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# THE APPLICATION OF AHP IN ASSESSING QUALITATIVE ASPECTS OF WORK: A CASE STUDY OF A MUNICIPAL COMPANY

***Abstract:****The article presents the use of the ahp in the evaluation of work in a selected municipal enterprise operating in one of the agglomerations in Poland. Based on the case study, the use of AHP was presented in terms of overall evaluation of jobs of municipal company, which enabled todetermine the hierarchy of organizational positions due to the difficulty and arduousness of work. . The research proceedings were suplemented by document analysis, structured interviews, team work methods, and classification technique. The article shows that such an approach ensured, on the one hand, the inclusion of qualitative aspects of tasks performed at individual positions in the assessment of work difficulties, and ensures team coordination of assessments and opinions, promoted in quality management, on the basis of which decisions regarding remuneration are made.*

***Keywords:****job evaluation, analityc hierarchy process, jobs ranking, municipal company*

## 1. Introduction

Rewarding system for employees is perceived as the predominant total quality management dimension that affects employees' performance (Bahjat & Khaled 2022).Rewards system that encourages employees play the major facilitating role in stimulating consumer satisfaction and continuous improvement programs (Koval et al., 2018). Essential in this regard isa proper remuneration system (Basera & Mwenje, 2021; Bullinger & Wolfram, 2002), which is fair, equitable, and consistent for everyone. Fair wage is wage that is reasonable for type of work done. In the reference to organization, fair wage address the relative value of the job (not the job holders) compared to other jobs in order to achieve the internal justice. the generally accepted thesis is that only job evaluation makes it possible to develop a fair remuneration system (Armstrong et al., 2005, Arthur, 2015, Dogan et al., 2014).

Job evaluation is a systematic process of assessing the difficulty and nuisance of work to identify the relative value or size of jobs in an organization in order to establish internal relativity and provide the basis for designing a fair grade and pay structure, grading structure and relativity management (Armstrong et al., 2003). The main aim of job evaluation is to provide an acceptable rationale for determining the pay of existing hierarchies of jobs and for slotting in new ones(Arthur, 2015).

Job evaluation depends on the results of the job analysis that produce both the job description and specification, which allows to counterbalance the difference in job values by differences in wage levels (Balshy & Ismael, 2023).In that respect job evaluation encompass the elements of qualitative and quantitative assession of

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work. Job evaluation, as the method of reducing wage inequities (Kutlu et al., 2013, p. 659) is most common method for determining pay in over 75% of US organisations (Dogan et al., 2014).The job evaluation can be analytical or non-analytical. Analytical one is about evaluating each of profession in organization basing upon a group of criteria, which enables to assess the difficulty and nuisance of work. Non-analytical are: job ranking, paired comparison, job classification (Armstrong et al., 2003, p. 19).

The key issue is to prevent job evaluation's results form subjectivity, therefore it is crucial to implement analytical decision making in job evaluation, in particular analytic hierarchy process (AHP).In order to prevent inequity problem and analytically support managers in job evaluations, in determining job evaluation criteria weights there is used AHP (Dogan et al., 2014), or more sophisticated fuzzy AHP (Senol & Dagdeviren 2019, Feng et al., 2023).

Though, the use of AHP in identification the ranking of company's jobs is relatively rare. Thus, paper presents the implementation of analytic hierarchy process in elaboration of ranking of jobs of the one of the municipal company in Poland. In that respect, the AHP was used in establishing the hierarchy of organizational positions due to the difficulty and arduousness of jobs. The research procedure was supplemented with document analysis, structured interviews, teamwork methods and a classification technique.

## 2. Data and Method

The research study was conducted in one of the municipal enterprise in Poland, i.e. autonomous municipally owned corporation (MOCs) owned by municipalities outside the local bureaucracy, which have tariffs and commercial revenues, and produce and deliver local public services (Voorn et al., 2017, p. 820). The decision-making problem was the assessment of 75 blue-collar jobs (see Fig 1).

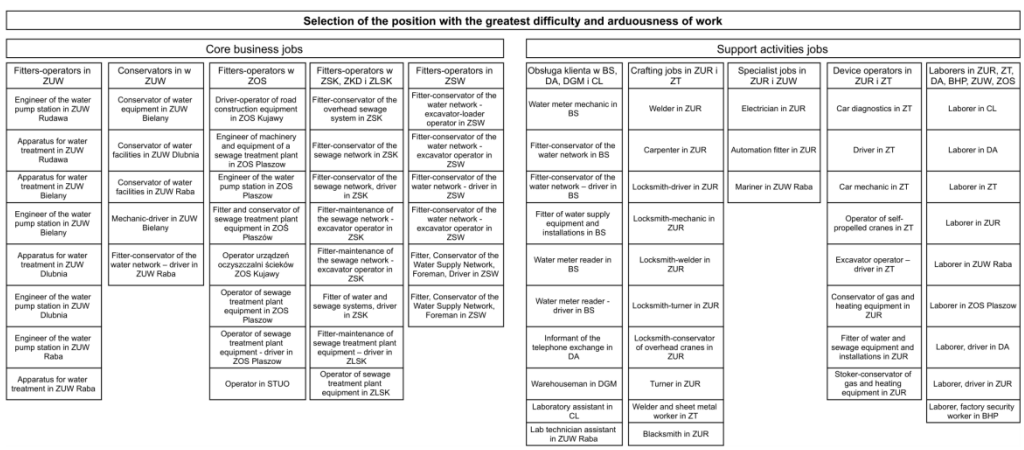


**Figure 1.**AHP hierarchical model

The study used data obtained in November-December 2022. Data were gathered from following internal sources of information: the scopes of responsibilities of jobs as well as the results of interviews with executive staff and employees in particular posts. Interviews– based on check lists forms (work sheets) – were conducted with the heads of organizational units and employees in order to gather information on the determinants of the difficulty and arduousness of jobs. Interviews were

preceded by a review of the formal scopes of relevant duties. Interview sheets and the collected organizational documentation (organizational charts, formal job descriptions) were a basis for the next stage conducted by a team of 28 experts (composed of company executives), who had deep knowledge of the tasks and responsibilities at work positions. Team of experts were supposed – during one-day meeting –to assess the difficulty and arduousness of company's jobs using AHP.

Analytic hierarchy process is one of the multiple criteria decision method (MCDM) widely described and used by many academics, starting T. L. Saaty (2000) who created this method. Contemporary researchers such Prusak and Stefanów (2014) and Kułakowski (2020) attempted to explain this tool using a step-by-step approach. The first stage of the AHP is to build decision-making, hierarchical model, which usually consists of the main goal, "parent" criteria, their "children" subcriteria (or factors) and decision variants. In the next stage, the hierarchy is evaluated using fundamental, 9-point pairwise comparison (PC) scale, where two alternatives are compared pairwise against each other with respect to the element one level above in the hierarchical structure. Assuming the criteria A, B and C, and their respective sub-criteria A1, A2, A3; B1, B2, B3; C1, C2, C3, the example comparisons will be as follows: *With respect to B, which element is more preferred (important): A1 or A2? How much is this preference of one element over another?* There are 9 options: from "1" – *A1* and *A2* are equally preferred, to "9" – *A1* has an extreme preference over *A2*, or *A2* over *A1*. Based on these judgments, the square *PC* matrices (*PCMs*) are constructed, and subsequently, local priorities (weights) are calculated using one of a dozen prioritization methods. The results are presented as ranking vectors, indicating which element is the most preferred (important), and which is the least preferred.

Alongside priorities, the consistency ratio (*CR*) should be derived for each PCM, and if it exceeds *0,10* (*10%*), an inconsistent matrix should be modified by reconsidering the most inconsistent judgment. Then, global priorities can be calculated as multiplication of (local) priority for the parent criterion and (local) priority of its children sub-criterion. They indicate how meaningful is a given factor for the whole hierarchy. Finally, if the preference analysis is made by the group of experts, all their individual priorities must be aggregated into common ranking vectors using geometric mean. All these AHP stages have been applied in this research.

## 3. Results and discussion

The decision-making problem was the assessment of physical workstations from the point of view of their difficulties and strenuous work. 75 jobs were assessed, which were categorized into two groups, i.e. Core business jobs and Support activities jobs. This division results from the nature of the work performed. The overall model is shown in the diagram (Figure 1).

The analysis was carried out using the R language, the AHP package. The presented results refer to average values (from all respondents). According to Saaty's recommendations (Saaty 2000), those matrices were included in the analysis for which the CR coefficient is less than 0.20 (20%).

The global ranking is the main part of the research, allowing to determine the degree of nuisance and difficulty of work of each of the analyzed positions. To increase the transparency of the analysis, the positions were divided into four groups:

1. Group I (see: Tab. 1) - positions with the highest global priorities, i.e. those involving the greatest, very high difficulty and arduousness of work. It has been assumed that global priorities for these positions are from 2% and above. During the research, two positions with priorities above 6% were

identified

2. Group II (see: Tab. 2) - positions with a medium-high value of global priorities, i.e. associated with medium-high difficulty and arduousness of work. It was assumed that global priorities for these positions range from 1.0-1.9%.

3. Group III (see: Tab. 3) - positions with an average value of global priorities, i.e. associated with an average difficulty and arduousness of work. It has been assumed that global priorities for these positions range from 0.5-0.9%.

4. Group IV (see: Tab.4) - positions with a low value of global priorities, i.e. involving relatively low difficulty and arduousness of work. It has been assumed that global priorities for these positions are below 0.5%.

**Table 1.** Global ranking for positions with weights of 2.0% and above

| No | Job title | % |
|---|---|---|
| 1 | Automation fitter in ZUR | 6,52 |
| 2 | Fitter-conservator of the overhead sewage system in ZSK | 6,46 |
| 3 | Fitter, Conservator of the Water Supply Network, Foreman, Driver in ZSW | 5,03 |
| 4 | Electrician in ZUR | 3,53 |
| 5 | Fitter-maintenance of the sewage network - excavator operator in ZSK | 3,52 |
| 6 | Fitter, Conservator of the Water Supply Network, Foreman in ZSW | 3,46 |
| 7 | Fitter, Conservator of the Water Supply Network, Driver in ZSK | 2,64 |
| 8 | Fitter of water and sewage systems in ZSK | 2,59 |
| 9 | Operator in STUO | 2,43 |
| 10 | Operator of sewage treatment plant equipment - driver in ZOS Plaszow | 2,30 |
| 11 | Fitter of sewage system equipment – driver in ZKD | 2,25 |
| 12 | Fitter-conservator of the water network - excavator and loader operator in ZSW | 2,20 |
| 13 | Driver-operator of road construction equipment in ZOS Kujawy | 2,11 |
| 14 | Fitter and conservator of sewage treatment plant equipment in ZOS Płaszów | 2,09 |

**Table 2.** Global ranking for positions with weights of 1.0-1.9%

| No | Job title | % |
|---|---|---|
| 15 | Mariner in ZUW Raba | 1,97 |
| 16 | Fitter-conservator of the water network - excavator operator in ZSW | 1,95 |
| 17 | Fitter-conservator of the water network – driver in BS | 1,93 |
| 18 | Engineer of machinery and equipment of a sewage treatment plant in ZOS Plaszow | 1,83 |
| 19 | Operator of sewage treatment plant equipment in ZOS Plaszow | 1,69 |
| 19 | Fitter-maintenance of sewage treatment plant equipment – driver in ZLSK | 1,69 |
| 20 | Excavator operator – driver in ZT | 1,64 |
| 21 | Operator of sewage treatment plant equipment in ZLSK | 1,60 |
| 22 | Fitter-conservator of the water network – driver in ZUW Raba | 1,55 |
| 23 | Operator of sewage treatment plant equipment in ZOŚ Kujawy | 1,54 |
| 24 | Engineer of the water pump station in ZOS Plaszow | 1,51 |
| 25 | Fitter-conservator of the sewage network in ZSK | 1,47 |
| 26 | Fitter-conservator of the water network in BS | 1,36 |
| 27 | Fitter of water supply equipment and installations in BS | 1,35 |
| 28 | Water meter reader - driver in BS | 1,27 |
| 29 | Fitter of water and sewage equipment and installations in ZUR | 1,19 |
| 30 | Operator of self-propelled cranes in ZT | 1,02 |
| 30 | Fitter-conservator of the water network - driver in ZSW | 1,02 |

**Table 3.** Global ranking for positions with weights of 0.5-0.9%

| No | Job title | % |
|---|---|---|
| 31 | Conservator of gas and heating equipment in ZUR | 0,96 |
| 32 | Engineer of the water pump station in ZUW Rudawa | 0,94 |
| 32 | Water meter reader in BS | 0,94 |
| 33 | Locksmith-welder in ZUR | 0,92 |
| 34 | Engineer of the water pump station in ZUW Raba | 0,91 |
| 35 | Welder in ZUR | 0,89 |
| 36 | Engineer of the water pump station in ZUW Dłubnia | 0,85 |
| 37 | Car diagnostics in ZT | 0,83 |
| 37 | Water meter mechanic in the Sales Office in BS | 0,83 |
| 38 | Fitter-conservator of the water supply network in ZSW | 0,81 |
| 38 | Welder and sheet metal worker in ZT | 0,81 |
| 38 | Apparatus for water treatment in ZUW Rudawa | 0,81 |
| 39 | Apparatus for water treatment in ZUW Raba | 0,80 |
| 40 | Stoker-conservator of gas and heating equipment in ZUR | 0,78 |
| 41 | Engineer of the water pump station in ZUW Bielany | 0,75 |
| 42 | Car mechanic in ZT | 0,74 |
| 43 | Conservator of water facilities in ZUW Raba | 0,71 |
| 43 | Apparatus for water treatment in ZUW Dłubnia | 0,71 |
| 44 | Driver in ZT | 0,70 |
| 45 | Mechanic-driver in ZUW Bielany | 0,67 |
| 46 | Conservator of water equipment in ZUW Bielany | 0,65 |
| 47 | Apparatus for water treatment in ZUW Bielany | 0,64 |
| 48 | Locksmith-turner in ZUR | 0,63 |
| 49 | Conservator of water facilities in ZUW Dłubnia | 0,61 |
| 50 | Laboratory assistant in CL | 0,60 |
| 51 | Warehouseman in DGM | 0,57 |
| 52 | Locksmith-conservator of overhead cranes in ZUR | 0,54 |
| 53 | Locksmith-mechanic in ZUR | 0,51 |

**Table 4.** Global ranking for positions with weights below 0.5

| No | Job title | % |
|---|---|---|
| 54 | Lab technician assistant in ZUW Raba | 0,49 |
| 55 | Locksmith-driver in ZUR | 0,45 |
| 56 | Informant of the telephone exchange in DA | 0,43 |
| 56 | Turner in ZUR | 0,43 |
| 57 | Blacksmith in ZUR | 0,37 |
| 58 | Laborer - driver in ZUR | 0,30 |
| 59 | Laborer - driver in DA | 0,28 |
| 60 | Carpenter in ZUR | 0,26 |
| 61 | Laborer a factory security worker in BHP | 0,19 |
| 62 | Laborer in ZOS Plaszow | 0,18 |
| 63 | Laborer in CL | 0,17 |
| 64 | Laborer in ZT | 0,16 |
| 65 | Laborer in ZUR | 0,15 |
| 66 | Laborer in DA | 0,14 |
| 66 | Laborer in ZUW Raba | 0,14 |

The team-worked ranking of jobs due to the difficulty and arduousness work difficulties with the use of AHP was accepted by the team members. Thus, it reflects the recognized, and indirectly acceptable, hierarchy of work difficulties in ranking jobs. It is worth mentioning that the developed ranking of positions, before it is adopted as input for the remuneration system, must be verified by applying analytical job evaluation with numerous criteria analyzing the content of work on evaluated jobs.

## 4. Conclusion

The paper investigates procedure for using AHP in developing a ranking of positions of municipal company. Having employed the firm-level data, there was found that AHP is methodologically adequate technique of comparing of difficulty and arduousness of company's jobs. AHP is especially applicable where there are complex decision-making processes, which in relation to job evaluation refers to a relatively large number of positions to be compared with each other. Basing upon multiple experts knowledge a clear hierarchy of difficulties and arduousness of work in individual positions was agreed. So this approach, which includes teamwork and all spects of employee, is in line with the key practices of TQM (Pratima et al., 2022, Srinivasaiah et al., 2023).

Further research in the studied municipal enterprise ought to identify whether the ranking of positions developed using AHP is consistent with the results of analytical job evaluation. The direction of further research defined in this way, on the one hand, results from the need to verify the ranking of positions using AHP. On the other hand, it directly results from the methodology of job evaluation, which assumes that prior to starting the analytical job evaluation, a ranking of the evaluated positions should be developed (Armstrong et. al., 2005).Such a ranking, developed by company employees (working as a team) who have in-depth knowledge of the work content of the evaluated jobs, is to reflect the generally accepted hierarchy of difficulty and arduousness work difficulties in the company. It should be remembered that the remuneration system developed on the basis of the results of work evaluation is a social contract at the enterprise level. in other words, the hierarchy of work difficulties of individual positions, and ultimately differences in pay levels must be acceptable to employees and fair.

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