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WOMEN IN EDP DEPARTMENTS

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Abstract

In the first chapter some characteristics of women in EDP (Electronic Data Processing) jobs are looked at. Women's participation in EDP occupations is low, though their participation rates differs from county to country. In all countries less women seem to be employed in EDP occupations at higher job levels. Lack of part-time jobs conflicts the interests of EDP women. In the second chapter the demand side of the labour market for EDP jobs is under study. Few women do have computer qualifications but the shift in labour market demands for EDP staff towards higher educational levels and towards more business-like qualifications might offer prospects for women to enter EDP jobs. In chapter three the discussion focus on theories concerning the low participation of women in EDP jobs. Following labour market mechanisms, the tide supply of EDP professionals should lead to recruitment changes, but Dutch employers have hardly tried to recruit amongst other potential worker groups, for example women. Following the theory of occupational closure it might be assumed that control strategies of occupational groups are less effective when the educational requirements are changing.

In the fourth chapter the question is posed whether women profit from the shift in labour market demands in terms of a better entry to EDP jobs and in terms of better wages. The answer is based on a case study concerning personnel data of an EDP department in an insurance firm, using data from 1981 to 1987, as is explained in chapter five. In chapter six the main descriptive statistics are presented. The male and female employees in the EDP department differ with respect to numbers of employees, average age, average tenure, average salaries and average salary group. Staff mobility is much higher amongst women than

amongst men. In chapter seven it is shown that the educational levels have increased, for the women much more than for the men. The wage gap has indeed diminished, but in contrast to our assumptions, the employment of women has not risen. The conclusions are drawn in chapter eight.

1. WOMEN IN EDP JOBS

The percentage female EDP employees differs from one country to another. In 1989 in The Netherlands the percentages of female system analysts and programmers were three times as low as they are in the US in 1990 (see table 1). The 1979 figures show that the percentage female systems analysts and programmers was as much as four times as low as in the US in 1980. But in both countries these percentages are increasing. Notwithstanding differences between countries with regard to the percentage of women, in all industrialized countries EDP jobs on higher levels seem to be more male dominated than they are on lower levels, as also can be seen in the labour market as a whole.

	US			The Netherlands	
	1970	1980	1990	1979	1989
Systems analysts	15%	23%	32%	5%	10%
Programmers	23%	31%	41%	8%	15%
Computer operators	29%	59%	-	26%	25%
Key entry operators	90%	92%	-	98%	77%

Table 1 Percentage of female EDP employees in the US and The Netherlands.

Source: Gilchrist et al., 1983, Frenkel, 1990, Tijdens, 1991a.

Within the national labour force statistics the classification of EDP jobs is not very detailed and there is no single category for EDP jobs. Most countries use the International Standard Classification of Occupations (ISCO) which is designed by the United Nations. On a two digit level in this ISCO-classification four jobs can be defined as EDP jobs: systems analysts and programmers, categorized as scientific jobs, and computer operators and key entry operators, categorized as service jobs. Managerial and other EDP jobs are not counted as such. More detailed classifications depend very much on private studies, conducted by computer consultants or manufacturers themselves, but these sources lack a uniform definition of the computer profession (see for an overview Commission of the European Communities, 1990).

In 1989 more than 118.000 people, about 1.7% of the total Dutch labour force, were employed in the four EDP jobs. Between 1979 and 1989 the number of

workers in two of the four jobs, the systems analysts and the programmers, increased by about a factor of four, whereas the number of computer operators and key entry operators decreased slightly (Tijdens, 1991a). As table 1 shows, the percentage of female workers in these two growing occupations doubled, whereas the percentage women in the two decreasing occupations did not change at all. Although the percentage of women in EDP jobs grew, it has to be noted that the percentage of women in the total labour force increased from 29% in 1979 to 38% in 1989, so the growing percentage of women in EDP is not as extreme as might otherwise be suggested.

Not only labour force statistics provide some information about women's participation in EDP jobs, national research projects concerning female EDP employees do as well as. Beech (1990) conducted a survey among 750 female members of the British Computer Society (BCS), the occupational association in the UK. De Olde (1990 and her chapter in this book) sent a large questionnaire to female subscribers of a Dutch computer weekly and conducted an in depth study of female EDP specialists in four Dutch firms. Hoffmann (1987) made a historical study of women's involvement in computer design and described the position of female EDP staff in Germany. For the UK and the US, Simons (1981) described the position of women in computing in the 1970s. Some results are discussed below so that our picture of women in EDP jobs becomes richer than a solely statistical summary.

Working hours per week are very high in the field of EDP jobs, for men as well as for women. Following the 1985 Dutch Labour Force Statistics the estimated average hours per week for male systems analysts, programmers, computer operators and key entry operators is 39 in all groups. The estimated average work hours per week for female systems analysts is also 39, whereas the female programmers work 38 hours, the female computer operators 35 and the female key entry operators 32 (Tijdens, 1991b). In her survey De Olde (1990) finds that EDP women on average spend 44 hours per week on their work, i.e. they work 37.5 hours per week, they add 3 hours overtime and they spend an extra 3.5 hours on training in their own time. The lack of part-time jobs conflicts the interests of more than 50% of these women. In the UK the gap between employment options and women's wishes seems to be comparable. Only 50% of the BCS women work at companies that provide part-time jobs and flexible working hours (Beech 1990). In Germany the working week is also very long: about 75% of the EDP staff (men and women) work 40 hours or more and 17% work even 50 hours or more, leading the author to conclude that these jobs give opportunities to ambitious young men only (Trautwein-Kalms, 1989).

In the labour market, women earn less than men, even if they have the same age, years of service, education, etc. The field of EDP occupations does not deviate from other occupations in this respect. The few available statistics show

that in every area of the computer industry male employees earn more than their female colleagues (EC, 1990). De Olde (1990) found that the women in her survey earned less than the occupational group as a whole.

No uniform conclusions can be drawn upon wage differentials between EDP women. Whereas the British survey found that non-technically qualified women do better than their colleagues with a science qualification, in the Dutch survey it appears that women with a technical background at university level earn more than their female counterparts from other university disciplines (Beech, 1990, De Olde, 1990). In the UK survey, the effect of a career break due to children can be seen very clearly: these women earn much less than women who did not have a career break. In the Dutch survey hardly any EDP women with children were found. In the UK women do not encounter the 'glass ceiling', because further career development seems to be possible. In the Dutch survey De Olde draws about the same conclusion: women can find career opportunities in EDP jobs and they are rather ambitious about it.

2. THE DEMAND FOR EDP PROFESSIONALS

Due to changes in information technology within a few decades a broad range of job titles has arisen, many jobs were upgraded and the occupational field became diversified. In the 1960s, only computer operators and card punch operators could be distinguished, as Game and Pringle (1983) described. The introduction of the IBM 360 series gave rise to a division of labour between programmers and computer operators. Then, the information technology not only required knowledge about programming, but also about work flows. So, still according to Game and Pringle, the systems analysts separated from the programmers job.

In the 1980s, a broad range of EDP job titles has come into being. New jobs were introduced on departmental levels, due to end-user computing. These jobs were strongly integrated into the existing organization. End-user computing also influenced the EDP departments and many organisations established information centres, providing support to users and establishing intermediary jobs (Bergeron et al., 1990). New managerial jobs came into being because EDP managers tend to be part of higher managerial levels in the firm than they were before, reflecting the increased importance of information technology for the firm's business. The spread of information technology was rapid and irrevocable throughout the firms. Changing views favouring business orientation instead of technical orientation influenced EDP departments as well. Whereas in the 1970s designing and programming used to be done inside the

firm in EDP departments, in the 1980s this had partly been contracted out, as can be seen from the growth of software houses as well as from the availability of packages that could be bought off the shelf. These developments increasingly matched the tasks of the systems analysts and the users.

The changing concepts of centralized information systems and decision structures within firms and the changing role of EDP departments are reflected by the qualification demands for EDP jobs. EDP jobs require more business-oriented qualifications with additional knowledge of information systems than ever before, whereas qualifications in the field of electronics or programming used to be the key qualifications. Kahn and Kusalis (1990) for example found that US information systems managers at a certain job level had a broad range of education from business, computer science and engineering fields and a quarter of them did not even have a degree in computer-related fields. At the same time and despite the broad range of educational opportunities, an upgrading of professional skills can be seen in the US (Cheney et al., 1990) and in The Netherlands (Central Bureau of Statistics, 1989). In Europe an increase of university courses leading to EDP jobs is forecasted, whereas the number of students enrolled in higher education courses is expected to decrease (EC, 1990). In The Netherlands this change in educational qualifications for EDP jobs can be seen as well (Biemans and Tijdens, 1989). In the 1980s the demand for entry-qualifications in EDP-jobs as well as the supply of EDP courses changed profoundly. In the 1970s, firms used to recruit young people with higher general secondary education for EDP jobs, either from the internal or the external labour markets. These people were trained in computing by courses for adults, called AMBI. This was an approved set of evening education courses, resulting from a lack of day-time education. Women's attendance of the AMBI evening courses was very low, because entrance was limited to people already having an EDP job. Employers used to pay for the courses. The shift in the traditional qualification demands came in the early 1980s, as full-time education on informatics was set up in several disciplines at secondary, tertiary and university level. At the same time many courses in informatics for unemployed adults were started, due to the employment policy of the government. Within a short period, many highly qualified people entered the labour market. Due to this supply and to the changing character of information technology, the entry-qualifications for nearly all sorts of EDP jobs changed from general secondary level qualifications with AMBI certificates into full-time secondary or university level business-oriented qualifications, as shown by a large survey of the Central Bureau of Statistics concerning the change of firms' preferences between 1982 and 1987 (Netherlands Central Bureau of Statistics, 1989).

Women's participation in AMBI courses used to be very low at all levels. In the 1980s, women's participation rate did not go beyond 10% in evening classes for

basic AMBI certificates and not beyond 5% in evening classes for advanced AMBI certificates. For many years, women's participation rate in Higher Vocational Education and in university courses did not exceed 10% for subjects in technical informatics and electrical engineering and did not exceed 20% in information systems design. In the second half of the 1980s, the percentage of women in EDP training groups for the unemployed fluctuated between 25 and 30%. The percentage of women in business administration is since 1987 over 20% and this is still increasing. The shift of educational qualifications gives better prospects for women, because their participation rates are higher in the new demanded qualifications than they were in the old qualification structure. The increasing participation rate of women for systems analysts and programmers might be caused by the shift towards training requirements which are more favourable for women, although this is not clear from the statistics.

3. MORE PROSPECTS FOR WOMEN IN INFORMATION TECHNOLOGY?

The demand and supply in the labour market of EDP jobs has been very much in favour of the supply side for a very long time. In Europe unemployment in these jobs is still at a very low level, although, the higher unemployment rates seem to be at the lower job levels. Demand is very clearly orientated towards university education, whereas demand for programmers seems to be decreasing and the demand for computer operators is static (EC, 1990). In The Netherlands, the highest scarcity rates are for systems analysts, although their scarcity rate went down from nearly 14% in 1986 to 7 % in 1989, according to the yearly salary survey of the Dutch research institute Berenschot Informatica. Following labour market mechanisms, it has to be assumed that this scarcity should have led to changes in recruitment strategy. But the scarcity did not lead to lower educational requirements nor to recruitment among other potential worker groups, for example by offering part-time jobs in order to attract female workers as employers have done in other occupational fields. One exception is known. A few years ago the Dutch Postal and Telecommunications Company (PTT) broke with this assumption, because they found it so hard to recruit workers for these jobs. The PTT explicitly recruited amongst women, not only by offering part-time labour and child care facilities, but also by changing the educational requirements slightly (Everts and Goossens, 1987). Less mathematical background and more social capacities were demanded. An unexpectedly overwhelming number of applications, more than 80% of them from women, was the result. Unfortunately, this recruitment policy has not been

followed by PTT itself, nor by other firms. On the contrary, scarcity has led to higher wages, including large fringe benefits.

So other theoretical theories have to be looked at to explain the low participation rate of women in the EDP field. The knowledge that occupational groups follow a strategy of demarcation by defining the content of the occupation as well as the routes of access to the occupation derives from occupational sociology. Witz (1986) has shown that these occupational control strategies include patriarchal strategies. As a result of these strategies, related occupations in which women's participation is high were excluded from the occupational group. Within the computer professions this can be seen as well, at least in The Netherlands (Tijdens, 1991b). Computer professions on lower job levels, like user support, key entry, selling etc. are excluded from the key professions, as they are defined by the occupational association. On average the excluded occupations have a much higher percentages females than the included occupations have. The occupational control strategies concern mainly the educational requirements. Factors that hinder women from entering EDP courses are the mathematical requirements, the full-time character of courses, the previous training requirements, the age barriers, the lack of nursery facilities and the lack of special recruitment for women (Biemans and Tijdens, 1989). The conclusion can be drawn that the occupational control strategies might be less effective when educational requirements for EDP jobs change as profoundly as they have done in the 1980s.

4. THE RESEARCH QUESTIONS

In the previous chapter it has been assumed that the shift in the skills demanded would be beneficial to women, because business-oriented qualification demands are more likely to be met. The central hypothesis in this article is that more women could enter EDP jobs because of the changing training demands and that the wage differentials could diminish. Unfortunately, the hypothesis can not be answered by the above mentioned statistics on EDP personnel and training because no questions were posed with regard to the issue of whether employers were more likely to recruit female EDP professionals than before, given the changes in educational requirements (Netherlands Central Bureau of Statistics, 1989).

So, other ways have to be looked for. Therefore, personnel data of an EDP department in an Dutch insurance firm was analyzed to get an answer. These data allow us to analyze gender differences in education during a period of vital importance regarding shifts in educational requirements in EDP jobs. In

addition, gender differences in wages, working hours and years of service could be analyzed as well. These data were available from 1981 to 1987 in two year periods and they include sex, date of birth, date of engagement, education, working hours, salary, salary increase and salary group. Of course a case study in only one firm is not a representative sample of the population of EDP departments and certainly not of the population of EDP workers, because they partly work outside EDP departments in firms as has been discussed in chapter 2. But, by lacking representative data, a case study can give insights in the mechanisms that are involved. Beside, no indication was found concerning that the firm studied was not representative.

5. THE EDP DEPARTMENT

The firm under study is a small insurance firm having about 600 employees. The firm has about 30% women employees, as is the case in the insurance industry as a whole. Based on the volume of business the firm is not one of the ten largest Dutch insurance companies. Three large production departments, each having about 100 employees, can be distinguished, as well as three smaller production departments, each having about 45 employees. The remaining employees work at 7 staff departments, that have on average about 20 employees. The EDP department is the largest staff department, employing about 50 workers. The EDP department includes an IS department and a computer centre.

The firm started automation in the early 1970s. A mainframe computer and a large terminal network were installed and an EDP department was set up. In the late 1970s and the early 1980s several large information systems were installed. Since then one out of every two employees has been given access to a terminal. Data processing and word processing have been integrated. Now, automation in the firm includes large information systems on policy-holders, local area networks and end user computing. Different cultures are found in the EDP department and in the firm, although user groups have been quite common over the years and throughout all levels of the firm.

6. GENDER DIFFERENCES IN THE EDP DEPARTMENT

Before going to the central question, some descriptive statistics concerning the EDP department of the insurance firm are presented in this chapter. The de-

partment is a very male dominated department (see table 2). Relatively less women work in the department than in the firm as a whole. Between 1981 and 1983 the number of employees in the department grew from 51 people to 65 and has remained stable since then. This growth was mainly due to the recruitment of a group of part-time women employees. Between 1981 and 1983 the percentage of women rose from 18% to 26%. After 1983 most of these women left the department and their places were taken over by full-time male employees, that is why the percentage female employees decreased to 18% in 1985 and to 15% in 1987. The data do not give any explanations for this increase and decrease.

Men stay for a much longer period at the department than women do. All together 99 people, 25 women and 74 men, worked in the EDP department during the period 1981 to 1987. 44% of these women worked only for one period at the department, whereas this is the case for only 22% of the men. Only 1 of the 25 women (4%) worked in the department throughout the whole period. This proportion is much higher for the men: 29 out of 74 (39%).

The EDP department	1981	1983	1985	1987	Increase
Number of employees at the department	51	65	68	65	27%
Perc. of the total work force in the firm	9%	10%	11%	11%	
Number of women at the department	9	17	12	10	11%
Perc. of the work force in the EDP dep.	18%	26%	18%	15%	
Women's average hours at the dep.	78%	47%	75%	90%	
Men's average hours at the dep.	98%	100%	100%	100%	

Table 2 Number and percentages of the total and the female work force and their working hours (100% is full-time) at the EDP department.

Employee changes at the EDP department	1981-83	1983-85	1985-87
Perc. of women entering the female work force at the dep.	47%	8%	70%
Perc. of women leaving the female work force at the dep.	0%	35%	75%
Perc. of men entering the male work force at the dep.	19%	27%	22%
Perc. of men leaving the male work force at the dep.	7%	6%	23%

Table 3 Proportion of women and men entering and leaving the female and male work force at the EDP department.

The personnel composition changed profoundly throughout the whole period, but especially between 1985 and 1987 (see table 3). In those years 7 women and 12 men entered the department and 9 women and 13 men left. One-quarter of the male work force and three-quarters of the female work force was 'renewed' in this period. Staff mobility had never been as high as that in the years before.

These different working patterns might give women less opportunities for good career prospects within the department in case of tenure-based careers, but on the other hand it gives opportunities to recruit relatively more women than men that fit the requirements in case of changing educational demands.

Hardly any old workers are employed at the EDP-department (see table 4). To be more specific, the women are very young. Their average age is much less than the men's, although the gender gap is slightly decreasing. Women's average age was 23 years in 1981 and men's average age was 30. In 1987 this was 27 for the women and 33 for the men. Ageing is a factor in this department as it is in the firm and in the Dutch labour force as a whole. Tenure is increasing as well. Whereas the average age increase has been higher for women, the average tenure increase has been higher for men.

Salaries in EDP jobs are high. In 1987 in the EDP department men's wages are one and a half times as high as women's wages, comparing their average monthly gross salary (see table 5). But this gap has been larger in the years

Ages and years of service	1981	1983	1985	1987	Increase
Women's average age	23	23	25	27	17%
Men's average age	30	32	32	33	9%
Women's average years of service	4	3	5	5	20%
Men's average years of service	6	7	8	8	33%

Table 4 Average age and average tenure of men and women in the EDP department.

Salaries	1981	1983	1985	1987	Incr.
Average salary (all)	f 3647	f 3977	f 4409	f 4692	29%
Average female salary	f 2062	f 2156	f 2589	f 3219	56%
Average male salary	f 3987	f 4622	f 4799	f 4965	25%
Average salary group (all)	3.7	3.6	3.9	4.3	16%
Average female salary group	1.4	1.4	2.0	3.5	150%
Average male salary group	4.2	4.4	4.3	4.5	7%

Table 5 Average gross monthly salary and average salary group of men and women in the EDP department.

before. Women's average salary group is also lower than men's, but the gap diminishes fast, especially in 1987. Obviously, the women in the higher wage groups receive smaller increments than the men do. Therefore, the large increase in average wage group only leads to a relatively small increase in average monthly wage.

7. CHANGING EDUCATIONAL LEVELS IN THE EDP DEPARTMENT

The changes in firm's educational preferences towards EDP jobs as they have been described in the Central Bureau of Statistics survey between 1982 and 1987 can also be seen in the EDP department. Counting the educational levels from 1 (lower technical education) to 9 (university), the change from a relatively badly educated department to a relatively well educated department can be seen very clear (see table 6). Within 6 years the average educational level augmented by 15%. The educational level of the female employees increased much more (79%) than the male's (7%). Whereas women's educational levels went up between 1981 and 1983 and between 1985 and 1987, men's upgrading can be seen only from 1985 to 1987. In 1981 the gender gap in education was large, due to badly educated female employees. In 1987 the gap was the opposite way around: the male employees were relatively less educated than the female employees. This explains the fast growth of women's average wage group, as is mentioned in chapter 6. The percentage of employees having less than four years secondary education was halved for the women and went down a quarter for the men. In 1981 none of the employees had an university degree, whereas in 1987 almost 11% had.

Education level	1981	1983	1985	1987	Incr.
Women's average education level	2.6	3.1	3.3	4.9	88%
Men's average education level	4.2	4.2	4.3	4.5	7%
Perc. of women \leq 4 years secondary educ.	100%	82%	83%	50%	
Perc. of men \leq 4 years secondary education	50%	50%	43%	38%	
Perc. of all \leq 4 years secondary education	59%	58%	50%	40%	

Table 6 Education levels of male and female workers in the EDP department.

A closer look at the personnel changes that were due to the increasing education levels shows the underlying movements. During the whole period the education level of the work force that left was lower than the level of the work force that entered the department, both for men and women. The pattern of other changes differs for male and female employees. Within the female work force the biggest shift took place between 1985 and 1987 as a large group of badly educated women left the department and a large group very well educated women entered the department, having an average education as much as 2.2 points higher than the women that left. Half of these entering women were recruited from the external labour market. A smaller shift took place between 1981 and 1983 as a large group of well educated women entered the depart-

ment. Within the male work force the shift towards higher education levels was more due to the entering men and less to the leaving men than was the case for the women. In all periods highly educated men entered the department, whereas only in the period between 1985 and 1987 a large group of relatively badly educated men left the department, their education being 0.7 points lower than the entering men. Three quarters of the men that entered the department came from the external labour market.

The best way to test our hypotheses is to calculate the F/M rates (see table 7). A rate of 1 indicates no gender differences, whereas a rate of 0 indicates the maximum difference. The table shows that the expected diminishing of the gender gap in educational levels has indeed happened. But the expected increase in women's employment did not take place in the department. On the contrary, the 1987 employment rate is worse than in 1981. The expected diminishing of the gender-based wage gap indeed occurred, although the increase in the wage group rate was much higher than the increase in actual wage rate. The rate in ages and tenure hardly changed in the period and the working hours rate increased. Women were more likely to work full-time in 1987 than they did in 1981.

To summarize, our hypothesis that the increased education levels would give more employment prospects for women in EDP departments has not been confirmed. But our hypothesis that the increased education levels would lead to smaller wage differentials has been confirmed in this case study.

The gender gap in the department	1981	1983	1985	1987	Incr.
Rate (F/M) for female and male educ. levels	0.62	0.74	0.77	1.09	76%
Rate (F/M) for female and male employment	0.21	0.35	0.21	0.18	-14%
Rate (F/M) for female and male wages	0.52	0.47	0.54	0.65	25%
Rate (F/M) for female and male wage groups	0.33	0.32	0.47	0.77	133%
Rate (F/M) for female and male ages	0.77	0.72	0.78	0.82	6%
Rate (F/M) for female and male tenures	0.67	0.43	0.63	0.63	-6%
Rate (F/M) for female and male working hours	0.80	0.47	0.75	0.90	13%

Table 7 Rates for male and female workers (F/M) in the EDP department.

8. CONCLUSIONS

Women's participation rate in EDP jobs is low, as it is in other industrialized countries, although the percentages differ between countries. The resemblance between countries seems to be twofold. On the one hand the percentage of women in EDP jobs is increasing. On the other hand the percentage of women is lower for higher job levels.

Due to changes in information technology within a few decades a broad range of job titles has arisen, many jobs were upgraded and the occupational field has become diversified, as can be seen in many countries. In The Netherlands in the 1980s this has resulted in a shift of entry-qualifications demands towards higher educational levels, full-time education and business-oriented qualifications. This shift towards training requirements which are more favourable for women is expected to give better prospects for women. From a theoretical point of view this might be expected as well. Control strategies of occupational groups concern mainly the educational requirements. These strategies might be less effective when the educational requirements are changing profoundly due to external changes.

In this article the question is posed whether this shift has indeed led to a higher percentage of women and to less wage differentials between men and women in EDP departments. The personnel statistics of an insurance company show that between 1981 and 1987 the educational level of the male and female employees has indeed increased, for women much more than for men. In accordance with our hypothesis it has led to a diminishing wage gap, although the decrease in the wage group rate is much larger than it is for the actual wages, because these new recruited highly educated women receive small increments due to low tenure. Contrary to the expectations this has not led to relatively increasing numbers of female EDP staff in the department. This is also not in accordance with the increasing percentage of women in EDP jobs, observed in the labour force statistics. It might be assumed that an increasing percentage of women in EDP jobs will work outside the EDP department in whatever departments of the firm in which information technology is used. This would be consistent with the rapid and irrevocable spread of information technology throughout the firms. EDP jobs are no longer concentrated in EDP departments only, they can be found in all departments.

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