Knowledge Management and Information Technology in Analyzing Human Resource Processes

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ABSTRACT

The paper investigates influence of usage information and communications technology in human resource field. The role of HR management has changed and information technology can add value to human resource data. Information and communication technology allows faster acquirement of information and decision making optimization on human resource field. HR information system can be upgraded with decision support systems, which are based on the knowledge discovery in databases methods. In the remainder of the paper, some cases of using these methods are represented.

Keywords: Knowledge Management, Information Technology, Human Resource Processes, Decision Support

1. INTRODUCTION

Human resource processes are very dynamic processes and are very difficult to measure some times. Mostly they have long-term influence on company development and human resource managers have often problems to manage their performance. The impact of new technology, new communication systems and new information systems is increasing in analyzing human resource processes. Human resource discipline is therefore investigating influence of usage information and communications technology, which allows not only faster acquirement of information, but offers extra help at decision making on human resource field.

As we are now in the knowledge era, the basic element of human resources (HR) research is the acquirement of knowledge. The amount of information currently available is huge and the problem of the HR management is mainly the filtering and integration of information. Numerous theoretics in the area of HR management that delved in this problem have reached the conclusion that it's not only the acquirement of information, but mostly its management, stemming from the fact that information is one of the basic resources of every organization. Like an organization manages material, human and other resources, it also manages the information that flow either within the company or outside. Information management has recently become one of the priority tasks of HR management, especially the integration of information into a whole and the subsequent creation of new knowledge.

The knowledge management that HR management has to face is in a wider respect composed of two elements: the people and the information technology (IT) [1]; [2]). The people are the knowledge carriers and the IT enables them to amass the knowledge, organize it, access it and use it. The HR management uses IT mostly as the HR information system (IS), which is connected to other information systems in the organizations and other external IS [3]. In this situation the point is that management can use the knowledge to create added value by getting the needed information at the right time and at the right place. Therefore the modern HR information systems are being upgraded to include decision support systems (DSS) that help to find different aspects in problem solving. The probably most important benefit of DSS is the transparency of produced solutions that enables close to optimal solutions even in the so-called "fuzzy" areas such as human resources. Some of the DSS are based on the knowledge discovery in databases methods (KDD) that is presented in the remainder of the article in more detail with the example of its use in the analysis of absenteeism - one of the most often analysed unwanted phenomena that the HR management encounters.

2. TRACKING ABSENTEEISM AND THE ROLE OF HR MANAGEMENT

Many researches in various fields treat the problem of absenteeism [4], [5], [6]. This is the reason for the multitude of definitions of absenteeism, the most basic being any form of temporary absence from work. Most researchers consider absenteeism in a narrow sense of sick leaves, also called "medical absenteeism". The results of medical absenteeism are lost days of work or a time when the employee is temporarily unable to work due to disease or injury. This distinguishes medical absenteeism from e.g. permanent disabilities that lead to permanent absence, even if the permanent disability condition may start as a disease or an injury that leads only to medical absenteeism at the beginning. Absenteeism is many times caused by lack of job satisfaction [7].

In a wider sense, absenteeism includes approved leaves, such as holidays, study leaves, special leaves etc. and the unapproved leaves, such as being late to work, leaving work during work hours without permission, skipping entire days etc. [8]. A separate problem is the so-called hidden absenteeism that is formally classified as medical absenteeism, however the reasons

for absence are dysfunctional family relations, poor financial state of the family, lack of organized day-care for the children or elderly, long distance to work, menial labour, poor employee training, poor motivation or stimulation, lack of scheduled lunch breaks etc. These forms of absenteeism are hard to track and control as they're usually undetected. Thus they are absent from records even though their influence on the level absenteeism is severe.

To reduce absenteeism the organizations should have a good overview of the types of absenteeism and not only statistical data on work leaves. They should also employ modern methods for detection of hidden absenteeism. They should discover the quantity of detection, its reasons and suggest measures to decrease it, based on the discovered facts. Data mining based DSS can be of a big help for the HR management.

Most organizations regularly tracks the unapproved daily absence, that is not based on the health of employees but things such as poor relations, job satisfaction, family problems and similar. For example a financial IS requires the data on the duration and type of job absence to calculate wages. If the organization lacks an IT supported HR information system, the files are plain paper files.

The content and tracking of the absenteeism indicators depend on the company size and its activities. In an organization with only a couple of dozen employees, the number of tracked indicators is smaller than in an organization with several hundred or thousand employees. The reason is the smaller amount of HR experts [9] in charge of tracking and management of the problem and the detailed knowledge of every employees work. In small companies, absenteeism is usually not a large problem as the small workforce requires employees to show up regularly, and all absences are quickly noticed, as the employees know each other well.

The situation in medium and large organizations is different, as the low intensity of interpersonal relations and poor knowledge of other people's work leads to higher absenteeism. Employees don't feel sufficient loyalty and aren't motivated to do their best.

Conversely, the size of an organization influences which indicators of absenteeism and in what detail they will be monitored. Therefore in production based organizations the monitoring of absenteeism indicators is much more detailed that in service based organizations as the level of absenteeism is much higher in production based companies due to physical nature of work and the work conditions in production.

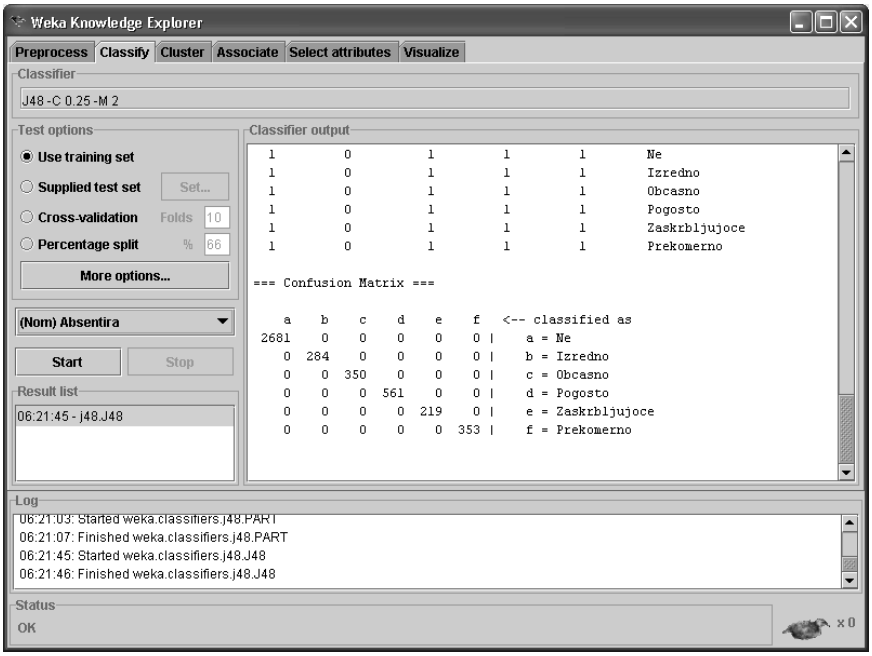
The data on absenteeism in the HR information system mostly refer to the absentee and the time of absence. The disability data is kept separate and are not counted as absenteeism. The category of data that would describe the reasons for absenteeism is not present in most companies as only the times and types of absenteeism are recorded. This is why the hidden absenteeism is hard to detect and reduce.

The HR information system data on absenteeism are mostly built around the identity of the absentee and the time of absence. The disability data is managed separately and is not connected to absenteeism. Most HR information systems do not include a data entity that would describe the reasons for absenteeism, but only times and types of absence. Because of this, hidden absenteeism is sometimes very hard to detect and reduce. One of the ways to discover the reasons of absenteeism and link them together is the use of data mining methodology, which when coupled with the HR IS enables us to:

- Transform data into meaningful information,
- Transform information into knowledge and link it to the process content,
- Exchange knowledge with other participants in the process.

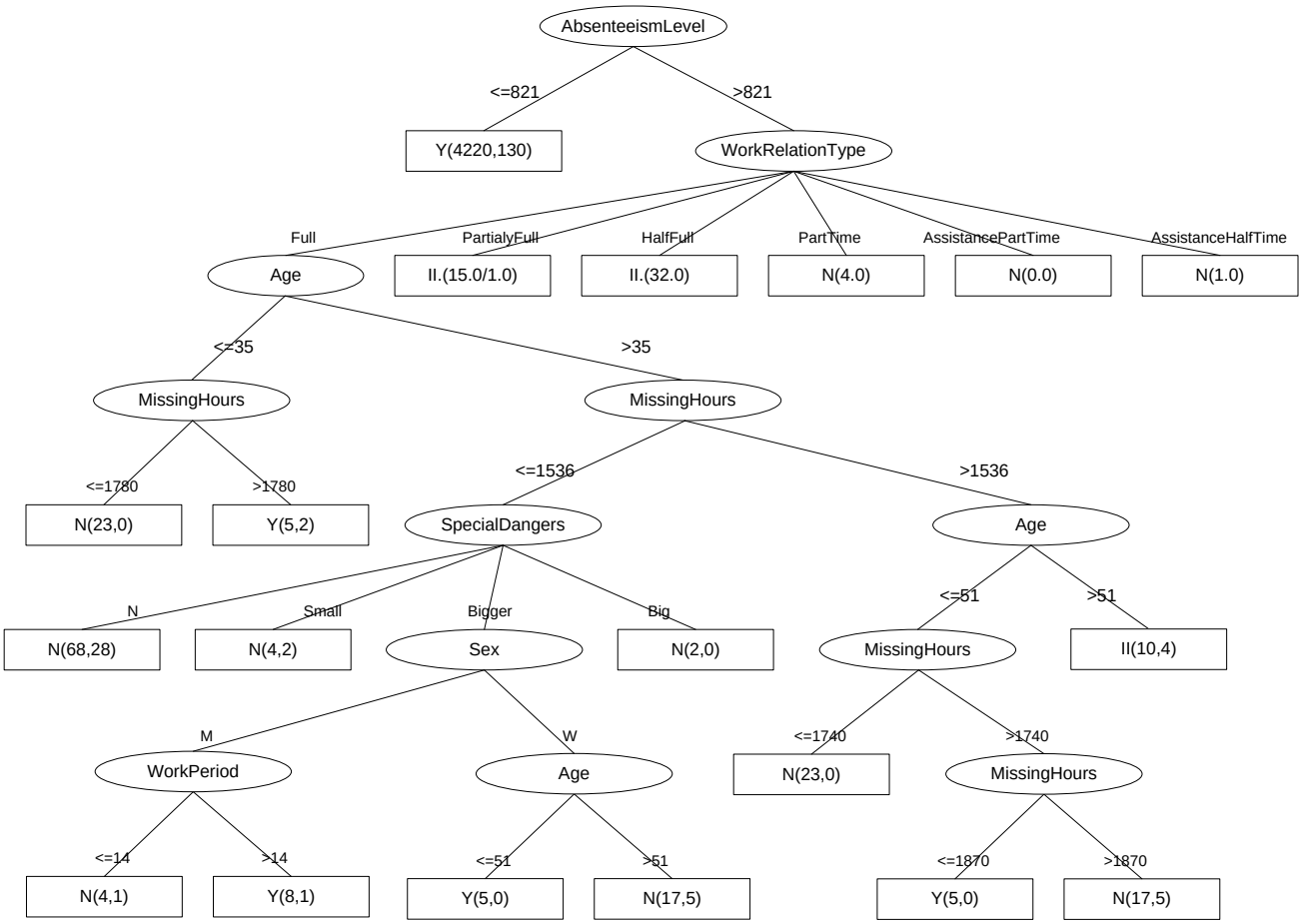
3. USING INFORMATION TECHNOLOGY IN THE RESEARCH OF ABSENTEEISM

The HR management uses the HR data that may be located in the central database of the organization or solely inside the HR IS, which is kept separate from the central database.



Picture 1: Weka Knowledge Explorer with classified data

Weka Knowledge Explorer is a graphical user interface which contains all the main tabs of Weka program: Preprocess, Classify, Cluster, Associate, Select attributes and Visualize. The *Preprocess* tab is the starting point for rules discovery. It displays the analysis-ready data, attributes characteristics, lets us select the attribute for classification and tree building and apply an arbitrary combination of filters. The *Classify* tab lets us configure and use any of the Weka's classifiers on the given data set (Picture 1). Picture 1 shows absenteeism classifiers which are most common (a) or least common (e) among employees. In Weka we can also select cross checking or a separate data set test. Classification errors and decision trees can be displayed. Similarly, in the *Cluster* tab Weka's data sorting methods are applied. The *Associate* tab searches for association rules and the *Select attributes* tab lets us select the most appropriate attributes in a data set by using any combination of attribute evaluation and search methods. The *Visualise* tab lets us display the data in one or two-dimensional graphs. For discrete attributes, values are depicted by different discrete colours, while continuous attributes are shown using a spectrum of colours. This tab also lets us visualise forecasts (it can be opened independently of the *Classify/Cluster* tab). If a class is discrete, the wrong classification points are shown in a frame in a colour of the predicted class. If a class is discrete, the point size depends on the size of the classifier's error [11].



Picture 2: A decision tree – classification of absenteeism by the absenteeism level

Picture 2 displays a tree of HR data analysis of medical absenteeism. The tree has a high classification precision, is comprehensible and is sized proportionally to the attributes.

We may conclude from the constructed tree that absenteeism level is a link between the total missing hours, work period and job special dangers, which is evident from the high classification precision and the tree comprehensibility. Apart from the discovery of reasons for absenteeism and related connections, we can use the shown methodology to find other reasons that are linked to absenteeism in any way.

4. CONCLUSION

The shown case of knowledge discovery in data methods and the explanation of absenteeism data suggest that the described methodology is appropriate to be used in human resources management. It allows us to evaluate human resources data from several aspects, which gives a new dimension and useful value to the data. Therefore, organizations should take into consideration advantages of methodology implementation before they collect the human resources data. In this case, data is going to be automatically prepared for further evaluations. This means, that the methodology of knowledge discovery in data can be simply used within the modern human resources information systems, as the user is not burdened with data analysis and can concentrate on the discovery of links and rules in the data. When coupled with appropriate explanations of the collected data, this leads to better decision making.

The described methodology is not useful only in the human resources, but in all areas where an explanation of data, collected from the transactional parts of the IS, is needed in the decision making. With the explanation based on the discovered rules the data is better understood and that means we can make faster and better decisions.

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