The information society in California

Social factors influencing its emergence

Jorge Reina Schement, Leah A. Lievrouw and Herbert S. Dordick

The authors identify three elements which will influence California's future. First, demographic shifts in the state's population have altered California's ethnic and cultural foundations. Second, the state educational system does not seem prepared to train larger numbers for information work, especially members of its growing ethnic population. Third, almost half the state's workforce is now employed in information-oriented work, whether in the industrial, service, or agricultural sectors. The authors demonstrate that the interaction of these elements has profound implications for California's development.

Keywords: Information society; Social factors; California

Jorge Schement is Associate Professor, Leah Lievrouw a doctoral student, and Herbert Dordick Visiting Professor at the Annenberg School of Communications, University of Southern California, University Park, Los Angeles, CA 90080-0281, USA.

[1]Herbert S. Dordick, 'California enters the information society', paper presented at the Conference on State Telecommunications

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Dramatic social and economic changes in the USA over the past ten years have drawn the attention of scholars interested in information. Many suggest that the changes are computer-driven, and some refer to the emergence of an 'information society' in the USA.[1] Still others assert that this transformation is not uniform, but varies from region to region. Most agree that among the regions in the vanguard is the State of California.[2]

In this article, we consider paradoxical and non-obvious aspects and consequences of California's purported information society. We have attempted to gain a better understanding of the significant elements in California's development, and to isolate the dynamics of the relationships among them.

The term 'information society' has been applied to a wide range of social phenomena. In 1981 California governor, Edmund G. Brown, Jr, commissioned a conference to elicit policy recommendations for the future of California and its technology-intensive and education-intensive economy. The analysts who participated in the conference examined the fate of such an economy in an 'information age'. For purposes of discussion, we refer to California here as an 'informated-oriented industrial society', or more simply, an 'information-oriented society', because opinion on the subject is still divided. At this point, there is no consensus as to whether an information-oriented society represents a fundamental departure from the past, or simply an outgrowth of industrial society.

California as a model

We chose California as the subject of our analysis for several reasons. First of all, California is the most important economic region in the USA. Its gross state product, for example, would rank as the eighth largest among all gross national products in the world. California is ahead of all other US states in personal income, and has the largest state population in the USA (10.3% of the national population in 1979). California also has

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the largest concentration of scientists, engineers, and mathematicians in the USA.[3]

The top 500 corporations in California range in revenues from $42.9 billion to $9.7 billion, putting them among the wealthiest in the nation. Of these, 214 (42.8%) deliver information services or produce information technology.[4] Moreover, 67 of the state's 100 highest revenue-growth firms are corporations in these same fields. Nor do these figures reflect the dominance of Hollywood within the state. Only 11 of these information firms are part of California's fabled entertainment industry (2.2% of the top 500).[5]

California was also chosen because its educational system has had a strong influence on the state's economic development. At one level, the public schools educate children and prepare them for productive working lives. On another level, the university–industry relationship in California has cultivated a highly skilled, professional information workforce, and has helped redirect the state's educational resources away from the humanities and towards engineering and the basic sciences. The allocation of educational resources has been a critical element in the state's economic success.

The working population of California is another contributing factor. Along with concentrations of highly skilled workers, California has always had a large ethnic population. Today, Latino and Asian groups are experiencing unprecedented population growth. Shifting demographic patterns make the transition to 'information society' status even more complex, and more compelling to the observer.

Do these characteristics make California an information-oriented society? They seem to invite a simple explanation, but the elements that contribute to California's economy and society are not simple. Population, education, and the changing nature of work are the principal elements in California's socio-economic picture. Each presents special problems, and they interact with each other to make precise analysis quite difficult. However, a closer examination of each element is necessary if one is to judge California as information-oriented.

Population

The population of California is undergoing dramatic changes. In particular, birth rates among whites and blacks are dropping while the rate is increasing for Latinos, the state's largest group. In addition, the state is absorbing record numbers of Spanish-speaking immigrants from the rest of the hemisphere. Moreover, the stream of domestic immigration, from the north-east to the south and west is also changing the population picture.

Chinese, Filipinos, Koreans, Vietnamese, and Mexicans have, in that order, shown the largest percentage increases in group sizes.[6] Many of these are illegal aliens. Since neither the Canadian nor Mexican borders are effective barriers to entry into the USA, the presence of an illegal resident population makes accurate estimates very difficult. Furthermore, critics have argued that there was a significant undercount in the 1980 census, as there was in the 1970 census.[7] All of this creates great problems in knowing who actually lives in the state. Nevertheless, the best estimate of the current California population, as synthesized from all available sources, is summarized in Table 1.

The percentages in the table show the ethnic proportions, but do not give a sense of the direction of California's population growth.

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Policies, Sacramento, CA, 21 October 1981.

[3]Jorge Reina Schement, 'The road to an information economy is paved with good intentions', paper presented to the Conference on State Telecommunications Policies, Sacramento, CA, 21 October 1981.

[3]*The Sixty-Mile Circle*, Security Pacific National Bank, Los Angeles, CA, October 1979; *California Statistical Abstract, 1979*, California Department of Finance, Documents Section, Highlands, CA, 1979.

[4]We define 'information industries' as those whose primary output is information. This group is strictly delimited and includes banking, finance, publishing, telecommunications, computer hardware and software, and entertainment.

[5]'California's 500 and California's 100', *California Business*, May 1981, pp 83–97.

[6]Franz Schurman, *The Other California* (no source available).

[7]*Counting the Forgotten: The 1970 Census Count of Persons of Spanish-Speaking Background in the US*, Report of the US Commission on Civil Rights, US Government Printing Office, Washington, DC, 1973.

Table 1. Estimated California population percentages, 1980.

	%	Number
Anglo (white)	57.0	13 487 919
Latino	19.2	4 543 770
Black	7.6	1 819 282
Asian/Pacific	5.3	1 253 987
Native American	0.9	201 311
Other (undetermined)	10.0	2 362 293
Total	100.0	23 668 562

Projections of future population distributions can be made by constructing age pyramids of different ethnic groups. When one does so, one finds that age proportions vary widely from group to group.

The age and ethnicity breakouts of the 1980 California popultion are summarized in Figures 1, 2 and 3 for whites, blacks, and Latinos, respectively.[8] As the figures illustrate, different parts of the age distributions are dominated by different ethnic groups. Whites comprise more than 80% of all Californians 65 years of age or older, while less than 9% of the same age group are Latinos. When Californians 13 years of age or younger are counted, however, the percentage of Anglos is about 60%, while the percentage of young Latinos is about 23%; Anglos have effectively bypassed the goal of zero population growth (ZPG) and blacks are rapidly approaching it. The Latino population, on the other hand, continues to grow. In fact, the most striking feature of the pyramids is the concentration of the Latino population under 25 years of age.

The largest population increases, then, are among minority ethnic groups – those who in the past have had the least job training, and the

[8]Comparable data were not available for Asians, and they have not been included in these figures.

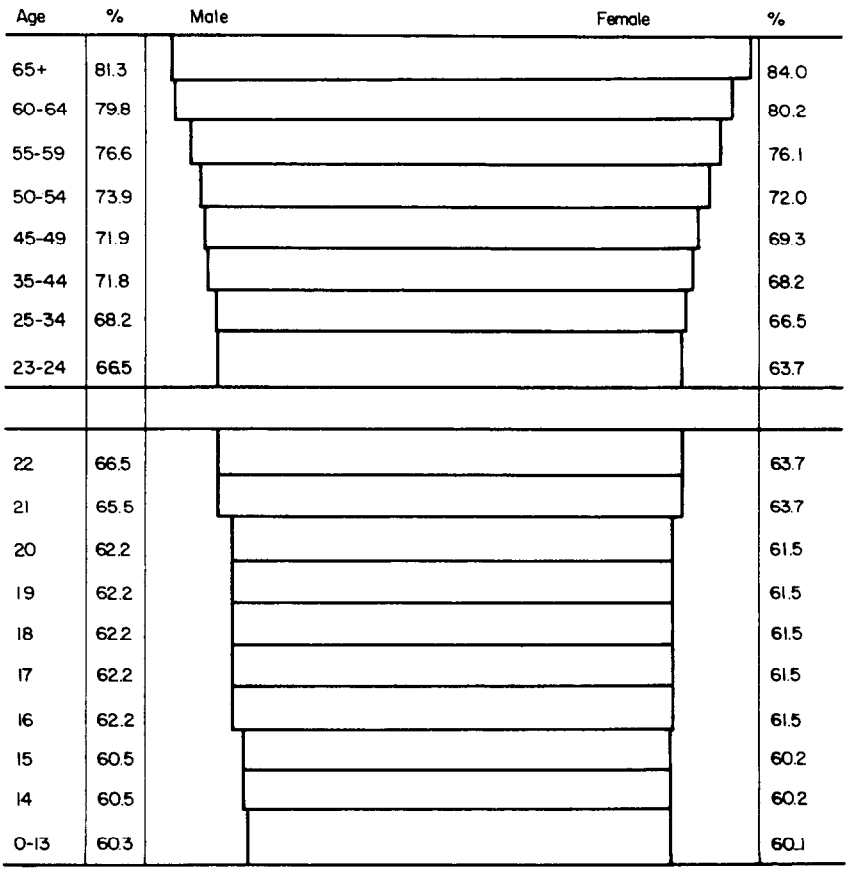

Figure 1. Age structure of California: whites (non-Latino).
The percentages are for all males or females in California for each age group (this applies also to Figures 2 and 3). The unevenness of the age group categories reflects the age group divisions in the 1980 census.
For example: 81.3% of all California males 65 years of age or older are white.

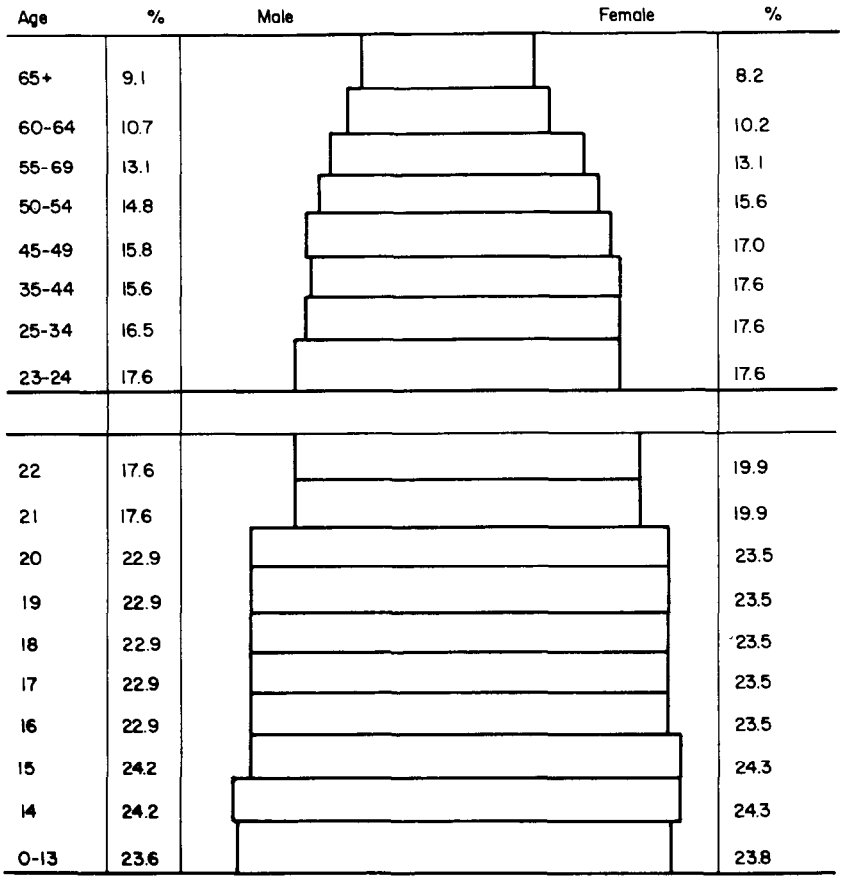

Figure 2. Age structure of California: Latinos.

least experience.[9] While it seems that there will continue to be a growing demand for skilled information workers, the employment prospects for Latinos and Asians with limited skills in English are uncertain. Certainly, they are harder to employ in jobs that require language proficiency, such as word processing. That these population shifts will have great implications for California's future seems fairly clear. Nevertheless, they have been largely overlooked in most discussions of information-oriented societies.[10]

Education

The emergence of an information-oriented society in California depends on the availability of an appropriately trained workforce. Given California's population trends, the supply of skilled workers largely depends on minority group success within California's educational system. The question arises: how do minority groups fare in the state's academic institutions?

The population pyramids indicate that more minority children than ever are entering the job training pipeline. Their educational experience is intended to provide them with the skills they need for work. However, there is evidence that minorities are differentially affected by the public educational system in California. For example, Meyer Weinberg[11] found substantial differences in educational attainment levels among ethnic groups. For every 100 white children entering first grade in California, 86 completed high school, and 47 went on to enter college. For corresponding samples of black children, 67 completed high school and 34 entered

[9] *The Condition of Education*, National Center for Education Statistics, Washington, DC, 1978.
[10] Wilson P. Dizard, *The Coming Information Age*, Longman, New York, 1982; Daniel Bell, *The Coming of Post-Industrial Society*, Basic Books, New York, 1973.
[11] Meyer Weinberg, *Minority Students: A Research Appraisal*, US Government Printing Office, Washington, DC, 1977.

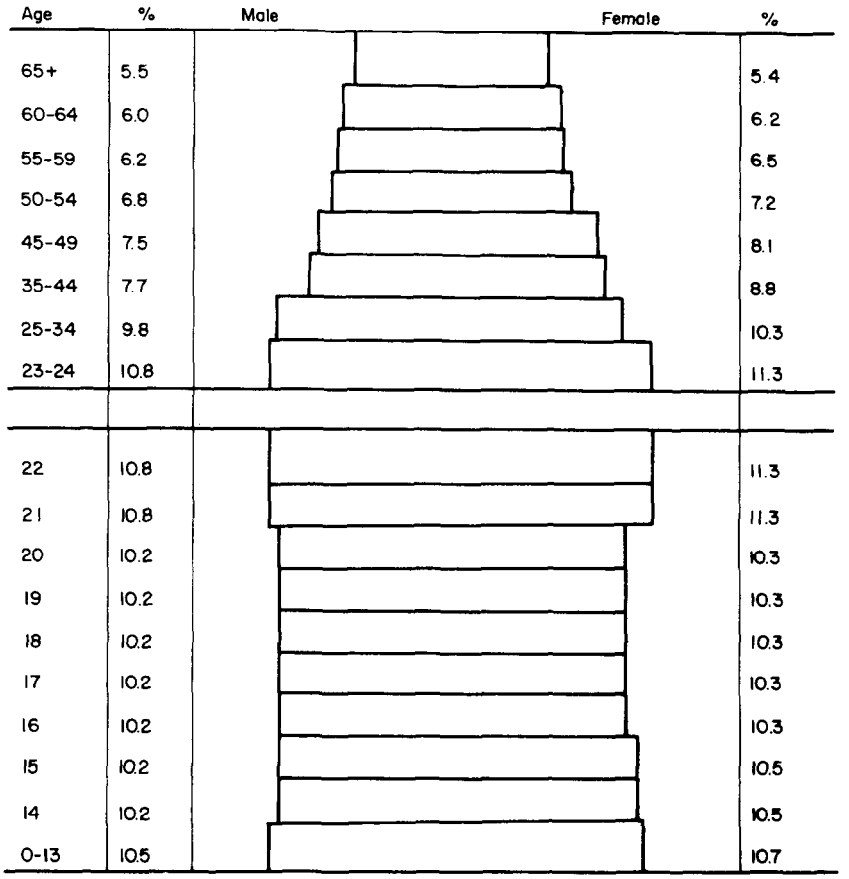

Figure 3. Age structure of California: blacks (non-Latino).

college. The rate for Mexican–American children was even lower. Of that group, only 64 completed high school, and 28 entered college (see Table 2).

This disparity is also evident in the 1980 California census. Of all Latinos over 25 years of age, 40% had only completed 0 to 8 years of school. Approximately equal percentages of all ethnic groups had completed high school, but college completion figures varied widely, 21% of whites over 25 had completed college; 13% of blacks; 31% of Asian/Pacific Islanders; and yet only 7% of Latinos had finished four years of college (see Table 3). At the university level, then, blacks and Latinos are particularly underrepresented on student bodies.

According to the *Digest of Educational Statistics,* in 1980 the median number of years of school completed was 12.5 for whites, 12.0 for blacks, and 10.6 for Latinos.[12] However, the same authors also indicate that minorities as a whole are showing a more marked increase than whites in median years of school completed, over time (Figure 4). This implies that some catching up may be occurring.

Nevertheless, continued ethnic imbalance can be inferred by enrolment and degree conferral profiles, which show that the traditionally

[12]W. Nance Grant, and L.J. Eiden, *Digest of Educational Statistics,* US Government Printing Office, Washington, DC, 1981.

Table 2. Grade completion per 100 entering first grade students in California by ethnicity, 1977.

Enter:	Grade 1	Grade 8	Grade 12	College
Anglo	100	100	85.7	46.9
Mexican/American (Latino)	100	93.8	63.8	28.2
Black	100	93.7	67.3	34.0

Source: Meyer Weinberg, *Minority Students: A Research Appraisal,* US Government Printing Office, Washington, DC, 1977.

Table 3. Last year of school attended, by percentage and ethnicity, 1980.

Years in school	White (%)	Black (%)	Asian & Pacific (%)	Spanish origin (Latino) (%)
0–8	11.46	15.56	16.39	40.38
9–11	11.76	15.42	8.0	16.41
12	32.36	29.69	23.60	23.36
13–15	23.52	26.18	21.35	13.72
16+	20.88	13.13	30.59	6.09
Total	99.98	99.98	99.93	99.96

Source: US Census Supplemental Report, PHC80-S1-1, 1980.
Note: Columns do not total 100% due to rounding.

white-dominated technical and scientific fields are growing. The number of degrees conferred in the humanities, where minority students have tended to concentrate, is dropping (Table 4). At this point, it does not seem that minorities are shifting in large numbers to technically oriented fields.

The emphasis on technical education has been supported by a close and profitable relationship between California's universities and its technical industries. Universities are sources of new knowledge and creative vitality for information-oriented firms. They produce skilled workers in the form of students, consultants, or faculty who leave universities for industry. A frequently cited example is the relationship between Stanford University and the growth of the computer and software industries in the Santa Clara Valley.[13] Stanford's encouragement of faculty to become industry consultants has provided a model for other institutions suffering funding cutbacks. Consequent depletion of the academic ranks has been avoided in the past because California's universities have been able to recruit new and replacement personnel from other states.

This pattern is now changing. Significant salary differentials between academia and these industries, and prohibitively priced housing, are exerting their effects. It is increasingly difficult for the state's universities to attract and hold on to academic talent. Information industries have established a very beneficial relationship with the state's universities but have placed demands on the universities that rob them of their resources: these industries may be chopping down the tree to get at the fruit.

[13]Robert Howard, 'Second class in Silicon Valley', *Working Papers*, Vol 8, No 5, September/October, 1981, pp 20–31.

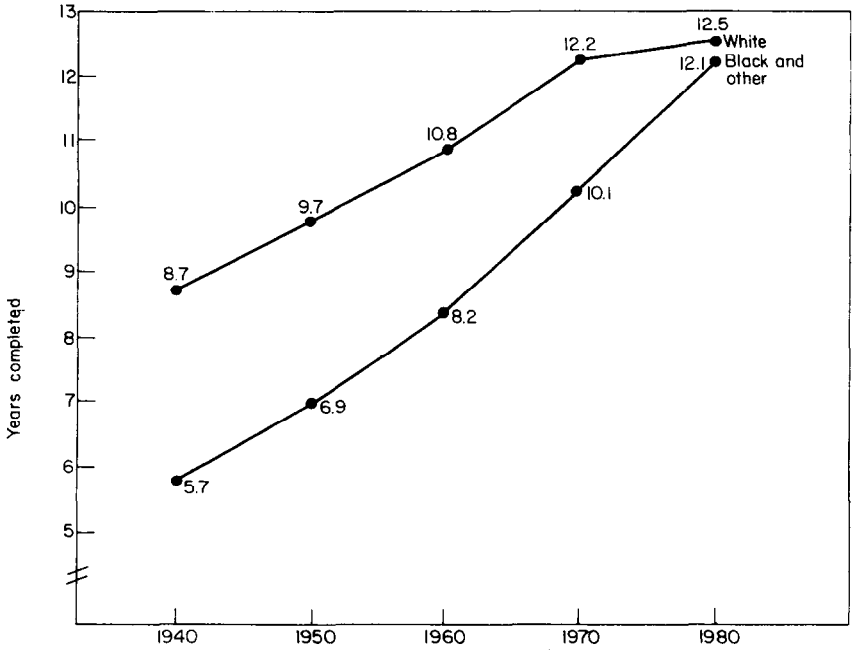

Figure 4. Median years of school completed by people 25 years and older, by race: USA, 1940–80.
Source: W. Nance Grant and L.J. Eiden, *Digest of Educational Statistics*, US Government Printing Office, Washington, DC, 1981.

It appears that two relationships will characterize California education in the future. First, the educational achievements of the state's minority children are likely to fall behind their Anglo counterparts. In the context of the state's minority population growth rates, the overall level of education of the population may well drop. This has great implications for the type of labour available to industry. Second, the lucrative relationship between industry and academia will continue, perhaps to the disadvantage of the universities. The depletion of academic ranks may jeopardize training programmes that prepare information professionals for the industry.

Information work

The third critical element in the analysis of California's future is the changing nature of work. Societies are often defined by the kind of work they engage in and deem valuable. Thus, we can sense the importance of information-related work by separating out and measuring information-based occupations with respect to California's labour force as a whole. Estimates of the size of the information workforce depend on a careful definition of information work. Our estimates are based on a behavioural, taxonomy-type scheme of work tasks.[14] Using this scheme, approximately, 48% of all workers employed in California in 1980 can be identified as creating or manipulating information for their principal job task. Another 3% produced or maintained information technology.[15] Job descriptions for these workers range from secretaries to telephone installers, to teachers, to artists, to engineers, and clergy.

Admittedly, the way in which the state collects employment data makes it difficult to identify information workers. Under the state's present categories, for example, it is difficult to separate manufacturing workers in information-oriented firms from manufacturing workers in industry as a whole. New classifications will have to be drawn up before any detailed analysis of the 'information sector' can be conducted.

Given the presence of a large percentage of information workers, state employment projections do not predict increased information-related employment in the short term.[16] This may indicate that there is some sort of natural 'ceiling' on the demand for information workers, or it may mean that the information sector is suffering from the same economic problems as the rest of the economy. For now, we prefer the former interpretation: tools like the computer are likely to reduce the labour-intensiveness of information work, limiting the number of people required for such work.[17]

A pattern related to the labour-intensiveness of information work is also worth noting. There is evidence that the production and distribution of information within firms are being subdivided into smaller components

Table 4. Percentages of degrees conferred and projected, total US, by discipline and degree.

	BA			MA/MS			PhD		
	1964–65	1975–76	1986–87	1964–65	1975–76	1986–87	1964–65	1975–76	1986–87
Social sciences	19.8	23.1	22.8	16.0	16.0	13.8	16.9	21.5	22.9
Humanities	16.0	15.1	13.8	12.1	9.6	9.2	11.2	12.4	11.8
Natural sciences & misc	64.2	61.8	63.4	71.9	74.4	77.0	71.9	66.1	65.3
Total	100.0	99.0	98.0	100.0	99.9	99.0	100.0	100.0	100.0

Source: Yearbook of Higher Education, 1981–82, 13 ed, Marquis Academic Media, Chicago, 1982.
Note: not all columns total 100% due to rounding.

similar to the way in which industrial tasks are subdivided on assembly lines.[18] Increased productivity per worker has become an important goal in information-oriented firms, and they have chosen the path of their industrial forbears – division of labour.

The emphasis on productivity in information work splits the information workforce in two. On one side are the highly educated, highly paid creative professionals allowed to work according to their personal lifestyle. On the other side are those who merely carry out repetitive, fragmented tasks, under rigid supervision and control. Unlike traditional paths in other industries, where workers might advance from the shopfloor into management, the two information groups are almost completely separate – bimodal. There are few chances to move up from information handling and assembly to creative professional positions.

Silicon Valley demonstrates the implications of bimodal employment demand on the population. The creative, well-paid jobs are filled almost exclusively by white males. Lesser paid assembly work and routine information tasks are performed by women, usually Asians and Latinas.[19]

To summarize then, information work has become an undeniable part of California's employment picture. Today, most people make their living doing this kind of work, and the firms they work for are among the largest in the state. Their demands are for highly educated information workers on one hand, and for 'assembly line' type workers on the other hand. In the mean time, California's economy has shifted toward information production and distribution, and the changing nature of work is at its heart. Work frames the material context of people's lives, so information work is likely to have social repercussions beyond the workplace.

Preliminary interpretations

The interaction of population, education, and information work is evident. Moreover, the economic output of California is actually changing. California has been an agricultural and industrial giant, and is now an information giant as well. Just as agriculture and industry created demands for particular kinds of work, so have information firms created specialized labour demands. They require staffs of information-producing professionals, supported by information-distribution infrastructures. Each job requires a corresponding level of education, ranging from advanced graduate work for scientists, to more elementary language skills for transcribers.

The burden of providing these skills rests on the state's educational system, which has been successful in preparing white males for professional roles, but less successful in preparing minority students. The system, at the public school level, finds itself unprepared to train a rising tide of ethnic students. At the university level, the depletion of academic talent jeopardizes the training opportunities for all Californians.

As the numbers of Latinos, Blacks, and Asians grow, their presence will alter California's culture and economy. Minority workers will find that most of the job opportunities require information skills, but they are likely to be the least prepared for such work. This training shortfall could be disastrous for a state economy dominated by information-oriented industries, and a political system predicated on equality of opportunity for all.

[14]Information workers are defined as performing a set of behavioural activities, and are subdivided into five groups: information producers, information recyclers, information maintainers, information technology producers, and information technology maintainers.

[15]*Ibid.*

[16]*Projections of Employment by Industry and Occupation, 1980–85 (California)*, report prepared by the State of California Employment Development Department, State of California, Sacramento, CA, 1979.

[17]Stanley Aronowitz, *Los Angeles Times*, 3 October 1982, 'Opinion' section, p 1.

[18]Barbara G.F. Cohen, Michael J. Smith and Lambert W. Stammerjohn, 'Psychosocial factors contributing to job stress of clerical VDT operators', presentation to the Office Automation Conference, American Federation of Information Processing Societies, San Francisco, CA, 5–7 April 1982.

[19]Howard, *op cit*, Ref 13.

Thinking about the future

We have identified patterns of interaction among population, education, and work, but there remains the problem of interpreting the patterns. Social changes translate themselves into new demands and into new questions, which can provide the structure for a systematic analysis of subsequent change. Thus, further analysis of California as an emerging information-oriented society will have to address the following questions:

- Can California produce a highly skilled information workforce? In particular, will ethnic minorities, who are comprising an ever larger part of the state's school-age population, be taught the kinds of skills, training, and education that an information-oriented economy needs?
- Can creativity and innovative thinking be developed as a resource? Can the state, for example, take an active role in the search for affordable housing, so necessary to attract creative professionals?
- How will the university be defined in an information-oriented society? Whether as the last stage in an educational pipeline, or as an incubator for innovative thinking, a healthy university system is an essential ingredient for a healthy economy. What role will the state, as chief funding agent, choose for its academic institutions?
- What is the meaning of the democratic process in an information-oriented society? A society that equates information with power must include information as an essential component of the democratic process, and do everything possible to ensure equality of information – and information skills – among its citizens. Is there more to California's responsibility than simply providing industry with a well-trained workforce?
- Is there a new information-oriented society emerging in California? Clearly, there is an information-orientation to its industry and workforce. Yet manufacturing industries and agriculture remain as critical contributors to the state's economy. Moreover, many of the work patterns crystallizing within information industries are direct outgrowths of industrially organized work. Does California's information-orientation, therefore, represent a fundamental shift in society's structures, or an evolution of those wrought by the industrial revolution?

Finally, it is important to realize that social change on this scale should remind us of the 'roads not taken'. Policy makers who look to California as an example of the social benefits brought about by a shift to information work, should also recognize the social price that is being paid on the way.