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THE INFORMATION SOCIETY: its human dimension

by

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THE INFORMATION SOCIETY: ITS HUMAN DIMENSION

Over the past few years, we have seen the increasingly widespread distribution of many new products and services associated with new information technologies (NITs). It is good to bear in mind that computers first entered our daily lives in the workplace. NITs have been broadly introduced to compensate for low productivity in the service sector and rising labour costs in offices (Deschênes, L., 1987).

In addition to word processing as a common office tool, we are seeing more and more complementary technologies such as electronic information transmission, electronic agenda, electronic mail, videoconferencing, etc. With the advent of the microcomputer, which encourages user versatility, we see a trend to widespread use of communication systems and networks. We are experiencing a major social change, the most significant impact of which is initially being felt in the areas of employment and the transformation of work. But the changes brought about by massive adoption of NITs in the workplace necessitate considerable adaptation by workers, organizations and society as a whole.

Recent decades have also witnessed the widespread introduction of a whole range of communication technologies into the home: cable television, videocassettes, audio cassettes, video games, compact disc players, new telephones, personal computers, and so on (Deschênes, L., 1989). Services for the general public should also grow significantly with the introduction of videotex (in Canada, Alex (Bell Canada) and its various competitors).

Communication and computers have thus become strategic resources and the factors advancing post-industrial society to a new stage: the information age (Deschênes, L., 1989). We will attempt here to determine what impact the process of technology diffusion has on everyday life, with emphasis on the context of computerization and the changes it brings in the workplace.

1 - NIT diffusion in the workplace

1.1 - Characteristics of computer users

A national study* on the attitudes and behaviour of the Canadian population with respect to computers (CROP, 1987) showed that about three out of ten Canadians used computers in one or another of their areas of activity (at work or in the home) in 1987. Use was almost twice as high in the workplace (17%) as in the home (10%), while 6% stated they used computers elsewhere. We imagine these would be mainly students who have occasion to interact with a computer in their general studies or in more specialized training (Deschênes, L., 1988).

Looking at the characteristics of individual computer users, we see that they are generally young (47% in the 15-34 age group and 35% among those 35-44), well educated (14 years of schooling or more: 49%) and from high-income groups ($35,000 or over: 43%). Use also depends on occupation (managers and professionals: 61%).

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* Carried out by the CROP survey firm on a Canada-wide sample of 2,072 people aged 18 and over.

Despite major fluctuations due to age, income, education and occupation, the degree of use is almost identical among men and women. It is also interesting to note that the computer was adopted at a similar rate for both sexes, with 41% of men and 37% of women stating they had been using a computer for over three years. Although women use their microcomputer less in the home and are less fascinated by it, they are more anxious about the use of the machine, but they claim to have adapted more easily than men to their computer (very easily: 31% compared to 23%).

Another important characteristic has to do with use in the various regions of Canada, which varies considerably from east to west (Atlantic Provinces: 18%, Québec: 24%, Ontario: 31% and West: 35%). Westerners (47%) and Ontarians (38%) claim to have been using their computer longer (more than three years of computer use) than Quebecers (30%) and Easterners (31%). A sizeable variance also occurred between language groups (Anglophones: 42% and Francophones: 28%), due no doubt to the fact that many software were not available in French.

This survey also showed that the methods used by Canadians aged 15 and over to learn the basics of operating hardware and software were mainly courses and other training. Almost half of users (47%) learned to use a computer through courses or other training, while 25% learned by themselves, 18% from fellow workers and 7% from friends.

Courses and other training were used by more women (51%) than men (44%), and in Ontario (52%). Self-training was used by more men than women (30% compared to 19% of women). Overall, 62% of users considered courses and other training the best way to learn, while 18% mentioned fellow workers and only 10% self-instruction.

If we look at use by a specific sub-group, the labour force, we find over two out of ten people (21%) using a computer in Canada: 22% of men and 19% of women. As noted previously, we see a breakdown by language, with 23% of Anglophones and 17% of Francophones using computers in their work. Here again, use increases with income ($35,000 and over: 32%) and level of education (14 years and over: 38%), but in particular with occupation (executives and professionals: 45%). As noted previously, the proportion of users also varies from east to west (Atlantic: 16%, Quebec: 20%, Ontario: 21% and the West: 23%).

Among the most common applications of the computer at work, we find that data processing as the main use is more prevalent among men than women (27% compared to 18%), and most common among technicians (35%). Word processing is more common among women than men (24% compared to 16%) and among executives and professionals (19%). Conversely, only 8% of Canadians used electronic messaging and 4% electronic agendas at the time of the survey.

1.2 - User satisfaction

On the whole, user satisfaction is high and adapting to computers seems to have been easy for the vast majority of them. For example, 76% of those using computers in one form or another (microcomputer, word processor, terminal) consider their equipment well suited to their work. This attitude is more pronounced as we go up the income ladder ($35,000 and over: 90%). Another indication of satisfaction is adapting to the machine, which does not seem to have been a problem for half of users, who claim to have adapted "fairly easily" to their equipment (47%) and over a quarter who adapted "very easily" (27%).

This high satisfaction is expressed despite the fact that, in general over four out of ten users (43%) stated that they had not been consulted regarding the purchase of software or any other computer equipment related to their work: 13% claimed they "always" participated in such decisions, while 9% did so "often" and 15% "occasionally". The degree of participation (always and often) is higher among men than among women (25% compared to 19%) and increases with income ($35,000 and over: 27%), education (14 years and over: 31%) and occupation (35% of executives and professionals and 37% of technicians). Anglophones claimed to be consulted more often than Francophones (24% versus 17%).

1.3 - Attitudes in the working population

Opinions expressed about computerization by the labour force generally show an open attitude which leaves little room for rejection or apprehension. For example, four out of ten people active in the labour force do not believe that the computer has any effect on interpersonal relations, while 21% believe that using computers improves these relations. We might conclude that concrete experience with computers contributes to reducing apprehensions and lessening expectations of negative consequences of this technology for human relations.

Regarding the impact of the computer on the work atmosphere, it is noted that, in general, the attitude of respondents is much more divided: whereas 32% felt there was none, 28% of those questioned considered this impact "positive" and 20% "negative".

There is greater agreement on the impact of computers on quality of work, with seven out of ten people (71%) thinking that use of a computer improves the quality of work. The frequency of this attitude increases with income (less than $15,000: 57%; $35,00 and over: 78%), level of schooling (14 years and over: 81%) and job category (managers, professionals and technicians: 80%). If we compare the opinions of users with those of non-users, we see that the attitude of users is more favourable: 82% of them think that computers improve the quality of work, compared to only 64% for non-users. In practice, contact with computers seems to provide a perception of their advantages.

1.4 - User opinions among the population as a whole

The same trend also shows up in the population at large, that is, the perceptions of the majority of respondents are very positive; clichés or negative impressions about the impact of computers on work are on the whole fairly rare.

With respect to user attitudes towards computers, it was observed that the majority, or nearly 80%, showed firm confidence in their capabilities. They stated that they felt little or no anxiety about their computer (77%) and have little or no fear of causing it to break down (80%) or of appearing ridiculous when seeking information about the equipment (88%).

Far from being nervous, 80% of computer users like exploring new tasks and applications. In addition, the vast majority (86%) say they are interested in other applications than video games. Overall, 75% of users said they were proud of having mastered this tool, which 80% do not or hardly consider an impersonal instrument.

When we compare users in the home with those using computers in their work, the latter appear particularly at ease with computers, and this is no doubt a direct result of greater familiarity and more advanced training.

1.5 - Use and impact on work

The reactions of Canadians as a whole regarding the introduction of computers into the workplace seem very favourable. For example, seven out of ten people agree with the statement that the introduction of computers or word processors in the workplace makes work more interesting (33% indicate they "agree completely" with this statement). This positive attitude tends to diminish with age (15-24 years: 79%, and 60 and over: 54%) and seems to be more common in higher income and education categories.

The majority of those questioned (87%) felt that introducing computers made work easier. This opinion becomes less common with age (15-24 years: 92%, and 60 years and over: 76%), but is more common among managers and professionals (94%). The majority of respondents (87%) also believe that introducing computers into the workplace will cause an improvement in productivity, and this opinion gains ground as schooling increases but loses ground among older people (93% of those 15-24 compared to 77% of those 60 and over).

In another area, even though almost half the population (49%) do not feel that use of a computer increases work-related stress, it was found that over a third of respondents (35%) nevertheless see the computer as an added source of stress. This reaction is less pronounced as income increases (less than $15,000: 42%, and $35,000 and over: 32%) and with job category (workers: 37%, and managers and professionals: 30%). It is also less common among Francophones (31%) than among Anglophones

(37%). Surprisingly, little differences was noted in the proportions of users and non-users who felt that the computer brought some additional stress to their work: 30% of the former compared to 38% of the latter. However, many more users than non-users (67% versus 42%) deny that computers cause stress, while many users stated they were undecided on this question.

Certain results allow us to compare differences between users and non-users and to validate the correlation between concrete experience of computers and the adoption of personal attitudes regarding this technology.

Eight out of ten of those questioned consider that introducing computers into the workplace will be a prerequisite for success in the future. There is little variance between sub-groups, except for Francophones (73%) who are less in agreement with this statement than Anglophones (83%), and users (all categories), who are almost unanimous (90%) in agreeing with the statement that the computer is a prerequisite for success, as opposed to non-users, 78% of whom agree with this idea. Lastly, it came as no surprise that the majority of Canadians (79%) disagree with the statement that computers make little change in work, particularly among the 15-24 age group. There is little difference of opinion among users and non-users, who both express opposition to the idea that the computer has no effect on work (87% versus 76%).

Based on this survey, and notwithstanding the fairly minimal differences between the two groups, it appears that among both users and non-users negative attitudes about computers in the workplace are, in the final analysis, fairly rare. The process of computerizing the work environment of Canadians thus seems to be an accepted fact, the consequences of which are felt to be positive and which gives rise to no major reservations.

Most Canadians thus have the impression that computers are a prerequisite for job success and seem fully aware that this tool is bringing considerable changes to work today. These attitudes are more pronounced among users who have had an opportunity to familiarize themselves with computer technology.

2 - Computerization context

2.1 - Impact on employment

Although the degree of satisfaction associated with the diffusion of NITs is high, it is nevertheless important to point out a certain number of concerns that were remarked by analysts. First is the fact that analysis of the impact of NITs on employment raised a major debate with two opposing hypotheses. On the one hand, it was postulated that unemployment would increase unemployment and labour would be displaced in certain job categories. Creation of new jobs might then not offset job losses due to technological change (Deschênes, L., 1987). It is foreseen that the service sector will be most affected by the decrease in jobs, since it is in this sector that we find the highest concentration of information-related jobs, i.e. those likely to be replaced by NITs. In this context, we might wonder about the ability of the service sector to absorb workers affected by technological change related to the diffusion of NITs.

On the other hand, based on the experience of past industrial revolutions, some believe that unemployment will effectively increase in the short term, but that improved productivity and competitiveness will lead to job creation in the long term. We will thus be looking at a significant displacement of jobs, and thus a major change in the occupational structure. In general, there is agreement that, while technology may cause many jobs to disappear, it will change a great many others and will create new ones, thus significantly affecting the nature of tasks and the content of work.

At the present time, we still do not know what the net result of these job creations and losses will be. According to a study carried out in Quebec (Québec, Ministère de l'Enseignement supérieur et de la Science, 1986), there are for the moment no overall statistics or any overall forecasts as to the number of jobs threatened by the use of new technologies for the Quebec labour force as a whole. The studies available have looked mainly at variations in employment for specific sectors of activity or job categories (Economic Council of Canada, 1987; Julien, P.-A., 1987). Internationally, it has been estimated that technology will have relatively little effect on overall employment levels compared to effects related to fluctuations in macroeconomic growth (OECD, R. Brainard and K. Fullgrabe, 1986). From this standpoint, we might ask ourselves whether the reduction in jobs associated with technological change will be offset by the creation of new jobs, and thus whether the anticipated increase in productivity will cause a decrease in employment or whether industrial growth will compensate by creating new jobs (Deschênes, L., 1987).

Along with economic factors (international competition, economic situation, etc.), organizational variables also influence the impact of NITs. Examples of these would be sector of activity, organization size, level of technology diffusion, stage of computerization, job category, unionization and sexist division of labour (Dumas, M.-P., M.-P. Maurice and L. Deschênes, 1989).

While the need to be more competitive motivates organizations to increase productivity and reduce hiring, we are also seeing an increase in part-time work (Dumas, M.-C. and others, 1989; McGraw, J. and H. Cossey, 1987). Attrition and part-time work reducing office personnel is a trend in management practices, particularly in the initial stage of computerization. There is generally a relation between computerization, job cuts and the increase in part-time work (Cohen, M. and M. White, 1986). But if up until now we have been able to take advantage of the demographic situation (aging of the population) to eliminate jobs through erosion, it appears that this source has now dried up and that, from now on, it is real jobs that should disappear (McCarthy, S., 1987).

The effects on employment differ significantly when we move from one stage of computerization to another: the number and type of jobs affected vary considerably (Dumas, M.-C. and others, 1989; Fane, G., C. Mickelwright, H. Traver, J. Yates and I. Hansen, 1989). Many authors agree that, as we move to the more advanced stages of computerization, jobs become increasingly integrated, which leads to a reduction in personnel (British Columbia Federation of Labour, 1987), and employment growth in this perspective would be unlikely (Fane, G. and others, 1989; Hull, D., J. Barton Cunningham, J. Sambrooke and J. A. Lischeron, 1987; Mosco, V. and E. Zureik, 1987). Among the main problems associated with technological change, we thus find stress related to the fear of losing one's job (Brown, D., 1989).

2.2 - Impact on work

In addition to revolutionizing the employment market, implementation of NITs has qualitative effects on work. It causes considerable changes in organizational structures, as well as to work content and the conditions under which it is performed (Benoît, C. A. Cossette and P. Cardillo, 1984; Deschênes, L., 1987; Morissette, R. and A. Desjardins, 1986). Once again, points of view differ: on one side, there is a fear that the qualifications required to perform work will be scaled down, and on the other, it is predicted that the overall qualifications of the labour force will improve.

Those who postulate the deskilling of work base their assumption on the fact that many operational tasks are now being taken over by computers with a view to producing more with a constant work force. They associate standardization of work using the manufacturing plant model with the creation of new routine jobs, centralization of activities and increased control of work (Dumas, M.-C. and others, 1989). Here we find workers being forced to change location and perform less interesting tasks that call for less personal judgment. This situation is associated with the ability to effect increasing fragmentation and deskilling of jobs and to regulate employee productivity (Cohen, M. and M. White, 1986), as in the case of data entry operators. A study carried out on the insurance industry showed that a high degree of division of labour is associated with a highly centralized, hierarchical, non-participatory management strategy that reflects the Taylorist view of work organization (Billette, A., M. Cantin and E. Labillois, 1986).

Others consider that the massive introduction of microcomputers in offices should make it possible to improve working conditions, for example those of secretaries working in individual work stations (David-McNeil, J. and S. Dahan, 1988; Dumas, M.-C. and others, 1989). This would give rise to a decentralization of activities and an increase in the qualifications necessary to perform the same work (Billette, A. and others, 1986). Most secretaries associate computerization of their work with an increase in their qualifications (Mosco, V. and E. Zureik, 1987). They consider their work more versatile, more enriched, and involving greater complexity, diversity and autonomy (Dumas, M.-C. and others, 1989).

Once again, the impact on work varies considerably based on sector of activity, organizational size, etc., but especially on the type of work organization prevalent in organizations. For example, while the initial stage of computerization seems to encourage centralization, the later technological stages can bring a decentralization of operations and less use of work pools (Dumas, M.-C. and others, 1989). This decentralization results from integrating certain activities into various departments of the organization. The same technology can also have very different effects on work, whether it be job restructuring giving more responsibility or a fragmentation of work. These effects are closely related to the type of work organization and the stage of computerization the organization has reached (Dumas, M.-C. and others, 1989).

Some studies, working from this viewpoint, reveal a trend towards polarization of qualifications. There is a widening gap between highly skilled jobs and unskilled jobs, which reduces the potential for occupational mobility for female workers at the bottom of the ladder. With the introduction of information technology, opportunities for promotion within a given category or between various job categories will be increasingly limited (Billette, A. and others, 1986; David-McNeil, J. and M. Garand, 1987; David-McNeil, J. and S. Duhan, 1988).

It is predicted that requirements for semi-skilled and unskilled labour will gradually diminish and that workers whose jobs have been eliminated will not be able to move directly into the new jobs being created, thus posing a problem of adapting labour supply and demand. One challenge, for example, is to integrate displaced office workers into the new groups of professional and technical positions (Deschênes, L., 1987).

One of the main concerns of office employees is therefore retraining (McGraw, J. and H. Cossey, 1987). It has been observed that female office workers (data entry clerks and secretaries) spend much less time on training than their more specialized colleagues (Mosco, V. and E. Zureik, 1987). There are indications of dissatisfaction regarding opportunities for training and development just when it is becoming apparent that we must provide for continuing retraining and skill maintenance (McGraw, J. and H. Cossey, 1987). Lack of training and inadequate training may contribute to lowering the morale and satisfaction of individuals, and this in turn affects their productivity.

Another dissatisfaction variable has to do with the increase in required skills and level of schooling (Bird, P. and J. Lee, 1987), while salaries are stagnating (David-McNeil, J. and M. Garand, 1987; David-McNeil, J. and S. Dahan, 1988) and opportunities for mobility remain low (Cohen, M., M. White, M. Benston and E. Decker, 1987), at least during the initial phase of computerization (Dumas, M.-C. and others, 1989). Although the majority of employees see their responsibilities increasing, these are rarely associated with a promotion, reclassification or the possibility of upward mobility (Stevenson, J. H., 1987). While many authors see occupational advancement, both in general and following the introduction of office automation as being non-existent or impossible to obtain (David-McNeil, J. and M. Garand, 1987; David-McNeil, J. and S. Dahan, 1988; Dumas, M.-C. and others, 1989), others see greater potential for advancement (Benoît, C., 1985; Dumas, M.-C. and others, 1989).

These different situations show the need for human ressources management strategies to offer concrete, tangible opportunities for advancement, for example by providing better access to training. This emphasis on training and retraining of human resources should lead to a broadening of employment prospects and eventually to a reorientation of career objectives.

Moreover, even though employees generally have a positive attitude towards technological innovations (Deschênes, L., 1988; Larson, P. E. and A. Dowson, 1987), it should be emphasized that management methods used to introduce these technologies often play a major role in employee

acceptance of new technologies (Saunders, W., 1987; British Columbia Federation of Labour, 1987). Administrative decisions on the use of this new technology (British Columbia Federation of Labour, 1987) often bring with them a decrease in occupational competence (Billette, A. and others, 1986), accentuating the division of labour. A generally positive employee attitude regarding these new computer systems would, in such a context, often become negative over time (Freedman, J. L. and N. W. Park, 1987).

It also appears that employees rarely participate in the decision-making process regarding introduction of new technology or the choice of hardware or software (Deschênes, L., 1988; Stevenson, J. H., 1987). A number of studies suggest that work reorganization and task restructuring must be done in cooperation between the administration and employees if the operation is to be successful (Dumas, M.-C. and others, 1989). For example, we might imagine that in cases where employees are not consulted, they are fairly unenthusiastic about the technology, and the anticipated results fail to materialize (Davidson, J. E., 1986).

Conclusions

Technological change has many repercussions for employment, work methods and organizational structures.

As regards employment, while job security is a major concern for workers, they believe that they will be increasingly called upon to use the NITs in their work (Deschênes, L., 1988; Davidson, J. E., 1986). We have observed that technological change affects the number and quality of jobs and raises major challenges in terms of training and retraining of the labour force (Dumas, M.-C. and others, 1989; Stevenson, J. H., 1987). One important question also has to do with the replacement of full-time jobs by part-time jobs (Goldenberg, M., J. Van Beek and A. Yolniznan, 1987) and suggests that special attention should be paid to staffing policies in the future.

Work methods are also significantly affected by computerization trends, which tend to move from centralized systems towards more autonomous processing using microcomputer networks, free standing software programs and expert systems (Dumas, M.-C. and others, 1989; Billette, A. and others, 1986). The new approach to production will require workers to have a better understanding of the entire processing system related to their jobs (British Columbia Federation of Labour, 1987). Increased productivity and fewer errors are the advantages expected by office workers; these can be associated with greater autonomy, more job diversity and increased skills.

Technological development will also increasingly affect the less structured activities of professionals and managers. Professionals and semi-professionals express the greatest satisfaction and are in general more likely to be consulted when equipment is being installed (Deschênes, L., 1988; Nova Scotia Government Employees' Union, 1986). An ambiguous attitude was also observed among professionals, who state they are more in favour of the introduction of new technologies, while fearing for their level of responsibility, autonomy and skills; they anticipate a shift from creative tasks to operational tasks (Dumas, M.-C. and others, 1989; Fréchet, G., J. Mercier, R. Parent and G. Dussault, 1987).

While workers were generally positive about future change, a number of analysts found that work related to new skills is rarely recognized (Dumas, M.-C. and others, 1989; Zalechow, A. and A. Clement, 1987; McDermott, P., 1987) and job descriptions rarely amended to take into account new responsibilities (Dumas, M.-C. and others, 1989; Zalechow, A. and A. Clement, 1987). They stress the importance of human resources planning to promote career development in a context of technological change.

From the standpoint of organizational management, we believe that the transition associated with technological change may be eased by consultation between management and personnel, by adequate information and preparation for employees and a commitment to staff development (Dumas, M.-C. and others, 1989; O'Toole, C. A. and J. Burns, 1986). In addition to these concerns, there should be a new management style, less directed to individual performance control than towards overall

production control (Billette, A. and others, 1986) and management skill in motivating employee performance (Bird, P. and J. Lee, 1987). We have shown, in fact, that the way in which computer systems are introduced may be a determining factor in employee reactions (Dumas, M.-C. and others, 1989; Freedman, J. L. and N. W. Park, 1987). More worker participation and involvement in decision-making may facilitate acceptance, reduce learning time, increase individual performance and improve morale and satisfaction (Nova Scotia Government Employees' Union, 1986).

The relation between organizational efficiency and employee satisfaction is the organizational challenge of the 1990s. The human aspect of new information systems application should be a priority within organizations as we move into the 21st century.

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