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#### Determining intuitionistic fuzzy index for overall employees' performance based on objectives and KPIs

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#### Abstract

Finding and retaining talented employees is critical to every organization's success. Every company should have an effective process for managing employee performance and at the end of this process every employee will have a performance index. In an attempt to represent better the complexity of the problem and the uncertainty of the measured and estimated values we use the apparatus of the IFS.

**Keywords**: intuitionistic fuzzy set, performance management, key performance indicators, performance index

### 1 Introduction.

Once an organization has analyzed its mission, identified all its stakeholders, defined its goals and motivated the staff, it needs a way to measure the progress of the employees working toward those goals. Key Performance Indicators are those measurements. Having properly defined the KPIs and the ways to measure them the overall performance index of the employees can be calculated. Metrics and Key performance Indicators (KPIs) are critical in prioritization what has to be measured. The methodology used helps in determining the metrics to be used by the organization. It is frequently said that one cannot manage what cannot be measured. Identifying the key metrics and determining how they are to be measured helps the organizations to monitor performance across the whole personnel. In this paper we present a new approach for evaluating intuitionistic fuzzy performance index, based on the achievements for every defined objective with its KPIs.

## 2 Brief overview of Intuitionistic Fuzzy Sets

Intuitionistic fuzzy sets (IFS) were proposed in 1983. by K. Atanassov [2] as an extension of the theory of the fuzzy sets, developed by L. Zadeh [1]. Let there be a fixed set. The set  $A^*$  is called intuitionistic fuzzy (IFS), if there exists a set:

$$A^* = \{ \langle x, \mu_A(x), \nu_A(x), \pi_A(x) \rangle | x \in E \}$$

where the functions  $\mu_A: E \to [0, 1]$  and  $\nu_A: E \to [0, 1]$  determine respectively the degree of membership and non-membership of the element  $x \in E$  to the set A, which is a subset of E and for every  $x \in E$ :

$$0 \le \mu_A(x) + \nu_A(x) \le 1$$

For the purpose of the present work we construct  $\mu_A$  and  $\nu_A$  with the help of expert evaluations. The function  $\pi_A(x)$  determining the degree of inaccuraccy of data is represented by  $\epsilon_i$ .

# 3 Evaluating the intuitionistic fuzzy performance index

The performance index of every employee is the final result of the achievements in the individual objectives. Every objective has different impact on the performance index and is based on a number of key performance indicators - criteria. Every criterion has a target value and a way to measure the results. In an attempt to represent better the complexity of the problem and the uncertainty of the measured and estimated values we use the apparatus of the IFS.

We start with the following assumptions: we have n in number criterions  $p_1, ..., p_n$  each with a given threshold values  $\{x_{i,min}, x_{i,target}\}$  and a respective wight coefficients  $q_i$  and m in number employees. For each criterion  $p_i$  and the *j*-th employee we define the IFS function thus:

$$\mu(p_{i,j}) = \frac{x_{i,j,current} - x_{i,j,min}}{x_{i,j,target} - x_{i,j,min}} - \frac{x_{i,j,current} - x_{i,j,target} - |x_{i,j,current} - x_{i,j,target}|}{2(x_{i,j,target} - x_{i,j,min})},$$
$$\nu(p_{i,j}) = 1 - (1 - \epsilon_i)\mu(p_{i,j})$$

where  $\epsilon_i$  reflects the uncertainty of the measurements.

For an objective to be optimal we need both

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \mu(p_{i,j}) . (p_{i,j}) . q_i \ge \text{ OTV}$$

and

$$\mu(p_{i,j}) \sum_{i=1}^{n} \ge \frac{\mu(p_{i,j})}{n}$$
 for as many indexes as possible

It is easy to compare the performance of each of the employees based on the given assumptions - the best employee is the one that has the highest sum

$$\sum_{i=1}^{n} \mu(p_{i,j}).(p_{i,j}).q_i,$$

for a fixed j. Also we can look for the minimum of

$$\sum_{i=1}^{n} \nu(p_{i,j}).(p_{i,j}).q_i$$

for a fixed j in order to get better confirmation. The first sum represents the objective index OI. Now we can evaluate the performance index by summing all OIs depending on their weight indexes  $Z_i$ 

$$PI_j = \sum_{i=1}^n OI_{i,j}.Z_{i,j}$$

The index represents all objectives, criteria, level of accomplishment and the level of uncertainness.

## 4 Conclusion

By determining the IF value of the performance index we can introduce more effective methods for estimating the overall performance of every employee, the related profit and career management. The objective indexes can be used for detailed performance analysis and future improvements of the performance management processes.

## References

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