

ISOS: A job evaluation system to implement comparable worth

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Abstract:

A fair pay structure is an essential element of the personnel policy of a firm. If the pay structure is perceived as arbitrary by the members of the staff, it becomes a cause of disturbance of the labor relations. Particularly, a pay structure is unfair if it discriminates against women. Job evaluation is a traditional tool used by companies to assist in the process of determining pay structures that can be also useful to detect and combat wage discrimination, since allow determining whether two jobs are of comparable worth or not. Although there are many kinds of systems, authors agree when defining point factor methods as the most appropriate and fair job evaluation systems. However, even being well defined from a technical point of view, most existing systems give discriminatory results regarding to gender. ISOS, a new job evaluation system which is described in this paper, has been designed, with the aim to define a neutral system with regard to gender, based on present jobs characteristics, existing job evaluation systems and job description questionnaires, international experts' knowledge and a wide body of literature on gender discrimination and its relation with job evaluation. Using ISOS

can contribute to detect, combat and eliminate part of the existing wage discrimination in general and, in particular, against women. ISOS includes all aspects of the work so no characteristics are omitted. The system can be applied in any company and to evaluate any job, and offers flexibility to be adapted to the specific characteristics of an organization. ISOS can also be used to detect and combat wage discrimination. Furthermore, characteristics of present jobs, such as cross-training or flexible working time, are also included so the system can be considered innovative in a very traditional field of industrial engineering.

Keywords: comparable worth, job evaluation, gender pay discrimination.

Título: ISOS: Sistema de valoración de puestos de trabajo para llevar a la práctica el principio de igualdad retributiva

Resumen:

Una estructura salarial justa debe ser un elemento esencial de la política de personal de cualquier empresa. Cuando ésta es percibida como arbitraria, se convierte entonces en una causa de perturbación de las relaciones laborales. En particular, una estructura salarial es injusta si es discriminatoria en relación con el género. La valoración de puestos de trabajo (VPT) es una herramienta tradicional utilizada en el proceso de diseño de las estructuras salariales. Pero estas herramientas pueden ser utilizadas también para detectar y combatir la discriminación salarial, ya que permiten determinar si dos trabajos tienen o no un valor equivalente. Aunque existen muchos tipos de sistemas, existe un amplio consenso al definir los procedimientos de asignación de puntos por factor como lo más adecuados y justos. Sin embargo, aún estando bien definidos desde un punto de vista técnico, la mayoría de los sistemas existentes proporcionan resultados que son discriminatorios en relación con el género. ISOS es un nuevo sistema de VPT que ha sido diseñado con el objetivo de definir un sistema neutro con respecto al género. El sistema se basa en las características de los puestos de trabajo actuales (se han incluido aspectos relacionados con la polivalencia o la distribución flexible del tiempo de trabajo, entre otros), en sistemas de valoración y cuestionarios para la descripción de puestos, en el conocimiento de expertos internacionales y en la amplia literatura existente sobre discriminación de género y su relación con la VPT. ISOS, que incluye todos los aspectos del trabajo sin omitir ninguna característica

relevante, puede ser implementado en cualquier tipo de empresa y para valorar cualquier tipo de trabajo, y ofrece flexibilidad para ser adaptado a las características específicas de cada organización. Utilizar ISOS puede contribuir a detectar, combatir y eliminar parte de la discriminación salarial existente (general y de la mujer).

Palabras clave: igual valor, valoración de puestos de trabajo, discriminación salarial de la mujer.

1. Introduction

A necessary condition to achieve satisfactory labor relations in a company is that its pay structure be fair. When the members of the staff perceive the pay structure as arbitrary, the deterioration of labour relations is unavoidable and ultimately productivity and competitiveness suffer from it (in Figart, 2000 it is pointed out that the introduction of job evaluation systems was supposed to discourage management discretion in determining wages and to lessen employee grievances). Particularly, a pay structure is unfair if it discriminates against women or against any other group. Of course, there are also ethical reasons to be against wage discrimination and one can consider them even more important than strictly economical consequences of an unfair pay structure.

Since the beginning of the past century, or even before (Figart, 2000), and particularly in its second half, job evaluation systems have been widely used as a tool to determine wages in industry and in the Administration. The adoption of job evaluation systems implies a major change in the personnel management. Indeed, "job evaluation deals with jobs impersonally and is not concerned with the race, creed, color, age or sex of the employee unless in some way these personal variations become pertinent to the jobs. Equal pay for equal work is the very essence of job evaluation" (Lytle, 1946, p. 287). Therefore, job evaluation broke away with the traditional way of determining salaries on the basis of the traits of the person that performed the job and opened the possibility of implementing the principle "equal pay for equal job" and, later, "equal pay for work for equal value (or comparable work). Hence, job evaluation has been considered, mainly since the 1980s (Figart, 2000) as a tool to fight against discrimination (i.e., the fact that

people performing two comparable jobs earn different wages) and, particularly, against gender discrimination.

However, job evaluation systems may suffer from two important defects. On the one hand, most of them are largely ad hoc (v.g. conceived for the manual jobs of a specific kind of manufacture) and designed longtime ago, what implies that they are often not able to deal with many new kinds of jobs or with new characteristics and, therefore, its application requires a previous, and laborious, adaptation or redesign. On the other hand, some job evaluation systems were used (Treiman and Hartmann, 1981; Steinberg, 1992; Figart, 2000; Figart, 2001) to rationalize pay inequities.

So, considered as a tool to fight against wage discrimination, job evaluation has a positive side and also a dark one, namely, badly used it can contribute to legitimate discrimination instead of to amend it.

In this paper we introduce ISOS, a job evaluation system which was designed with a two-fold objective. Firstly, to help in detecting and avoiding wage discrimination (the starting point was gender discrimination, but, in fact, ISOS can be used to fight against any other kind of wage discrimination). Secondly, in order to facilitate its use, to be capable, without laborious adaptations, of being applied to any kind of job, including those presenting the newest characteristics of jobs.

The layout of the rest of this paper is as follows. Next section discusses the “equal pay for equal value” principle and its relation with job evaluation; the following one is devoted to the description of the main features of ISOS. Finally the conclusions close the paper.

2. The “Equal pay for equal value” principle and job evaluation processes

Legislation, in many countries, guarantees the “equal pay for equal work” principle, obliging employers to pay the same salary or wage for the same work (article 119 of the Treaty of Rome, 1957; Equal Pay Act, 1963 in the case of the US). The failure to comply with these precepts is easy to detect, but, this notwithstanding, it still occurs. Leaving aside the obvious differences between wages corresponding to equal jobs in different firms or in different establishments of a firm, equal jobs with different wage may coexist even within a establishment, hiding the equality of the jobs by giving them different denominations.

It is more much difficult to detect the non-compliance with the wider principle of "equal pay for equal value (or comparable worth)" (article 141 of the Treaty of Amsterdam, 1997), which we will abbreviate to EPEV, according to which employers are required to offer the same remuneration for work of comparable value (this concept is discussed in the following section). This principle was set by the International Labor Organization (ILO) in 1951 (Equal remuneration Convention, No. 100; Equal Remuneration Recommendation, No. 90) and enshrined in Europe, in 1975, by the "Council Directive 75/117/EEC on the approximation of the laws of the Member States relating to the application of the principle of equal pay for men and women".

The acceptance of the EPEV principle, which encompasses the narrower notion of "equal pay for equal work" is fundamental for fighting wage discrimination against women, but the greatest difficulty in the application of this principle lies in the lack of general agreement regarding precisely what is to be understood by the "value of work" and how it can be quantified.

3. The value of work

The difficulty in defining the value of work and in quantifying the value of a particular job stems from various factors. On the one hand, the production processes of goods and services are collective, and determining the precise contribution of each group member is a complex and contested task. On the other hand, price (salary) cannot be used as a measure of value (if this were so, then by definition discrimination would not exist): the salaries paid at the present time are the result of a complex process in which supply and demand, the negotiating capacity of each party and the prestige attributed to each job and to its characteristics all play a part.

Even if we renounce to define the value of work and address the more modest aim of defining what is understood by jobs of equal value, conceptual and practical difficulties still arise. However, in the case of the US, in general, the courts have considered that two jobs have to be given the same wage for the purposes of the Equal Pay Act when both require equal levels of skill, effort and responsibility and are performed under similar conditions.

This approach lays the foundations for determining whether two jobs have or have not the same value or, more broadly speaking, the relative value of two or more

jobs. A job is evaluated in relation to the requirements of the task performed and its nature (European Commission, 1994).

In some countries the law provides the right to receive a salary (remuneration) which is the same as that paid for a job that is classified as equivalent according to a job evaluation procedure (for example the 1970 equal pay law in the United Kingdom, known as the EQPA, and the 1983 ruling on equal value that amended it). Of course any attempt to implement comparable worth may be quite sensitive to the system used to evaluate job value (Arnault et al., 2001).

Job evaluation processes, despite the criticisms that can be made of them, are the only tool that in a general, practical way allows determining the relative value of jobs within an organization, and, in particular, establishing that two jobs have the same value (of course, two jobs must be considered, too, of equal value if this is declared by an unappealable sentence).

4. Job evaluation

The evaluation of tasks as a technique was associated with "scientific management", advocated primarily by FW Taylor (International Labour Organization, 1986; Figart, 2000).

Job evaluation procedures have mainly been criticized by those who deny the scientific nature of Taylor's "scientific management" (see for example Vegara, 1971).

Of course, job evaluation is not a fully objective (or "scientific") method of determining the value of jobs. Many of its features suffer, in a greater or lesser extent, from subjectivity. In spite of this, however, the use of job evaluation as a way of allocating salaries does significantly reduce the subjectivity, although it cannot eliminate it completely. A job evaluation system places each job on a usually discrete scale. Each value in the scale (or a set of close values) corresponds to a level or category. Through the correspondence of this scale with monetary values (which may or may not be proportional), remuneration (or a part of it) is fixed. However, the method of establishing correspondence between job categories and monetary values depends on the wage policy of the firm concerned, and lies outside the scope of job evaluation procedures (van Sliedregt et al., 2001).

Specific job evaluation procedures are many and varied, as is to be expected in the case of techniques with such a long tradition. Some have been developed by consultants and others by companies themselves or by trade associations in particular sectors. Our intent is not to describe them in detail, but to present a synthesis (for a detailed description, see Armstrong and Baron, 1995). In order to do so, our classification is grounded on qualitative and quantitative procedures.

Qualitative procedures evaluate jobs from a global perspective with the aim of ranking them in order (hierarchical structuring systems), or situating them at one of the levels previously established (classification systems). Thus it is possible to appreciate the importance of each job within the organization, but not the differences in value between them.

Quantitative or analytical procedures evaluate jobs according to different criteria, called factors, previously selected and clearly defined. These can, in turn, be classified as procedures involving the comparison of different factors on the one hand, and the allocation of points to each factor on the other. The use of a quantitative method allows the determination of a numerical value for each job, and thus the quantification of the differences in value between jobs.

There is broad agreement (Armstrong et al., 2005) that the procedures based on allocating points per factor are the most suitable, both in generic terms and also with regard of avoiding wage discrimination, since this kind of systems are those whose results less depend on subjective judgments.

When a point factor system is applied, each job is evaluated using a set of criteria, which are denominated factors, such as knowledge, initiative, intellectual effort, responsibility for materials etc. The factors must be comprehensive, i.e., they must cover all the relevant characteristics of the job. The factors must also be independent, i.e., any two factors have to consider completely different aspects of the job; otherwise, the characteristics taken into account by more than one factor would be given an actual importance greater than the intended or apparent one.

For each factor, an evaluation scale must be defined; the positions in this scale are the grades (sometimes named levels). The number of grades may be the same for all factors or not. However, if it is not, the difference in magnitude acts as an implicit weighting of the factors, thus attributing greater or lesser importance to each one.

It is in any case necessary to define the requirements corresponding to each grade for each factor (for example, if one factor is formal education, one grade may correspond to holding a Bachelor degree and another to a Master one). Using either the job description or practical observation as a basis, a level or grade is allocated for each factor. Finally the points that correspond to the job are calculated by adding, for all factors, the products of the number of the assigned degree by a positive coefficient (weight), previously attributed to the factor.

It is clear that the choice of factors, the definition of levels for each factor, the job description and the weighting of the factors are, at least in part, subjective, and are socially conditioned. However, as we see it, this does not mean that these procedures should be rejected. On the one hand, due to the lack of alternatives; on the other hand, because they define a structured framework for the development of a bargaining about the wage structure within an organization and require an analysis of each job, i.e., of the functions involved and of the conditions under which they are performed.

5. Job evaluation and wage discrimination against women

It is well known that there is a gap, whose amount is different from one country to another, between wages earned by men and women. Sometimes, a part of this gap may be explained by factors such as education, experience or hours worked. Notwithstanding, studies indicate (Hessaramiri and Kleiner, 2001) that not less than a quarter of the gap cannot be explained by legitimate factors and, therefore, corresponds to wage discrimination.

Job evaluation procedures are not only mechanisms for detecting wage discrimination, but also for fighting it. The fact that their objective is to evaluate jobs, and not people, is in itself an important anti-discriminatory characteristic.

However, even if the implementation of evaluation procedures can be considered almost a necessary condition for fighting discrimination, it is not sufficient to eliminate it, since an evaluation procedure may present discriminatory characteristics due either to what is included within it, or to what is omitted (Arvey, 1986; European Commission 1996; Jacobs and Steinberg, 1990; Hastings 1987 and 1991; Smet, 1996; Steinberg, 1992 and 1999; and Van Meensel, 1993). In particular, the procedure itself must be neutral regarding gender. The gender bias may occur when certain factors (for example an aptitude for communication or

emotional effort; see Steinberg, 1999 and Steinberg and Figart, 1999) that should be taken into account as requirements for particular jobs are omitted, or when excessively high values (weights) are allocated to factors in which a gender has an overall advantage over the other (as is the case with physical effort).

However, in general, evaluation is based on observation or on job description, and if this observation or description is biased, discrimination could take place even if the set of factors to be considered and their weighting are correctly defined. It is certain that one of the most significant causes of discrimination is the omission of job characteristics related to skills or abilities that are supposedly innate or "natural" in women (it is interesting to note that equivalent omissions do not usually occur in relation with male-dominated jobs), or because certain difficult working conditions such as those involved in nursing or cleaning work are deemed acceptable to women, whereas on the other hand it is accepted that they would be rejected by men.

From what has been said, it follows that the relationship between job evaluation and wage discrimination against women is more complex than it may at first appear.

The authors have been involved in several research projects regarding job evaluation and wage discrimination (see Instituto de la Mujer, 1999 and 2000; Corominas et al., 2000; Corominas et al., 2001; and the team web which includes all working papers and information in both Spanish and English: <http://www.giopact.upc.edu>), most of them supported by a national Women Institute of the Labor and social Affairs Ministry. The first of them involved the elaboration of a descriptive and critical synthesis of the most widespread evaluation procedures, a discussion of the discriminatory elements that may be implicit in such procedures, a study of the possible quantification of gender differences, criteria for the establishment of neutral procedures, a questionnaire for the detection of discriminatory elements in evaluation procedures and a mathematical model and a computer program for the calculation of the weighting of each factor in such a way that the values of specific jobs are equaled, and the resultant weightings are as close as possible to certain given values. The project also included the translation, some adaptation and a critique of the document "Equity at Work: an approach to gender neutral job evaluation" produced in New Zealand (State Services Commission and Department of Labour, 1991), which was

generally considered to be one of the most successful attempts at defining a reasonably detailed framework for the elaboration of a manual on neutral evaluation. Finally, a great deal of documentation on the subject was compiled during the course of the research. The results of the project are available at the research group website.

The main objective of the second project, whose results are shown in this paper, was to design a job evaluation scheme free, as far as possible, of gender discrimination and to embed it in a computer tool which had to be used by people with different profiles. The knowledge and expertise got in previous projects was the starting point and the authors were given advice from a team of the University of Helsinki and two international experts in job evaluation and gender discrimination.

6. ISOS job evaluation system

As it is aforementioned, job evaluation is a very important tool to detect and fight wage discrimination. However, it requires an important amount of resources: money, time and qualified personnel; furthermore, existing job evaluation systems have been designed to be applied to specific types of activity (Armstrong and Baron, 1995).

Therefore, it had to be designed a job evaluation system that:

- Would include characteristics aimed to guarantee the absence of gender bias
- Would be flexible so it could be applied in any company and to evaluate any job
- Would be used by any of the people who participate in wage discrimination issues: users with different requirements and with different knowledge levels about job evaluation systems and their relation with wage discrimination

Hence, it seemed obligatory that:

- Evaluation had to stem from the answers of a questionnaire (where each question had to have a finite number of possible answers) in the framework of a point factor system
- The system had to be applied by means of a friendly software tool that had to run in most common computers and operative systems. Likewise, it was very convenient that the tool offered equivalent or superior features than the ones offered by software that can be currently found in the market

Next the main characteristics of the system are described. The discussion about the main features of ISOS gives raise to questions that may be taken into account when designing any gender neutral job evaluation system. We do not intend, instead, to depict the software tool, since its details are contingent on the computer environment; it is mentioned only when this helps to understand the characteristics of the system and its implementation.

At the beginning of the project the team had abundant documentation about job evaluation and gender pay discrimination. We had different job evaluation systems such as NEMA, Hay, Willis, handbooks of some companies and the document “Equity at work: an approach to gender neutral job evaluation” (State Services Commission and Department of Labour, 1991). To complete the information that we already had, new job evaluation systems, job description questionnaires and software on job evaluation were searched from specialized books and journals, data bases, Internet and people and consultancies specialized in human resources management and job evaluation: 55 different questionnaires and 20 software tools, with different features and complexity levels, were consulted.

ISOS has, of course, characteristics that are similar to other job evaluation systems, but others are specific and the system as a whole can be considered as innovative in a traditional area belonging to industrial engineering.

The main characteristics of the system are the following:

- Emphasis in the neutrality, guaranteed by means of:
 - The selection and definition of factors and sub-factors. An effort was made to consider characteristics and demands of work typically developed by both women and men; for example, besides the physical and mental effort included in most job evaluation systems,

the emotional effort is also taken into account (of a great importance in female-dominated jobs belonging to health or education sector)

- The writing of the questionnaire. Including alternatives (answers) which include aspects of the work typically done by women; for example, when considering unpleasant working conditions include not only work with dust or oil but also tasks requiring being in contact with bodily fluids (like blood or excretion) or detergent. In those cases in which some jobs are given as an example, both male-dominated and female-dominated jobs are included
- The use, in the writing of both system and software tool texts, of neutral and non-discriminatory vocabulary
- The inclusion of warnings, in the system and in the tool, in those points in which a bad use can give rise to discriminatory results (for example, in the modification of the factor weights)
- Universality regarding to the types of organizations and jobs to be applied to. To assess that universality a large number of factors is required. Hence, to simplify the use of ISOS in a concrete organization or for a specific group of jobs, there is the possibility to create a variant of the system by deleting sub-factors or factors and modifying weights
- Capability of being used by different profiles with different requirements and levels of knowledge about job evaluation. This is got by:
 - Assigning permissions to the users: each user is registered in such way that the access to some options is limited; for example, most users will have access only to the questionnaire, while some can check the answers, get reports, modify the system, etc.
 - Including help, warnings, definitions and other comments accessible to the user. Moreover, links to some webs were included in the tool in order to broaden the information of some issues
- Inclusion, by means of factors or sub-factors, of new evaluation criteria linked to elements of new work organization, such as cross-training or flexible working time

- Flexibility in the weight assignment
- Reduction in the subjectivity inherent in the evaluation, since the result stems from the answers of the questionnaire
- Immediate availability of numerous reports that allow the user to make comparisons (for example, to compare different evaluations of a job or the evaluations of different jobs of the same organization)

The main components of ISOS are described below: (a) factors under which jobs are evaluated, (b) weights assigned to factors and group of factors, (c) grades of the factors, (d) questionnaire for describing jobs, (e) correspondence between the answers of the questionnaire and levels in each factor, (f) equations to compute the value of the job.

a) Factors

The twenty factors included in the ISOS system are set out in Table 1 (the sub-factors in which the factors are divided are not specified).

Group A	Working conditions (it evaluates the surrounding or conditions intrinsic to the duties that cannot be modified).
Factor 1	Environment (it identifies the extent to which working situations are environmentally unpleasant).
Factor 2	Hazards (it evaluates the possibility of accidents or diseases, as well as their gravity).
Factor 3	Nights and weekends (it evaluates the need for unusual working hours: nights, weekends and holidays).
Factor 4	Schedules (it evaluates the need to adapt to the irregularity of the schedules that can be disruptive to the social and family life of the worker).
Factor 5	Traveling (it evaluates the need to travel as well as its nature and its duration).
Group B	Knowledge and skills (it evaluates the knowledge and skills required to carry out the job to the normally expected standard of performance).
Factor 6	Knowledge and understanding (it evaluates the knowledge and the skills to carry out the job, including equipment and machinery, mathematics, reading and understanding, data processing, software, creative or artistic talent, other cultures, formal education, training, period of adaptation, experience and updating the knowledge).
Factor 7	Cross-training (it measures the capacity of accomplishing functions of different nature).
Factor 8	Physical skills (it evaluates the motor skills and at the sensory skills involved in performing the job).
Factor 9	Mental skills (it evaluates the degree of analysis, interpretation, evaluation, reasoning and creativity required by the job).
Factor 10	Communication skills (it is concerned with the skills required by the job to communicate with people, influence them, persuade them, counsel them, motivate them or negotiate with them).
Factor 11	Human relations skills (it evaluates the active, face to face skills for relationships with other people within and outside the organization; it is assumed that all jobs require a minimum of common politeness; a job that requires the ability to motivate, convince or sell is the opposite extreme).

Group C	Effort (it evaluates the extent to which the job is demanding).
Factor 12	Physical demands (it evaluates the nature, intensity, duration and frequency of the physical effort).
Factor 13	Mental demands (it evaluates the degree of concentration as well as the duration and frequency of tasks that require it).
Factor 14	Visual demands (it evaluates the intensity and the frequency of the visual attention required by the job).
Factor 15	Auditory demands (it measures the auditory demands in terms of frequency and duration).
Factor 16	Emotional demands (it measures the conditions that cause anxiety, tension or mental stress. Examples may include deadlines, lack of control over the pace of the work, disruption of lifestyle, isolation, repetitious work or exposure to emotionally disturbing experiences).
Group D	Responsibility (it evaluates the nature and the magnitude of the responsibility, as well as the consequences of committing errors).
Factor 17	Responsibility for information and material resources (it evaluates the responsibility for supplies, equipment, money, budgets and information).
Factor 18	Responsibility for supervision (it evaluates the responsibility for guiding, directing and supervising others; scope of supervision appraises the total number of people within the unit supervised).
Factor 19	Responsibility for well-being (it evaluates the responsibility for the care, treatment and well-being of people).
Factor 20	Responsibility for planning, organization and development (it evaluates how far into the future it is generally necessary to plan, organize and develop the highest level of work activities; it takes account of the predictability of the events).

Table 1. "Description of factors and group of factors". Source: Own

b) Weights

The system of weights reflects the importance that each organization grants to each family of factors, factor and sub-factor. A method to determine the weights that must be assigned to each factor that can be considered totally scientific or objective does not exist; in addition, configurations that can be considered suitable for some organizations can be considered not suitable for others. Each company or organization must adapt the weights to its own specificities regarding activity sector or type of organization and jobs to be evaluated.

One of the most usual procedures to determine the weights assigned to the factors is the consensus in a committee or in a group of experts panel. By means of this procedure, a group of people expert in job evaluation and wage discrimination defined the weight configuration of the standard ISOS system, which is reproduced in Table 2.

When comparing the weights attributed to ISOS evaluation system with the weights of other systems, it can be seen that, in general, the weights assigned in ISOS system to "Working Conditions" and to "Effort" are superior, and that the ones granted to the "Knowledge and skills" and to the "Responsibility" are inferior.

To a great extent, it is because ISOS system, due to its universal character, incorporates a number of factors significantly superior to other systems (which have been developed for a specific company or sector). Thus, the fact of including aspects related to the organization of the working time or to emotional effort increases the weight associated to the groups “Working conditions” and “Effort” and, consequently, the weight granted to the remaining groups diminishes.

Working conditions	11	Knowledge and skills	42	Effort	20	Responsibility	27
F1	20	F6	35	F12	30	F17	25
F2	50	F7	5	F13	40	F18	20
F3	10	F8	14	F14	5	F19	25
F4	10	F9	20	F15	5	F20	30
F5	10	F10	12	F16	20		
		F11	14				

Table 2. “Weights (in %) of the factors and group of factors”. Source: Own

Some factors (for example, physical effort or responsibility for material resources) usually have (or had) greater presence in male-dominated jobs; others (for example emotional effort or responsibility for well-being) are typical of female-dominated jobs. To give a significantly greater weight to the typically male factors than to the typically female ones must be avoided (unless this can be justified in an objective way), because the resulting system could be discriminatory. For that reason, the following indications should be considered when modifying weights:

- The weight given to the factor “physical effort” should not be significantly greater than the weight given to the factor “mental demands” or “emotional demands”
- The weight given to the factor “responsibility for information and material resources” or “responsibility for supervision” should not be significantly greater than the weight given to the factor “responsibility for well-being”

c) Grades of the factors

Generally speaking, each factor can be evaluated using any number of levels. For the sake of clearness, the number of grades is the same for all factors and sub-factors included in the ISOS system. This way, there is no implicit weighting and it is easier for each company to modify the system according to the importance they give to each factor. The number of levels has been set to 5.

d) Questionnaire

The aim of the questionnaire is to have a complete description of each job, to have all descriptions in the same format (essential to fight discrimination) and to allow the system evaluating each factor from the answers.

To evaluate the different factors and sub-factors 68 questions were included to the questionnaire: 51 of them are used to evaluate the job and the 17 remaining are open ended questions added to check the answers (for example, the job holder is asked to put examples of tasks demanding some kind of skill or effort). Of course, if an organization adapts the system by deleting some factors, the correspondent questions are automatically deleted, resulting in a shorter questionnaire.

e) Correspondence between the answers of the questionnaire and levels in each factor

Using the same methodology of the Finnish expert, each factor or sub-factor is evaluated by a maximum of two simple questions (i.e., questions with a finite number of possible answers) or one matrix question (i.e. questions including rows and columns where one or more than one cell can be chosen). To decide the levels we were given the advice of experts in the different knowledge areas involved in the system.

Below there is an illustrating example of the evaluation of the factor “nights and weekends” (Factor 3). There are two simple questions to evaluate it and the value of the level depends on the answer to both questions, as it is shown on Table 3.

Question 1: Do you work at night?

- a) No
- b) Yes and I receive extra pay
- c) Occasionally and I do not receive extra pay
- d) In period rotation and I do not receive extra pay
- e) Always and I do not receive extra pay

Question 2: Do you work on weekends and/or holidays?

- a) No
- b) Yes and I receive extra pay
- c) Occasionally and I do not receive extra pay
- d) In period rotation and I do not receive extra pay
- e) Always and I do not receive extra pay

Level of the factor:

		Q2				
		a	b	c	d	e
Q1	a	1	1	2	3	4
	b	1	1	2	3	4
	c	2	2	3	4	4
	d	3	3	4	4	5
	e	4	4	5	5	5

Table 3. "Levels of Factor 3 (nights and weekends)". Source: Own

f) Computing the value of the job

Once the job is described using the questionnaire and each factor is evaluated from the answers and by means of the tables, one can easily obtain the value of the job by applying the weights to group of factors, factors and sub-factors. The maximum value of a job using ISOS system is 500, and the minimum is 100. Details about computing the value of job are given in the appendix at the end of the paper.

The stages to carry out the process of job evaluation in an organization using ISOS, which are shown in Figure 1, are the following:

- Definition of the structure of the organization and assignment of responsibilities. It consists of introducing the information about the organization: departments, sections, jobs and users
- Definition, if it is judged necessary, of the variant of the system to be used, by deleting sub-factors or modifying weights

- Job description. Each job holder must fill the questionnaire, by answering the questions about the characteristics, functions, responsibilities and requirements of the job
- Revision and validation of job descriptions. The person directly in charge of each job must review the answers given by the occupants of each job and introduce the answer he/she considers correct (this permits to solve discrepancy among the occupants of the same job). Then, someone (the Evaluation Commission for example) must analyze the answers given by the job holders and by the reviewer and confirm or modify each one of the answers
- Evaluation. Once the job description has been validated, the obtained points in each factor and the total points of the job are calculated
- Generation of reports (tables and figures) that allow to analyze the results with a great level of detail

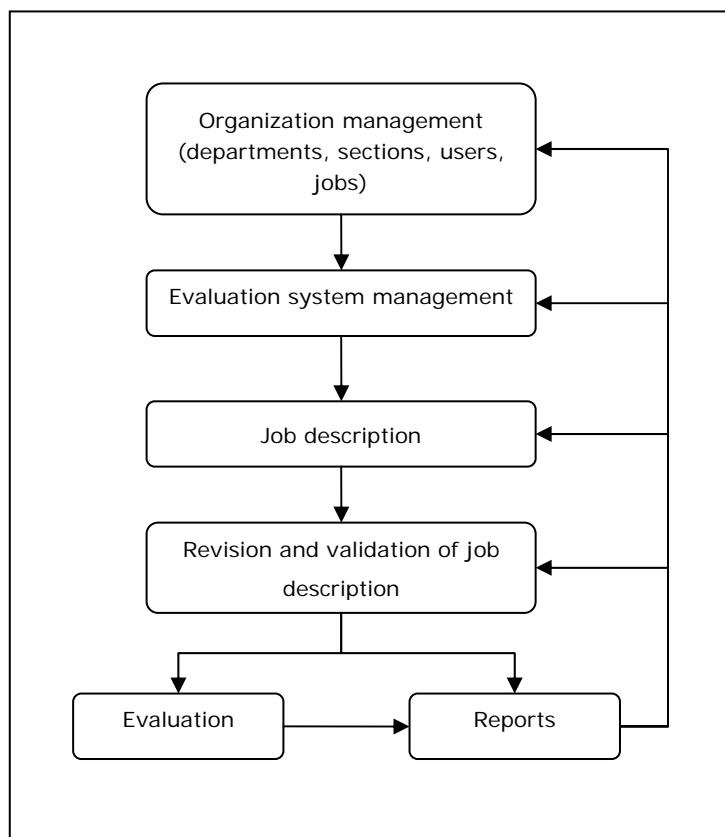


Figure 1. "Stages of job evaluation process using ISOS". Source: Own

7. Conclusions

This paper introduces job evaluation as an instrument to detect and combat wage discrimination. Job evaluation systems are an old tool of industrial engineering and many companies and organizations use or used them; notwithstanding, many job evaluation systems are still discriminatory against women. The main causes of this phenomenon are that some characteristics of male-dominated jobs are overvalued, while the ones typical of female-dominated jobs are undervalued or absent. Hence, to avoid discriminatory results is very important to consider all aspects of work. The description of the job is also very important, because poor descriptions use to lead to less value. Thus, it seems essential to have a questionnaire in which both female and male aspects and tasks are included.

In this paper a new system, called ISOS, is described. ISOS include all aspects of the work so no characteristics are omitted. The system can be applied in any company and to evaluate any job, and offers flexibility to be adapted to specific characteristics of the organization. The system (factors and sub-factors, weights, questionnaire and correspondence between the answers and the value of the job) and the computer tool have been designed with the aim of guaranteeing the neutrality in the job evaluation process. Furthermore, characteristics of present jobs, such as cross-training or flexible working time, are also included so the system can be considered innovative in a very traditional field of industrial engineering.

ISOS has been already used by some companies, whilst the authors have supervised the adaptation of the system to two very different cases: a hospital department and an industrial company.

Appendix

The details about computing the value of job are given below.

We make use of the following notation:

$vsf_k \in [1, 5]$ value of the sub-factor k ($k=1,\dots,46$), which is obtained by using the correspondence between answers and levels. Some factors are considered to have only one sub-factor.

vf_j value of the factor j ($j=1,\dots,20$), obtained by using equation (1)

vg_i	value of the group of factors i ($i=1,\dots,4$), obtained by using equation (2)
V	value of the job, obtained by using equation (3)
$wsf_k \in [0,100]$	weight assigned to the sub-factor k ($k=1,\dots,46$)
$wf_j \in [0, 100]$	weight assigned to the factor j ($j=1,\dots,20$)
$wg_i \in [0, 100]$	weight assigned to the group of factors i ($i=1,\dots,4$)
SF_j	set of sub-factors belonging to factor j ($j=1,\dots,20$)
F_i	set of factors belonging to group of factors i ($i=1,\dots,4$)

The value of the job is obtained by using the following equations (1 to 3):

$$vf_j = \sum_{\forall k \in SF_j} wsf_k \cdot vsf_k \quad (j=1,\dots,20)$$

Equation 1. "Value of factor j". Source: Own

$$vg_i = \sum_{\forall j \in F_i} wf_j \cdot vf_j \quad (i=1,\dots,4)$$

Equation 2. "Value of group of factors i". Source: Own

$$V = 500 \cdot \sum_{i=1}^4 wg_i \cdot vg_i$$

Equation 3. "Value of job". Source: Own

Computing the value in that way permits to analyze the results with a great level of detail.

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