. For example, when jobs are categorized as occupations there is no evidence of massive changes in relation to six kinds of work (Holland codes) over a 40-year period. The Realistic area still dominates both employment and occupational categories, and the Artistic area is still very small. While employment in the Investigative area has doubled over the period studied, the actual employment in this area remains at less than 10% for men and less than 5% for women. And, finally, it should be noted that occupations continue to be licensed by government agencies and monitored by professional associations—in this regard occupations show no signs of disappearing from public view.

## Future Work

The findings of the 2000 Census regarding occupational employment will be available sometime in March-May 2002. We anticipate continuing the analysis reported here when new information is available. We also plan to examine age of workers in occupations to provide an additional perspective on these phenomena. Future census data related to employment will use the Standard Occupational Code as the classification system, which increases the standardization of labor market information across various federal agencies. This, in turn, will enable labor market researchers and career theorists to create more useful information for those who provide career services and guide public policy.

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