What are the most important factors affecting job satisfaction? Evidence for Poland from the Bayesian Network model*

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Abstract

Job satisfaction and its relationship with other variables determining organizational successes and failures continues to be an important field of research because the role of job satisfaction and its impacts have not been yet sufficiently explained. The issue of job satisfaction is particularly important for countries or regions that are transitioning from emerging to developed status, to a free market system and towards a knowledge-based economies. Despite the topicality of the topic, there is still limited research on the formation of job satisfaction of employees in the emerging Central and Eastern European countries. To properly measure job satisfaction, adapted methods that show adequate validity evidence for the desired context might be used.

This study aims to investigate employees' overall level of job satisfaction using a novel multivariate Bayesian Network (BN). Several discrete variables that affect job satisfaction are incorporated into the model. The graphical representation of the model is supplemented by numeric information about probability based on the questionnaire. The simulations reveal that there is a considerable potential to improve employees' satisfaction within the Polish companies investigated in this research. The obtained results also have an implication for managers in emerging economies, seeking to improve productivity as it may help them to devise an effective Human Resource Management (HRM) system toward job satisfaction for their employees. This research is valuable in terms of recognizing the best employer strategies to increase the level of employees' job satisfaction in Polish companies. In the light of the existing literature, the proposed BN approach is quite innovative, and it is an universal one since it can be easily adapted for other economies.

1. Introduction

Transition economies are economies that are in a long-term process of transition from a centrally planned economic system to a market-based system (Kowal/Roztocki 2015). According to the ranking of the WEF report 2016–2017, Poland, together with such EU countries as Croatia, Hungary, Latvia, Latvia,

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Slovakia, was included in the group of countries of the transition economies stage (i.e. between the effects-based economy and the innovation-based economy). Romania and Bulgaria was placed in the output-based economy. The remaining EU-28 countries were classified in the innovation-based economy (World Economic Forum 2016). According to the World Economic Situation and Prospects 2018 by UNCTAD, Poland and other Central and Eastern European countries were counted as developed economies. However, there is no unanimity between various sources and the opinions regarding the status of Poland are not homogenous. For instance, based on the recent MSCI reports, and especially on the report "MSCI Global Market Accessibility Review. Country comparison" (June 2021, p. 4), Poland is still recognized as an emerging economy:

Moreover, although the transition began more than three decades ago, many emerging economies still suffer from the communist past in the form of persistent government bureaucracy and managerial attitudes not fully adapted to a free market economy (Bahl et al. 2021). Furthermore, the often unclear legislation present in many emerging countries, also a relic of the bygone days of the centrally planned economy (Zygmunt 2020), complicates human resources management.

Existing data point to differences in management style. For example, managers in emerging countries in general seem to rely less on hard data in comparison with their colleagues in developed, mature economies. This may be explained by the lack of historical data and the need for managerial flexibility in a fast changing regulatory environment (Kowal/Roztocki 2015). Moreover, compared to developed countries, in emerging countries, many managers and employees identify less with their firm, experience, low job satisfaction, and often tend to look at the firm only with their own interests in mind (Zygmunt 2020). This situation makes it a priority goal of domestic companies to have incentive actions addressed to employees and managers focused on making them satisfied with their jobs.

Somers (2001) emphasizes that the research on the topic of work attitudes is grounded in the hypothesis that psychological reactions to work have tangible consequences with respect to work behaviour. Virtually, all attitudes identified in the literature as relevant to the workplace (e.g., job satisfaction, job involvement, organizational commitment, role conflict, role ambiguity) have been postulated to be related to individual job performance. Job satisfaction and its relationships with other variables determining organizational successes and failures (within the psychological employee's sphere and the economic domain) continue to be important fields of research (Saari/Judge 2004; Rogozińska-Pawełczyk 2020).

The majority of studies on job satisfaction have been conducted in Western Europe and North America (Kowal/Roztocki 2015), while not much is known about job satisfaction in Central and Eastern Europe countries (Lange 2009). Despite more than three decades of transition process, there is a significant economic gap between emerging economies and the mature, developed economies (Kowal/Roztocki 2015). One explanation of the persistence of this economic gap can be seen in the so-called "fragile human capital" (Soja/Paliwoda-Pekosz 2013). Many firms in emerging countries struggle with the management of human capital resources, since many employees leave the country to seek positions in mature, developed economies that would give them better salaries and promotion prospects, thus making hiring and retaining satisfied employees an issue (Kowal/Roztocki 2015). However, employees with job security, prospects of higher salary, promotion, and positive relationships with managers and co-workers are more likely to innovate, which in turn leads to a stronger position for the firm in the global market (Vila et al. 2014). Thus, the hierarchical treatment of the links between the various dimensions of job satisfaction is quite innovative in emerging market research.

This paper aspires to fill the gap in the literature concerning the most important factors that affect an employee's overall level of job satisfaction within the Polish companies, representative of the emerging countries located in Central and Eastern Europe. The research is carried out with the representatives of 80 large and medium-sized companies based in Poland and with 800 of their employees. Thus, the main research questions guiding our research are formulated as follows: What are the most important factors that affect job satisfaction?

The remainder of this study is organized as follows. Section 2 contains a brief the literature review concerning job satisfaction. The results of the literature review are then used in establishing a set of hypotheses. Section 3 describes the motivation and methodological background of BNs. Section 4 presents research design, data collection, and the BN model of job satisfaction. Section 5 emphasizes entering evidence as an important advantage of the BN framework to analyze various scenarios. Section 6 contains a discussion and discussion of the results. The last two sections summarize the main results with conclusions and indicate further directions of the research.

2. Job satisfaction: a brief literature review and hypotheses formulating

Job satisfaction has a long history of proliferating organizational research (Wright 2006). Over the past decades, scholars have provided various definitions of job satisfaction as well as different approaches to explain what it means and how the theory could be applied to organisations.

Job satisfaction is considered as a general attitude toward the job and it defines the feelings of an individual towards his or her job (Oshagbemi/Hickson 2003; Nurperihan/Hatice 2017). Robbins and Judge (2009) define job satisfaction as a positive feeling about a job resulting from an evaluation of its characteristics. Job satisfaction is a global attitude that individuals maintain about their jobs based on perceptions of their jobs. More recent efforts to define job satisfaction have explicitly drawn on the work attitude literature and included both affect and cognition (Brief/Weiss 2002). Kreitner and Kinicki (2007) define job satisfaction as the extent to which someone likes his or her job, while Nelson and Quick (2009) define it as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experience. Job satisfaction is a feeling of pleasure or discomfort, which develops in relation to the performance of tasks, functions, and roles (Aziri 2011). This affective state is underpinned by the fulfilment of a person's internal needs (for responsibility, achievement, etc.) and external needs (e.g., comfortable working conditions, good interpersonal relations, fair pay, etc.). In this sense, job satisfaction provides a measure of an employee's emotional attitude to their work, tasks, goals, values, and workplace (Nielsen et al. 2011; Yang 2012).

According to Gesinde and Adejumo (2012), an attempt to categorically state an all-inclusive and conclusive definition of job satisfaction is a difficult task. They state that some theorists view job satisfaction as a broad positive emotional reaction and attitude that an and individual has towards his/her job brought about by a comparison between actual and desired or anticipated outcomes, while others view it as two dimensions of a dissatisfaction/lack of satisfaction dimension or an intrinsic/extrinsic satisfaction dimension. Moreover, some authors attribute the development of job satisfaction to the evaluation of the organization and of the employee's performance together with the rewards it brings (a top-down approach) (Ilies/Judge 2003), while others indicate that it is the job satisfaction that influences organizational productivity (Koys 2001) and individual performance (a bottom-up approach) (Anastasios/Prodromos 2019).

Thus, job satisfaction is a multidimensional concept that refers to employees' job-related attitudes and the level of satisfaction they experience with their role (Newstrom 2010). Job satisfaction is closely related to employees' attitudes (Aziri 2011).

In this study, the situational hypothesis as the theoretical foundation of the research is used (Sousa-Poza/Sousa-Poza 2000). Job satisfaction can be influenced by various situational job characteristics. Well known situational approaches are the two-factor theory of Herzberg, Mausner, and Snyderman (1959), the job characteristics model (JCM) of Hackman and Oldham (1976) and the work of Warr (2007). The two-factor theory clusters the antecedents of job satisfaction into motivational and hygiene factors. Motivational factors – such as achieve-

ment, recognition, work, responsibility, promotion and growth – are assumed to increase job satisfaction but do not diminish dissatisfaction. In contrast, hygiene factors – such as pay, company policy, relationships with colleagues and supervision – are assumed to decrease job dissatisfaction but do not increase job satisfaction.

Job satisfaction's various antecedents are often categorized into different dimensions. The most popular categorization distinguishes between extrinsic and intrinsic job characteristics and can be traced back to Herzberg's differentiation between motivators (here, intrinsic aspects) and hygiene factors (here, extrinsic aspects) (Kaasa 2011; Mottaz 1985). Some authors (e.g. Katz/Van Maanen 1977; Mottaz 1985) hypothesize on a further cluster of social rewards derived from interpersonal relationships at work, such as good relationships with colleagues. In the current research, it is often assumed that these three groups of situational job characteristics affect job satisfaction (e.g. Huang/Van de Vliert 2003).

Several empirical studies have further shown that different situational drivers are not equally relevant for job satisfaction across nations (e.g. Masuda et al. 2012; Robert et al. 2000; Sousa-Poza/Sousa-Poza 2000). In their cross-national analysis of 21 countries, Sousa-Poza and Sousa-Poza (2000) show that seven situational job characteristics are the most important determinants of job satisfaction across all countries analyzed: (1) high income, (2) advancement opportunities, (3) job security, (4) interesting job, (5) independent work, (6) good relationships with management and (7) good relationships with colleagues. These seven characteristics cover all three categories of job satisfaction antecedents (namely, intrinsic, extrinsic and social antecedents of job satisfaction), showed relevance in an international context and will therefore be the focus of our subsequent analyses.

Cano and Castillo (2004) study proved that situational drivers such as interpersonal relationships, affiliation and recognition are the important drives of job satisfaction. Parvin and Kabir (2011) assessed the level of job satisfaction of employees through their development condition, promotion methods and career improvement opportunities. Sudha et al. (2017) analysed the employee job satisfaction through, management and meeting satisfaction of employees' needs by managers. The study also revealed that power and recognition related dimensions significantly associated with job satisfaction. Lottrup et al. (2015); Vakola and Nicholaou (2012) and Giannikis and Mihail (2011); Agarwal (2016) research reveals that personal factors as well as situational job treads can affect job satisfaction. Thus, this paper proposes positive relationships between three groups of situational job characteristics and employees' sense of job satisfaction, including the need for development, affiliation, and power and recognition. The hypotheses are developed as follows:

Hypothesis 1 (H1):   *Development need has significant impact on job satisfaction.*

Hypothesis 2 (H2):   *Affiliation need has significant impact on job satisfaction.*

Hypothesis 3 (H3):   *Power and recognition needs have significant impact on job satisfaction.*

Furthermore, over the past seven decades, job satisfaction has been an extensively researched topic in the organizational studies literature (Hackman/Oldham 1975; Bell/Weaver 1987). The importance of job satisfaction as an important dimension of the organisation, explaining employee motivation, productivity, absenteeism and turnover was highlighted by Koh and Boo (2001). The results of many studies indicate that good employee motivation has a positive impact on a company's productivity. Job satisfaction can consist of many aspects, including the level of remuneration, job security, the possibility of an independent decision-making method and opportunities for promotion, good relationships with co-workers – with colleagues and superiors, and satisfaction with the job itself (Vitell/Davis 1990, Lange 2009, Kowal/Roztocki 2015). Research shows that job satisfaction is related to the material side of life and can affect employees' overall sense of quality of life (Anke/Fugl-Meyer 2003). The research by Sudha and Beena Joice (2017) investigates the intensity of job satisfaction among the employees by stability, salary, fairness in workplace and economy rewards. Consequently, this study assumes positive relationships between security need and employees' sense of job satisfaction. The following hypothesis was proposed:

Hypothesis 4 (H4):   *Security need has significant impact on job satisfaction.*

In emerging economies, there are also a number of situational factors that are typical of many of these economies and may potentially affect job satisfaction. The transition from a centrally planned to a market economy created opportunities for independent decision-making at the organizational level, which resulted in more flexible management mechanisms and larger HRM inequalities (Lange 2009).

Regarding job satisfaction in emerging countries, Linz (2003) studied satisfaction among Russian employees and identified factors affecting the level of job satisfaction. In the result, Russian employees were satisfied with their job, and there were positive correlations between job satisfaction and organizational commitment. Carraher and Carraher (2006) examined the applicability of traditional HRM theories to 375 owners of small- to medium-sized enterprises in Belarus, Poland, and Ukraine. Performance and annual income were relatively unrelated to job satisfaction. Regarding the relationships between performance, income, and job satisfaction, the authors think that many assumptions that are

based on the traditional Western human resource management do not operate well with business owners in the emerging economies of Eastern Europe. The recent results of Gadomska-Lila, Sudolska, and Moskalenko (2020) research demonstrate that there is a significant relationship between HRM practices, particularly around compensation and reward, applied in the case of employees from Ukraine, and their job satisfaction. The findings of this research are beneficial for HRM managers in Polish enterprises who hire employees from Ukraine and would like to satisfy them and retain them longer, as they confirm the importance of certain practices and facilitate their efficient selection. Sakowski (2012) studied the job satisfaction of occupational medicine nurses in Poland. He observed low satisfaction with salary and promotion opportunities. He reports that about 26 percent of nurses who participated in the survey considered leaving Poland to find a job in one of the mature, developed economies.

In a comparative study, Fargher et al. (2008) compared the impact of cultural values and beliefs on job satisfaction in 8 emerging countries with job satisfaction of 12 developed countries in Western Europe. Contrary to the developed economies, in emerging economies, the importance of family/friends as a predictor for job satisfaction is not substantial. In the following study, Ubius et al. (2013) compared job satisfaction in 3 emerging economies in Eastern Europe (Czech Republic, Estonia, and Slovakia) with 2 countries in Asia (Japan and China). In contrast to the Asian counties where the innovation climate in an organization positively affects job satisfaction in emerging economies, the relationship between innovation climate in a company and the level of job satisfaction was not identified.

Overall, many organizations functioning within emerging economies are faced with typical conditions, where there is a wide mismatch between organizational needs and employees' needs. At the first look, in an emerging job market, job satisfaction can encompass many different dimensions that include: recognition, compensation, supervision, job security, and advancement on the job, etc. Ajala (2012) points out five predominant models of job satisfaction based on different causes, namely, need fulfillment, discrepancy, value attainment, equity, and dispositional/genetic components. Research findings establish that unmet needs affect job satisfaction and turnover, need fulfillment correlates with job satisfaction (Coomber/Barriball 2007), and expectation meeting related positively to job satisfaction (Willem 2007). Furthermore, job satisfaction were found to be dependent on favorable work conditions (Busch/Bush 1978), job security (Ritter/Anker 2002), promotion and pay (Rehman et al. 2010), social factors such as relationships with customers, colleagues or management and surrounding environment, good social relationships, and interaction with people in the work place (Jex 2002), level of social acceptance of the work group, and treatment with respect (Geeta/Pandey 2011). Focusing on employees' factors that affect job satisfaction becomes particularly important in developing coun-

tries (Miah/Bird 2007) because of the specific characteristics of the political, economic, social, and cultural environment (Budhwar/Sparrow 2002).

Analyzing the results of studies on the relationship between factors affecting job satisfaction among economically developed countries (Roztocki/Weistroffer 2015), it was observed that there is a lack of similar analyses in emerging economies, both at the organizational level and at the individual level. In particular, a lack of studies related to the relationship between situational antecedents of job satisfaction has been observed.

In order to fill the research gap, the authors therefore propose to examine whether the specific needs of employees working in Polish companies effects their job satisfaction. Due to the questionnaire data availability, the aforementioned hypotheses are tested on the example of the Polish companies, but they are more universal since the proposed BN model can be easily adapted for other economies.

The focus of the research is significant because people may place different degrees of importance on the various facets of work that contribute to job satisfaction (Saridakis et al. 2020). For instance, an employee may report a high level of dissatisfaction with a particular aspects of the job but is not dissatisfied with the job overall. Despite the various approaches to the study of job satisfaction, most researchers suggest the concept can be viewed multidimensionally (Bell/Weaver 1987; Oshagbemi/Hickson 2003), but there continues to be mixed empirical support among researchers. It is important to clarify job satisfaction as a variable figure in a variety of models of individual work behaviour as explanatory or as a predictor variable.

3. Motivation and methodological background of Bayesian Networks

Most of the existing studies deal with self-reported subjective measures at the individual level and assume that reported subjective job satisfaction is a satisfactory empirical approximation to individual utility (Frey/Stutzer 2002). A large number of measures of job satisfaction have been developed, but there appears to be no consensus on how to measure job satisfaction. There is also debate as to whether single item questions are adequate, or whether it is better to conceptualize job satisfaction as multidimensional and to employ facet measures (Judge/Kammeyer-Mueller 2012). van Saane et al. (2003) reviewed and evaluated 29 job satisfaction measures and found only seven met their reliability and validity criteria. The recently renewed debate about how precisely to define job satisfaction, what methodological designs, and estimation techniques to choose also implies earlier methods may no longer be considered adequate (Saridakis et al. 2020).

In this study, we propose the use of a novel multivariate statistical Bayesian Network model (henceforth BN) to describe and explore the influence of several qualitative variables on the overall level of an employee's job satisfaction. BNs seem to be especially useful in this context since they are themselves decision support systems, so that they provide not only an easy-to-read picture of the investigated processes but also an efficient tool to evaluate various scenarios (Di Pietro et al. 2015).

The obtained results cannot be directly applicable to other studies presented in the literature, because most of the studies assumed correlative (e.g., Riketta 2008; Xu/Chopik 2020) or less frequently causal links with job satisfaction (Rakowska/Macik 2016; Rogozińska-Pawełczyk 2020), possibly referring them to the one-dimensional structure of the measuring tool (Frey/Stutzer 2002). Usually, job satisfaction with other research structures was considered correlated with each other, without prejudging the direction of causal dependence (Schaufeli/Bakker 2010). The hierarchical treatment of relationships between the various exploratory or explanatory dimensions of job satisfaction is quite innovative in the light of the existing literature. Rakowska and Macik (2016) presented in their research the application of PLS-SEM structural modelling in the exploration of the relationship between job satisfaction and employee engagement, with a comparison of the potential impact of HRM situations and practices in the company and the category of the job against the background of considerations on the measurement of employee engagement and satisfaction.

In turn, to determine the type of relationship between the intention to quit and the psychological contract, and to test the mediating effect of job satisfaction, the SEM technique and the maximum likelihood method was applied by Rogozińska-Pawełczyk (2020). To test the possibility of work satisfaction being a mediator between the psychological contract and the intention to quit, a model for mediation was constructed. The results of both studies accurately determine the causal mechanisms of the analysed relations.

According to the literature, the BN approach is an interesting alternative to Structural Equation Modelling (SEM). SEM is the most frequently used method in social science research for quantifying and evaluating an assumed causal process. The primary objective is to assess whether a postulated theoretical network is a reasonable approximation of the process that generated the study data. In contrast to SEM, BNs assume the main role of causal modelling is to facilitate the analysis of potential and actual actions, rather than focus on theory confirmation (Anderson/Vastag 2004). The limitation of SEM is that it mainly models linear relationships. If the relationships are nonlinear, the potential effect of independent variables in explaining the variance in dependent variables would not be accurately known, resulting in poor prediction and diagnostics. This imitation of SEM can be overcome by using BNs (Gupta/Kim 2008).

BNs belong to a family of graphical multivariate statistical models satisfying a set of (conditional) independence relationships contained in a graph (Lauritzen 1996). BNs illustrate statistical dependencies by using directed acyclic graphs (DAGs). A DAG is a network that is composed of a set of nodes, denoting the variables of interest, and a set of directed arcs, representing the directional influence between variables. The graph is acyclic since any path that starts and ends in the same node is not allowed if all its arcs have the same direction (Di Pietro et al. 2015).

A BN model is a graphical representation of a joint probability distribution that includes two components (Pearl 1988): (1) a directed acyclic graph (DAG), (2) a set of numerical parameters, which usually represent conditional probability distributions. The framework for BNs is applicable to continuous or discrete variables or both, but the vast majority of applications have been concerned with discrete BNs (Anderson/Vastag 2004).

Let us consider a finite set $U_n = \{V_1, V_2, \cdots V_n\}$ of random variables. For each variable $V_i \in U_n$ we store a family of conditional probability distributions $P(V_i | \text{Parents}(V_i), \theta_i)$, where θ_i is assumed to be a collection of multinomial distributions, one for each parent configuration. If $V_i \in U_n$ has no parent, then $P(V_i | \text{Parents}(V_i), \theta_i) = P(V_i)$. For these conditional distributions, we can obtain the full joint distribution over U_n as the product using the following Eq. 1:

$$P(V_1, V_2, \cdots V_n) = \prod_{V_i \in U_n} P(V_i | \text{Parents}(V_i), \theta_i)$$

(1)

It is important that Eq. 1 represents a fundamental assumption of the BN framework: when we multiply the conditionals for each variable, we get the joint probability distribution for all variables in the network.

In most application domains, probabilistic information is available from various sources. The most common are statistical data, literature, and human experts. Druzdzel and van der Gaag (2000) point out that the task of obtaining numbers for a real-life application is hard and time consuming. The probability assignment may be subjective or based on frequency ratios from a database or a combination of both (Anderson/Vastag 2004). Therefore, the BN structure can incorporate causal relationships derived from expert knowledge and data. There are some computer software which enable us to build and apply BN models, e.g., GeNIe (https://bayesfusion.com), Netica (https://www.norsys. com), Hugin Expert (http://hugin.com), the R bnlearn package (https://www .bnlearn.com). However, the number of studies that utilize BNs to analyze various aspects related to workplaces, work attitudes, organization behaviours, working conditions, and work in general, is very limited. For example, Somers (2001) investigates the relationship between work attitudes and individual job

performance with BN as the case of artificial neural networks. Zhou et al. (2008) proposed the BN-based approach to establish a probabilistic relational network among causal factors (i.e., safety climate and personal experience factors) that have influence on human safety behaviour at workplaces. Garcia-Herrero et al. (2012) applied BNs to analyze the influence of working conditions on occupational accidents. In the next paper, Garcia-Herrero et al. (2013) create a BN model to explore how social support reduces the occupational stress caused by work demands. Moreover, Mohammadfam et al. (2017) provide a BN model for managing and improving the safety behaviour of employees at workplaces. Recently, Chanda and Goyal (2020) investigated the relationship between the dimensions of socially responsible HRM and organizational performance by using the BN approach.

4. The Bayesian Network model of job satisfaction

The study of job satisfaction is strongly present in many publications and research related to human resources management. Despite this fact, there is still a great need to verify the assumptions made in the theory, especially in relation to the realities in which organizations operate. Being aware of the complexity of many not fully explained issues, an attempt was made to verify the importance of the impact of selected factors on employee satisfaction. Selected factors belong to the elements of numerous motivational tools used in companies.

4.1 Research design and data collection

The quantitative research enabling the identification of factors influencing employee satisfaction was one of the stages of an extensive research project dedicated to Polish employees. The entire project had a wider scope, both in relation to the subject of research and the methods used, in addition to quantitative research, it also included qualitative research carried out in Poland. One of the aims of the quantitative research was to explore the most important factors that affect employees' job satisfaction working in Polish companies. Special attention was given to identifying those factors that are particularly important to employee satisfaction. Recognizing these factors gives employers a chance to take specific action strategies that may increase job satisfaction.

Fundamental in the research process was the design of measurement instruments to collect data on the main constructs within the proposed hypotheses. The basis for the development of the questionnaire was the results of research by Sousa-Poza and Sousa-Poza (2000), who point to several important situational factors shaping employee satisfaction such as high renumeration, development opportunities, job security, identification with the organization, independent work, good relations with management, good relations with colleagues. The mentioned job satisfaction factors became the starting point for proposing a set of factors in the

questionnaire related to the possibility of satisfying individual job satisfaction needs.

The questionnaire was designed to ensure that all participants understood the questions, and anonymity was assured. The item adaptation process was performed using quantitative research methods and invertible scales, the validation of scales and subscales, and a structure comprising operational models and a socio-demographic data module for rearranging the data according to the purpose of measurement.

The questionnaire consisted of two parts. The first part contained 11 closed-ended questions related to job satisfaction and aimed at obtaining employees' opinions on shaping key factors that build job satisfaction. The second part of the questionnaire included 7 questions on personal information, including demographic information such as age, gender, education, experience, or seniority. This part of the questionnaire was designed to explore the relationship between job satisfaction and personal experience.

Respondents were asked to respond to the statements regarding the various situational factors studied and express their opinions in a three-point Likert scale, where, 1 – factor in general or only insignificantly affects my job satisfaction, while 3 – factor in a very significant way affects may job satisfaction.

The original 11 questions in the questionnaire were then reduced through removing those questions that did not have internal consistency with other elements belonging to the same factor (McDonald et al. 2000). This resulted in four questions excluded.

Several empirical studies have further shown that different situational drivers are equally relevant for job satisfaction (Sousa-Poza/Sousa-Poza 2000; Masuda et al. 2011). Sousa-Poza and Sousa-Poza (2000) show that seven factors shaping employee satisfaction are the most important determinants of job satisfaction (1) high re-numeration, (2) development opportunities, (3) job security, (4) identification with organization, (5) independent work, (6) good relationships with management and (7) good relationships with colleagues. These seven characteristics cover most of the factors studied for job satisfaction antecedents in our analyses.

To assess which factors affect employee satisfaction, 7 variables have been identified that have been linked to the ability to meet one of four basic individual needs. Thus, four organization's variables have been identified that could contribute to meeting the employee's needs: (1) development, (2) affiliation, (3) power and recognition, and (4) security needs (see Table 1). Given the presented considerations on the results of Sousa-Poza and Sousa-Poza (2000), it can be concluded that the knowledge of the influence of situational factors on employee

job satisfaction is fundamental while aiming at the increased employee satisfaction with work.

Table 1. Selected factors shaping an employee satisfaction

	Employee's needs	Factors analyzed
1	Development	Development opportunities V1
2	Affiliation	Cooperation V2 Identification with organization V3
3	Power and recognition	Empowerment V4 Management support V5
4	Security	Employment stability V6 Remuneration and awards V7

Source: Created by the authors.

To assess the reliability of the survey data, a Cronbach' α (Cronbach 1951) was calculated for each variable. Its values showed high internal consistency of the data for: overall work satisfaction α = 0.71; work satisfaction components: development: α = 0.69; affiliation: α = 0.75, power and recognition: α = 0.71, and security need: α = 0.79.

In the next step of the analysis, the questionnaire form was standardized using Harman's single factor test, which indicated that no single factor in a given variable explained more than 50 % of its variance, thus providing grounds for rejecting this variable.

The quantitative research was conducted in 2018 among 800 employees of large and medium-sized Polish companies. The research was conducted using the PAPI (Paper over Pencil Interview) technique, which involved face-to-face interviews by an interviewer using a prepared survey questionnaire (the construction of the research tool is described in Section 4.1). Face-to-face interviews were chosen because they allow us to study the occurrence of certain phenomena among selected population groups.

In the implementation of the research process, it was decided to conduct a partial research of a country-specific nature, covering employees employed throughout Poland. The sampling frame was the database of business enterprises held by the Agency for Statistical-Economic Analysis "An-Stat", the organisation responsible for conducting the research. Both the construction of the questionnaire and the calculation of all statistics were the responsibility of the authors of the article. The selection of the companies was based on the following criteria: size of the company, industry, form of ownership, and a separate human resources department in the company's structure, which proves the use of human resources management policy and practices.

The sample of firms selection scheme was random. The list of modern business service centres catalogued on the basis of current reports prepared by Association of Business Service Leaders (ABSL) and Polish Investment and Trade Agency (PAIH) was used as the basic sampling frame. The list included 1513 modern business services centres (including headquarters and branches of 970 companies). A return rate of at least 1/3 was assumed. The database of companies purchased for the project included 755 records (company headquarters), which together with the branches formed 1024 business entities which met the conditions of the survey. Both public and private entities were included in the sampling frame. On the basis of databases constructed on the basis of data published by ABSL and PAIH, using a random method taking into account the criteria of company size, industry, form of ownership and a structured HR department, 178 entities were selected for the study.

The following scheme of selecting respondents for the research sample was adopted. The first level sampling frame was a list of 178 entities covered by the survey. The possibility of refusal to participate in the survey by many of these companies was taken into account – the survey requires the interviewer to be present on the premises of the surveyed company and to interview the employee, usually during working hours. It was assumed that cases of refusal by the management to consent to such a procedure will be quite frequent. For this reason, by randomly mixing the list of entities from the base used in the survey of employers, a basic sample was created from the first 80, and the remaining ones constituted a reserve sample. The selection of employees from companies for the survey was left to the discretion of the interviewers – if possible the interviewer should aim to draw every N:10th employee from the list (attendance, payroll, etc.), so that from each company no more than 10 respondents were selected for the survey. If a respondent is drawn who cannot be interviewed (absenteeism, high level manager, refusal to participate in the survey) the first subsequent employee on the list is selected. If the company did not agree to help in the drawing (making the list of employees available), the interviewer himself would be responsible for the selection of respondents with one condition – each of the ten interviewees should work in different organisational units. In the case of a lack of consent to conduct interviews at the company premises (the mass scale of such cases should be taken into account), the interviewer can make an individual appointment with employees for an interview after or before work. If the assumed number of ten interviews is not reached, the interviewer will supplement this number with interviews with employees of companies from the reserve list. The adopted base of companies participating in the implementation of the employee research project was not sufficient to obtain a set of 800 completed employee questionnaires. The effectiveness of the base of companies accepted for the survey was 66 %. This meant that out of a core list

of 80 entities, only 53 companies agreed to be surveyed, and 530 questionnaire interviews with employees were ultimately conducted in the first round.

After refusing to carry out the survey in the companies indicated, interviewers supplemented the missing quantities of questionnaires by interviewing employees of companies operating in the same area and with a similar profile of activity, maintaining the condition of the size of the company. Thus, from a basic base of 178 entities reduced by 80 companies from the first stage, permission was obtained to survey another 27 companies and a random selection of 270 employees.

In the conducted survey there took part 272 (34 %) employees from large companies and 528 (66 %) employees from medium-sized companies. The main sectors represented by the surveyed companies that agreed to be surveyed included: industry (23), other services (10), transport, telecommunications (11), banking, finance and insurance (10), trade (7), construction (5), health care (4), education (4) and public administration (6). The sampling rules took into account the proportional selection of no more than 10 respondents from each organisation, so 230 employees were surveyed in firms in the industrial sector, 110 respondents were interviewed in the transportation and communications sector, and 100 interviews each were conducted in the banking, finance and insurance and other services sectors. Similarly, 70 employees were surveyed in the trade, construction (50), health care and education (40 respondents each) and public administration (60) sectors. Taking into account that the structure of the sample was not in line with the structure of business entities in Poland, it cannot be qualified as representative.

The information on the survey participants' characteristics such as gender, age, position, or length of service is presented below (Table 2). Of the surveyed workers (persons holding nonmanagerial jobs), 272 (34 %) respondents worked in large firms and 528 (66 %) in medium-sized organizations; 46.4 % were females and 53.6 % were males. Most of them had been with the firm longer than 10 years (67.5 %), around 11 % worked up to 3 years, and 21.9 % longer than 3 years. Regarding respondents' educational attainment, 40 % had secondary education and another 39.9 % had tertiary education; 20.1 % had education lower than secondary. Almost 30 % of the surveyed workers were aged 31–39 and 40–49 years (27.8 %). The smallest group consisted of persons older than 55 years of age – 7 %.

Table 2. Characteristics of the study group (N=800)

Variable	Description	%	n
Gender	female	46.4	372
	male	53.6	428
Age	≤ 30 years	23.0	184
	31–39 years	29.0	232
	40–49 years	27.8	222
	50–55 years	13.2	106
	> 55 years	7.0	56
Educational attainments	lower than secondary education	20.1	161
	secondary education	40.0	320
	tertiary education	39.9	319
Work position	managerial	18.0	144
	non-managerial	82.0	656
Length of service	≤ 3 years	10.6	85
	4–10 years	21.9	175
	>10 years	67.5	540
Length of service in the examined institution	≤ 5 years	40.9	327
	< 5 years	59.1	473
Type of employment contract	full-time employment	69.8	558
	temporary	30.2	242

Source: Own calculations.

4.2 The BN model construction

The BN model supporting statistical analyses of job satisfaction has been built based on survey data with the goal to answer the following questions:

What are the most important factors that affect job satisfaction?

Table 3 presents seven qualitative variables V1-V7 (parent nodes) that affect the target variable *Job Satisfaction* (the conditional deterministic node).

The graphical representation of the model is supplemented by numeric information about probability. The nodes V1-V7 have no parents, therefore a prior distribution is specified for each of them. Marginal probabilities presented in Table 4 were calculated based on the questionnaire, which was built taking into consideration the literature review. In particular, a 1–3 point ordinal scale was utilized in this research.

Table 3. Description and construction of variables

	Variable (Node name)	Short description	Probability distribution
1	V1	Development opportunities	Marginal
2	V2	Cooperation	Marginal
3	V3	Identification with organization	Marginal
4	V4	Empowerment	Marginal
5	V5	Management support	Marginal
6	V6	Employment stability	Marginal
7	V7	Remuneration and awards	Marginal
8	Job Satisfaction	Employee satisfaction	Deterministic Conditional on V1-V7

Note: Notation as in Table 1.
Source: Created by the authors.

The study assesses the importance that each of the variables contributes to employee satisfaction. Therefore, the respondents indicated the importance on a three-stage order scale, where 1 – factor in general or only insignificantly affects my job satisfaction, while 3 – factor in a very significant way affects my job satisfaction. For each qualitative variable V1-V7, the proportions with three possible discrete states: 1 (Very Important), 2 (Important), and 3 (Less Important) are expressed in Table 4.

Table 4. States and marginal probabilities for variables V1-V7

State	Abbreviation	V1	V2	V3	V4	V5	V6	V7
1 (Very Important)	VImp	0.369	0.595	0.543	0.326	0.381	0.434	0.268
2 (Important)	Imp	0.385	0.301	0.338	0.314	0.396	0.355	0.307
3 (Less Important)	LImp	0.246	0.104	0.119	0.360	0.223	0.211	0.425
Sum		1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Own calculations.

The relationships in a BN are quantified by a set of conditional probabilities, known as beliefs on relationships. It gives the probability of all states of a specific node under the conditions of all possible combinations of the states of its parents (Zhou et al. 2008).

The conditional probability distribution for a deterministic *Job Satisfaction* node is defined given each combination of states of the parent nodes V1-V7. The number of combinations of cases is equal to 36 based on Eq. 2:

$$\overline{C}_n^k = \binom{k+n-1}{k} = \frac{(k+n-1)!}{k!(n-1)!}, \tag{2}$$

where $k = 7$ (seven variables, V1-V7) and $n = 3$ (three states, VImp, Imp, LImp).

Table 5 reports all combinations with assigned states that represent high, medium, or low levels of job satisfaction, respectively. To avoid difficulties with interpretation, the points are assigned to a particular state in the following manner:

$$\text{VImp} \rightarrow 2; \text{Imp} \rightarrow 1.25 \text{ (the average)}; \text{LImp} \rightarrow 0.5.$$

Therefore, in Table 5, the sum of points within the range $3.5 - 6.75$ means the state Low, the sum of points within the range $7 - 10.5$ represents the state Medium, and the sum of points within the range $10.75 - 14$ means the state High. For example, case No. 1 consists of 7 VImp states, so the sum of points is equal to 14 (state High), etc.

The total number of possible cases for *Job Satisfaction* nodes (considering the sequence of variables) that are incorporated into the model is equal to:

$$n^k = 3^7 = 2187. \tag{3}$$

Table 5. Conditions for deterministic Job Satisfaction node (36 combinations of states)

No.	1	2	3	4	5	6	7	8	9
Case	7 VImp	6 VImp	5 VImp	4 VImp	3 VImp	2 VImp	1 VImp	7 Imp	6 Imp
		1 Imp	2 Imp	3 Imp	4 Imp	5 Imp	6 Imp		1 LImp
Points	14	13.25	12.5	11.75	11	10.25	9.5	8.75	8
State	High	High	High	High	High	Medium	Medium	Medium	Medium
No.	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Case	5 Imp	4 Imp	3 Imp	2 Imp	1 Imp	7 LImp	6 LImp	5 LImp	4 LImp
	2 LImp	3 LImp	4 LImp	5 LImp	6 LImp		1 VImp	2 VImp	3 VImp
Points	7.25	6.5	5.75	5	4.25	3.5	5	6.5	8
State	Medium	Low	Low	Low	Low	Low	Low	Low	Medium
No.	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Case	3 LImp	2 LImp	1 LImp	1 Limp	1 Limp	1 Limp	1 Limp	1 Limp	2 Limp
	4 VImp	5 VImp	6 VImp	1 Imp	2 Imp	3 Imp	4 Imp	5 Imp	4 Imp
				5 VImp	4 VImp	3 VImp	2 VImp	1 VImp	1 VImp
Points	9.5	11	12.5	11.75	11	10.25	9.5	8.75	8
State	Medium	High	High	High	High	Medium	Medium	Medium	Medium

No.	28	29	30	31	32	33	34	35	36
Case	2 Limp	2 Limp	2 Limp	3 Limp	3 Limp	3 Limp	4 Limp	4 Limp	5 Limp
	3 Imp	2 Imp	1 Imp	3 Imp	2 Imp	1 Imp	2 Imp	1 Imp	1 Imp
	2 VImp	3 VImp	4 VImp	1 VImp	2 VImp	3 VImp	1 VImp	2 VImp	1 VImp
Points	8.75	9.5	10.25	7.25	8	8.75	6.5	7.25	5.75
State	Medium	Medium	Medium	Medium	Medium	Medium	Low	Medium	Low

Note: Notation as in Table 4.
Points: VImp → 2; Imp → 1.25; LImp → 0.5
The sum of points within the range $3.5 - 6.75 \rightarrow$ the state Low
The sum of points within the range $7 - 10.5 \rightarrow$ the state Medium
The sum of points within the range $10.75 - 14 \rightarrow$ the state High
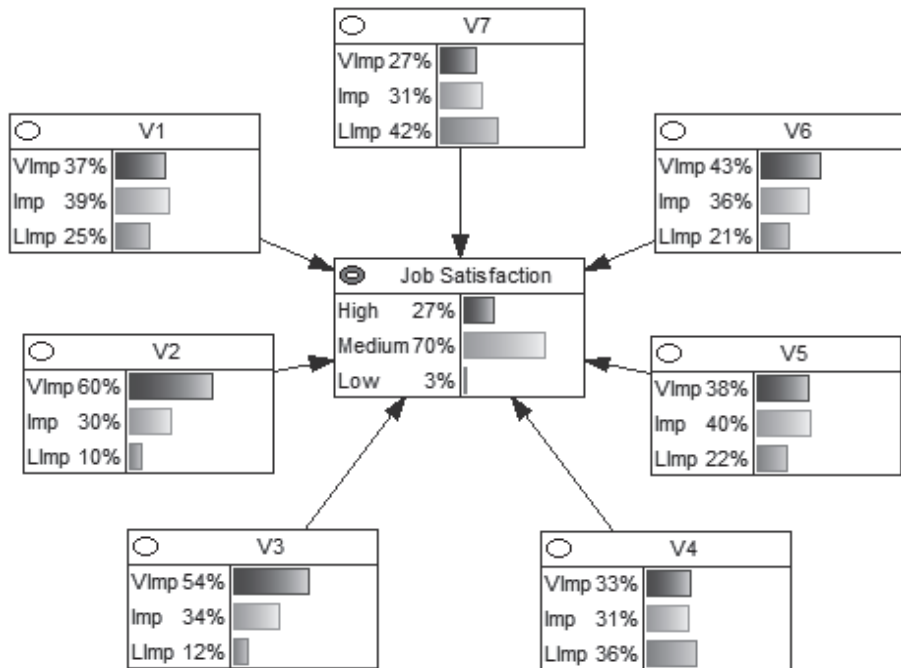Source: Created by the authors.

The BN model of *Job Satisfaction* presented in Fig. 1 has been built based on the data reported in Tables 4–5 with the use of the GeNIe Modeler for Academia software (available at https://bayesfusion.com). Mathematically, the BN structure displayed in Fig. 1 is described by Eq. (4):

$$p(V_1, V_2, \cdots, V_7, \text{Job Satisfaction}) = p(V_1) \bullet p(V_2) \cdots p(V_7) \bullet p(\text{Job Satisfaction}|V_1, V_2, \cdots, V_7) \tag{4}$$

The probabilities of each node in different states (also known as beliefs on events) are illustrated in Fig 1 on the basis of the survey data. For instance, the belief on the V1 node (*Development opportunities*) shows that about 37 % of respondents consider *Development opportunities* as very important, about 39 % as important, while about 25 % respondents believe that this factor is less important. The interpretations concerning the remaining nodes are similar.

Taking into consideration all factors shaping employee satisfaction (i.e., V1-V7), the findings for the deterministic *Job Satisfaction* node unveil that approximately 27 % of respondents consider themselves as having a high levels of job satisfaction. The majority of respondents (about 70 %) feel a medium level of job satisfaction, while only about 3 % reveal a low levels of work attitude. Therefore, the implication is that there is a visible potential to further improve employees' satisfaction within the large and medium-sized Polish companies investigated in this study.

Figure 1 The BN model – estimated probability of the states of the Job Satisfaction deterministic node based on the survey data

Source: Created by the authors

5. Reasoning within the BN

With the BNs, four types of reasoning can be performed: diagnostic, predictive, inter-causal, and combined reasoning (Zhou et al. 2008). Perhaps the most important advantage of the BN framework is that it allows the decision-maker to explore various scenarios and add new qualitative or quantitative information as evidence to the model in several ways. First, the decision-maker can utilize an expert judgment on any variable to update the probabilities assigned to certain states of these variables. Alternatively, evidence can be added by means of updating the actual values of the states of variables. Evidence is defined as any information that changes the probability distribution in the network. The conditionals given in a BN representation specify the *prior* join distribution of the variables. If we observe the values of some variables, then such observation can be represented by probability tables where we assign 1 to the observed value and 0 the unobserved one. Then the product of all tables (conditionals and observations) gives the *posterior* joint distribution of the variables. Thus, the joint distribution of variables changes each time we gain new information about

the variables (Olbrys 2009). The distribution of *Job Satisfaction* variables can be dynamically updated when the values of some of the variables V1-V7 are observed. Based on the Bayes Rule, the *posterior* probability of a certain event *A* given *data* can be expressed with formula (5):

$$p(A|data) = \frac{p(data|A) \bullet p(A)}{p(data)} \tag{5}$$

Once a complete BN has been built, it is an efficient tool for performing inferences. Due to the main goal that was mentioned in Section 4, the authors interrogated the network for highlighting the most important factors that affect job satisfaction.
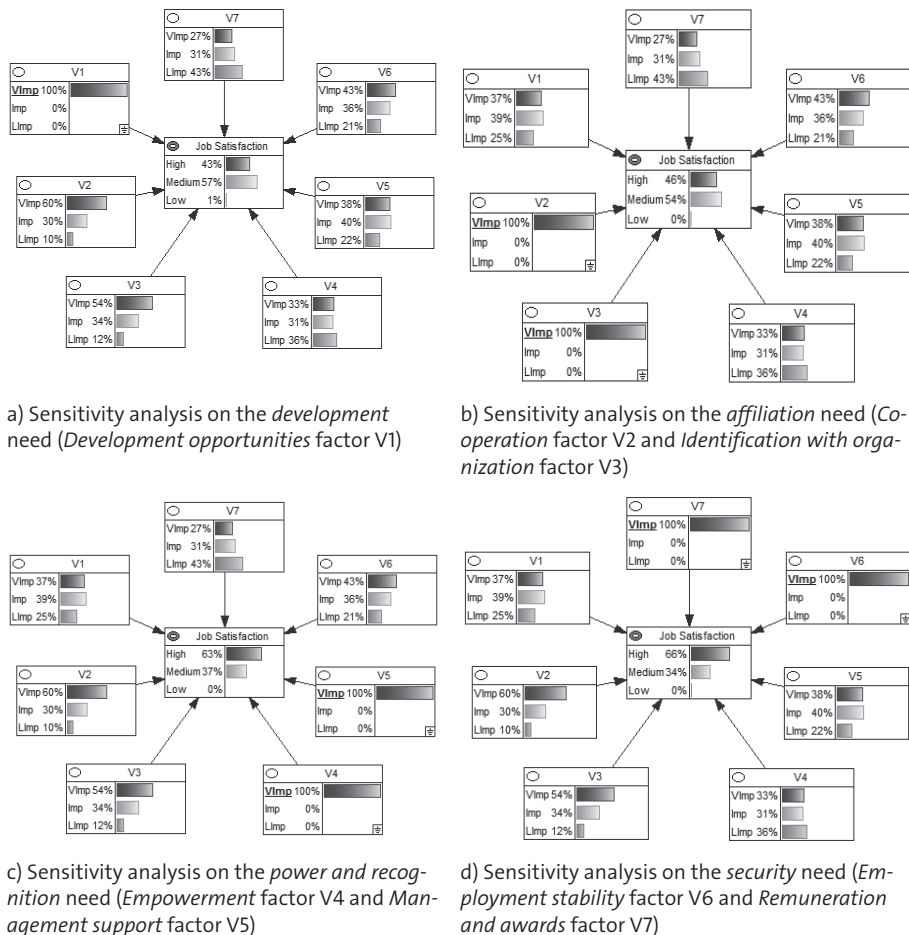
Identifying the most important factors that influence job satisfaction may become valuable in terms of identifying the best employer strategies to increase the overall level of an employee's job satisfaction. In the consecutive subsection, the authors provided what-if-analysis for tasks using the basic BN model presented in Fig. 1.

5.1 Using the network for job satisfaction analysis

To identify the most important factors that affect an employee's job satisfaction, various scenarios regarding an employee's needs are analysed (Table 1). Four scenarios concerning (a) *development*, (b) *affiliation*, (c) *power and recognition*, and (d) *security* needs are displayed in Fig. 2. The relevant beliefs with other factors being equal (*ceteris paribus* rule) are updated. Using belief updating, the sensitivity of the target node to changes in other nodes can be assessed.

Figure 2 Reasoning within the BN model – four scenarios concerning an employee's needs
(a) *development,* **(b)** *affiliation,* **(c)** *power and recognition,* **(d)** *security*

a) Sensitivity analysis on the *development* need (*Development opportunities* factor V1)

b) Sensitivity analysis on the *affiliation* need (*Cooperation* factor V2 and *Identification with organization* factor V3)

c) Sensitivity analysis on the *power and recognition* need (*Empowerment* factor V4 and *Management support* factor V5)

d) Sensitivity analysis on the *security* need (*Employment stability* factor V6 and *Remuneration and awards* factor V7)

Source: Created by the authors

The obtained results presented in Fig. 2 could be explained as follows:

1) Under the hypothesis that *Development opportunities* factor (V1) is very important for all respondents (VImp = 100 %), the probability of a high level of job satisfaction rises from 27 % (Fig. 1) to 43 % (Fig. 2, a).

2) Under the hypothesis that *Cooperation* (V2) and *Identification with organization* (V3) factors are very important for all respondents (VImp = 100 %), the probability of a high level of job satisfaction rises from 27 % (Fig. 1) to 46 % (Fig. 2, b).

3) Under the hypothesis that *Empowerment* (V4) and *Management support* (V5) factors are very important for all respondents (VImp = 100 %), the probability of a high level of job satisfaction rises from 27 % (Fig. 1) to 63 % (Fig. 2, c).
4) Under the hypothesis that *Employment stability* (V6) and *Remuneration and awards* (V7) factors are very important for all respondents (VImp = 100 %), the probability of high level of job satisfaction rises from 27 % (Fig. 1) to 66 % (Fig. 2, d).

Therefore, the evidence is that the *power and recognition* and *security* needs have been identified as very important for an individual level of an employee's job satisfaction.

In the next step, the sensitivity of the single-factor strategies that could improve an employee's job satisfaction is evaluated on the basis of the established BN. Each factor in the BN model is controlled individually. Assuming that a particular primary factor is very important (VImp=100 %), the probability of high job satisfaction is predicted (*ceteris paribus*). By analogous, the probability of high job satisfaction is predicted under the assumption that a particular factor is less important for respondents (LImp=100 %). Then, the percentage difference between both scenarios is calculated (e.g., Mohammadfam et al. 2017; Zhou et al. 2008). The results of sensitivity analyses are shown in Table 6. As demonstrated, the sensitivity is rather high and very similar in the case of all factors. It varies between 308.3 % (V7) and 362.5 % (V3). Therefore, the what-if-analysis reveals that there is a considerable potential to improve employees' job satisfaction within the companies investigated in this study. For instance, one can observe in Table 6 that changes in probability of *Remuneration and awards* variable (V7) strongly affect the level of job satisfaction. Under the hypothesis that V7 factor is less important for all respondents (LImp = 100 %), the predicted probability of high job satisfaction is equal to 12 %. Similarly, under the hypothesis that V7 factor is very important for all respondents (VImp = 100 %), the predicted probability of high job satisfaction is equal to 49 %. For comparison, changes in the probability of the *Cooperation* variable (V2) weakly influence the level of job satisfaction.

Table 6. The sensitivity of the singe-factor strategies to improve job satisfaction

Primary factors	V1	V2	V3	V4	V5	V6	V7
Predicted probability of high job satisfaction when LImp=100 % (*ceteris paribus*)	0.10	0.08	0.08	0.11	0.10	0.09	0.12
Predicted probability of high job satisfaction when VImp=100 % (*ceteris paribus*)	0.43	0.35	0.37	0.46	0.41	0.41	0.49
Sensitivity (%)	330.0	337.5	362.5	318.2	310.0	355.6	308.3

Note: Notation as in Table 3.
Source: Own calculations.

To check the accuracy of the established BN in classifying *Job Satisfaction* states, the predicted results of the classification (based on the model) are compared with the actual results (based on the questionnaire) by using the following formula (6):

$$\Delta\, p = \frac{p(actual\ value) - p(predicted\ value)}{p(actual\ value)} \bullet 100 \tag{6}$$

The aim is to test whether the prediction agrees with reality. As indicated in Table 7, the predicted and actual values are very similar in all cases. The error rate is generally acceptable, especially on the aspect to make a prediction on medium job satisfaction (very low absolute error rate equal to 0.60 %). The negative values in Table 7 indicate that in the particular state of the variable, the proportion of job satisfaction among employees is higher than what is shown in Fig. 1. Mean absolute percentage error is acceptable as it is equal to 25.92 % (e.g. Zhou et al. 2008).

Table 7. The relative variation in probability of the Job Satisfaction states

Job satisfaction (actual)		Job satisfaction (predicted)		Error rate $\Delta\, p$
High	0.2250	High	0.2710	20.44 %
Medium	0.7013	Medium	0.6971	-0.60 %
Low	0.0737	Low	0.0319	-56.72 %

Note: Notation as in Table 4.
Source: Own calculations.

6. Discussion

The main goal of this research was to investigate overall level of employees' job satisfaction in Poland using a novel multivariate Bayesian Network approach. The research was carried out with the representatives of 80 large and medium-sized companies based in Poland and with 800 of their employees. To assess

which factors affect employee satisfaction, seven variables were identified to meet one of the four basic individual needs. Thus, four organization's variables were considered that could contribute to meeting the employee's needs: development, affiliation, power and recognition, and security needs. The graphical representation of the BN model was supplemented by numeric information about probability based on the questionnaire. To identify the most important factors that influence job satisfaction, several scenarios were evaluated. The sensitivity analyses of single-factor strategies that could improve job satisfaction were conducted. The simulations revealed that there is a considerable potential to improve employees' satisfaction within the Polish companies investigated in this study.

The conducted analysis allowed to verify the hypotheses that have been formulated in the research process. To verify the research hypotheses, the evidence is in Figure 2 (a-d). In the middle boxes named "Job satisfaction" the highest values obtained were taken into account. If the highest value is at a high level, the research hypothesis is fully verified. If, on the other hand, it is at a medium level, then it is only partially confirmed.

The empirical results unveiled that the *power and recognition* and *security* needs were identified as very important for the overall level of an employee's job satisfaction. In further, *development* and *affiliation* needs were found to be less important to an employee's overall job satisfaction.

The results of the study indicate that having satisfied employees it is more dependent on employment stability (V6), remuneration and awards (V7), management support (V5), empowerment (V4) and development (V1) factors than cooperation (V2) and identification with organization (V3) factors.

Results supporting that job satisfaction is influenced by multiple situational factors have also been presented by other researchers. According to Sousa-Poza and Sousa-Poza (2000), employees have partially different motives, values, and goals; their job satisfaction thus depends on different factors such as: development design, belonging, power and recognition, and security systems. Reports by other authors (e.g., Anto´n 2009) confirm that a low level of employee's job satisfaction is a predictor of their intention to quit. Das (2012) also observed that studies examining the causes of employees' departures focus on the relationship between their feelings and attitudes (such as job satisfaction) and the intention to quit. The study results are consistent with reports by Rogozińska-Pawełczyk (2018) which show that job satisfaction remains at a medium level and in another study it has also a direct relationship with employees' motivation to stay or quit their organization (Rogozińska-Pawełczyk 2020).

Hence, managers must be aware that the desired level of employee job satisfaction can be influenced through proper employer strategies that signal that

organizational resources invested in a subset of personal and organizational factors of an individual's job satisfy employee needs and increase job satisfaction. Our analysis strongly supports the need for human resources management. Workforce can be handled successfully only if these differences are addressed properly through adequate employer strategies.

As demonstrated by the results presented here, the perception of the level of *security* needs such as *employment stability* (V6) and *remuneration and awards* (V7), can have considerable influence on the level of an employee's job satisfaction. **These results support Hypothesis 4 stating that security need is significant factor that affects job satisfaction.** The empirical evidence is in accordance with the earlier findings. According to Alzyoud (2018), the fact that *renumeration and awards* (V7) is the most important for employees can be used to shift the focus away from income increases, which frees up financial resources that can now be used for factors that are more important to employees in order to further financial motivate employees. A possible explanation could be seen in the existing compensation structures in many Polish companies belonging to the emerging economy. Frequently, in Polish companies it may be difficult to offer competitive compensation for a specific group of employees. Moreover, a large number of newly graduated professionals seeking jobs may depress the salary level for the whole group. This imbalance between a large number of professionals seeking jobs and the relatively small number of job openings is typical for the job markets of many emerging economies. In those job markets, relative high demand enjoys professions such as maintenance, personal cleaners, janitors, sales force, security personnel, and construction workers, while job offers for university graduates are rather rare (Kowal/Roztocki 2015). Moreover, such actions as *employment stability* (V6) will also provide a serious message of the organization's intentions about nourishing long-term employment relationships, which may influence positively the attitudes and behaviour of employees towards increasing levels of job satisfaction (Das 2012).

As emphasized by Dugguh and Ayaga (2014), the following are the strong determinants of job satisfaction: work itself, achievement, power and recognition, and management support. This is supported by our survey results, which indicate that the needs for power and recognition were secondarily considered by respondents as very important to an employee's overall job satisfaction. These results support **Hypothesis 3 stating, respectively, that power and recognition needs are significant factors that affect job satisfaction.** Therefore, the best employer strategies to increase the level of an employee's satisfaction should also use the increased importance of *power and recognition aspects*, such as *management support* (V5) and responsibility for their own decisions and for the results of their teamwork (*empowerment*) (V4). The exchange between employees should be stimulated in order to enable learning and knowledge transfer, which satisfy employees' wish for knowledge and information, and employees'

wish for good relationships with colleagues. This knowledge transfer is of special relevance and will become even more important, as companies operating in emerging economies now face the forthcoming economic recession and radical labour market changes after the pandemic (https://covid19.who.int/). In addition, Dugguh and Ayaga (2014) stress that communicating to employees how their work is essential to the overall enterprise's goals helps to make them motivated and satisfied. This is consistent with the results of other researchers, like Edery (2017) or Ghaffari et al. (2017) who confirmed that power and recognition towards an employee is a significant predictor of job satisfaction in the organizations they have investigated.

There is also slightly less need for *development* (V1) among respondents. **This result only partially supports Hypothesis 1, according to which development need is significant factor that affects job satisfaction.**

One explanation of this could be that middle management in many Polish companies does not value acquiring additional business knowledge from their employees and rather discourages business thinking. To this extent, a study reports that 67 percent of Polish managers believe that there is no need for continuous professional training (Kowal/Roztocki 2015). In essence, this middle managers' resistance to continuous training and education, which is essential for competitiveness in this global knowledge economy, could be seen as a relic from the communist past. Many decision-makers currently holding managerial positions in Poland were educated and started their careers in a centrally planned economic system. In this old communist system, there was no need for business thinking and initiative by young employees were suppressed, and individuals showing signs of excelling within a group were seen as destructive to socialist group harmony (Lange 2009).

However, managers' awareness of the crucial importance of the need to create conditions supporting the personal and professional development of employees, and of taking care of employee well-being as a means of boosting their job satisfaction can be increased through coaching, workshops and training activities. HR professionals should make efforts using different approaches to change the mindset of employees to ensure positive attitude toward their jobs (Behery et al. 2016).

According to the results of our research, employees' work requiring affiliation with the organization seems to have only a marginal impact on their job satisfaction. Concerning the design of jobs in terms of content and roles, we find that *cooperation* (V2) and *identification with the organization* (V3) are less important to employees, and no need to be the full focus of HR managers concerning surveyed employees. However, cooperation and identification with the organization should play a major role in the design of jobs and the selection of employees for certain tasks (Khaldoun 2020). **This result partially supports**

Hypothesis 2 stating that affiliation need is significant factor that affects job satisfaction. This issue refers to work design and the obtained result indicates that employees rarely value social relations at work.

One explanation of this could be seen in the situation in the job markets in emerging countries mirroring their phases of the transition process. Although the emerging economies are able to attract foreign investors, yet the difficulty in attracting and retaining headquarters of global players persists; while knowledge and technology is imported from developed countries than created (Kowal/Roztocki 2015). Furthermore, as many outsourcing initiatives have a commodity character and seek a cost advantage rather than a search for committed employees who identify with the company, they could often be conducted with the help of newly graduated, young employees. Consequently, the demand for uniquely committed, highly affiliated, experienced employees is flat and, as a result, many of the requests for development and social interaction in the workplace increase from these employees could be simply turned down.

For a reader convenience, Table 8 briefly describes the main findings concerning the proposed research hypotheses tests results based on the BN model scenarios presented in Figure 2.

Table 8. Hypotheses tests results

	Hypothesis	Evidence	Result
H1	Development need has significant impact on job satisfaction	Medium influence on job satisfaction (57 %)	H1 is partially confirmed
H2	Affiliation need has significant impact on job satisfaction	Medium influence on job satisfaction (54 %)	H2 is partially confirmed
H3	Power and recognition needs have significant impact on job satisfaction	High influence on job satisfaction (63 %)	H3 is confirmed
H4	Security need has significant impact on job satisfaction	High influence on job satisfaction (66 %)	H4 is confirmed

Source: Created by the authors based on the BN model (Figure 2).

7. Conclusion

7.1 Theoretical implications

The theoretical contribution of this study is manifested in two important aspects. First, all seven factors (V1-V7) shape an employee satisfaction. Approximately 70 % of respondents consider themselves as having a medium level of job satisfaction. Second, among the four needs discussed, the most effective way to improve the overall level of an employee's satisfaction is to improve *security needs*, followed by power and recognition needs. In other words, the level of an employee's satisfaction is more dependent on employment stability (V6),

remuneration and awards (V7), management support (V5), empowerment (V4) and development (V1) factors than cooperation (V2) and identification with organization (V3) factors. As a result, in devising a simple strategy to improve the level of an employee's satisfaction, it is more efficient to control *security* and *power and recognition* aspects than to control *development* and *affiliation* factors.

The research conducted and the results obtained fill the gap in the literature concerning the definition of the most important factors influencing the general level of employee job satisfaction in Polish companies, representative of an emerging economy located in Central and Eastern Europe. Our research confirms that the specific needs of employees (such as needs of development, affiliation, recognition and development) working in Polish companies and their attaching different importance to various aspects of work have affect their job satisfaction. Moreover, in our study, the authors used a new multivariate statistical Bayes network model to describe and examine the effects of four variables related to situational work factors on an employee's overall job satisfaction.

7.2 Practical implications

The practical value of this study is that its results can organizations design the most effective employer strategies for harmonizing the organization's and employees' values so to increase the retention rates. In this regard, predictive reasoning can be introduced to analyse the most effective employer strategies to increase the overall level of an employee's satisfaction.

These strategies might be useful in order to increase job satisfaction and further positive outcomes such as motivation, employee engagement, and high performance among workforces (Drabe et. al. 2015). Poland's approaching economic recession, shortage of funding, intense competition, and other similar factors after the COVID-19 pandemic period probably prevent organizations from fulfilling their employees' needs. Since these factors are beyond the control of any institution, managers can use these valid reasons (when applicable) to mitigate the negative effects of unmet needs. Prior research has demonstrated that providing employees with valid explanations/justifications (e.g., economic recession, shortage of funding) for negative outcomes/ events (e.g., layoff, not receiving a job offer) resulted in better employees' work attitude behavioural reactions and job satisfaction (Khaldoun 2020).

To conclude, the presented research provides implications that governments in emerging countries should pay more attention to continuously monitoring the factors that influence employee satisfaction. Moreover, by building and applying the multivariate statistical Bayesian Network supporting the investigation of an employee's overall level of job satisfaction, we contribute substantially to the literature on organization and management, because our theoretical assumptions

and empirical findings provide concrete recommendations for HRM. Our analysis has important implications for the formulation of HRM strategies, because the issue concerning which an employee's needs (development, affiliation, power and recognition, security) should be focused on organizational interventions in the form of people management practices seems to be rendered moot.

When the organization changes in response to negative external environmental changes, more reduced levels of job satisfaction are likely to occur (Behery et al. 2016). This is more significant in the context of turbulent pandemic times and recession, which necessitates organizations to implement changes that are not employee friendly. The present study supports the fact that, to avoid conflict and disillusionment, it is important that employers understand the need to enhance the factors that affect an employee's job satisfaction. Job satisfaction is a critical work level and should be given priority in HR practice.

8. Limitations and suggestions for further research

This research is a subject to several limitations. First, the survey is conducted in only one country. However, this study presents detailed instructions for the construction of the appropriate deterministic BN model. The model is general, and therefore it could be easily applied in the case of other countries. Conducting a survey in several similar countries would allow a comparison and generalization of the findings to other emerging economies. Second, in analysis, the authors did not specifically account for differences in the demographic profile of the participants such as gender and age. Another limitation stems from the fact that both the survey entities and respondents were not a representative group. Therefore, it would be worthwhile to expand the circle of research, which would make it possible to determine how individual factors affect employee satisfaction. In addition, data could be collected in a representative group of companies operating in specific – Polish – cultural conditions. On the one hand, this may be a limitation of the research, as it narrows the possibility of generalizing the results to other countries. On the other hand, however, it provides specific knowledge for this cultural circle. Finally, the authors are aware that the analyses cannot provide definitive conclusions as to the factors that affect job satisfaction in Poland because the BN model is rather simple. Hence, this research can be treated as a preliminary study of BN applications in HRM and social science in general. This kind of analyses could produce additional interesting results.

An important direction for further research could be a comparative investigation of the factors that influence an employee's satisfaction based on the survey presented in this study (before the COVID-19 pandemic) and a survey that will carry out after the COVID-19 pandemic period. In all likelihood, some of the Polish companies will be among the most affected by the worldwide recession. Many firms will have serious problems to survive the COVID-19 crisis period.

Moreover, as mentioned above, the similar research could be conducted for other countries, and it would allow to compare and generalize the obtained results.

These and the abovementioned recommendations represent primary routes for gaining further insights into the theoretical intricacies and practical implications for building a successful level of job satisfaction. The study and results are nonetheless a significant step forward in illuminating the needs of workforces and in choosing measures to satisfy these needs towards job satisfaction.

Acknowledgements

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