

Measuring Innovative Employee Behavior in an Enterprise – Methodological Aspects

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ABSTRACT

Innovativeness is currently one of the basic determinants of development and building competitiveness in modern organizations. It is conditioned by a number of factors, among which an important group are internal factors related to the activity and participation of employees in the generation, development and implementation of innovative ideas, among other things. Modern enterprises cannot limit themselves to active adaptation, but should themselves become innovative organizations characterized by skillfulness in creating, implementing and disseminating innovations. The aim of the study is to present the concept of measuring innovative employee behavior in the internal perspective of the organization. The article discusses the main methodological problems regarding the employee innovation measurement model. The implementation of the objective required reviewing the literature and developing an independent research model. The novel nature of the issues raised, together with the high relevance of the research problem at hand, prompted the need to pay special attention to the correct design of the research process. As the literature indicates, decisions made at the design stage of research, and further diligence in implementing those decisions, determine not only the quality of the research project itself, but more than anything, the credibility of the conclusions drawn on their basis.

Keywords: innovative behaviours, employee behaviours, stimulate innovations, research methods, scientific research

1. Introduction

In the era of increasing competition, companies are making efforts to become more competitive, also by increasing innovation, understood as the ability to implement new solutions in various areas of business operation. To this end, many organizations are seeking new sources of innovation that will stimulate and promote employee behavior beyond the traditional standards of task performance and achieved results. The importance of - and need for - proactive behavior among employees is stressed, which not only allows adaptation to changes, but also involves generating and implementing new solutions. Innovative employee behavior is considered key in ensuring the increase of the company's efficiency and survival (Nederveen Pieterse, van Knippenberg,

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Schippers, Stam, 2010), as well as its competitiveness (Ployhart, 2015). Arguments pointing to the need for innovative behavior in employees, which makes the organization perform better, are cited by various researchers in this field (Sameer, 2018; Turek, Wojtczuk-Turek, 2017; Bratnicka, Ingram, Wronka-Pośpiech, 2016; Ingram, 2016; Kraśnicka, 2016; Kraśnicka, Ingram, 2016; Głód, Kraśnicka, 2015; Kraśnicka, Głód, 2015; Ingram, Głód, 2014; Kraśnicka, Wronka-Pośpiech, 2014; Krot, 2014; Gableta, Bodak, 2014; Kheng, June, Mahmood, 2013; Kheng, Mahmood, Hamy Beris, 2013; Wojtczuk-Turek, 2012; Odoardi, Battistelli, Montani, 2010; Yuan, Woodman, 2010; Janssen, 2005; Janssen, 2003; Scott, Bruce, 1994).

Literature review indicates that innovativeness is associated mainly with technological processes, new or improved products, and organizational changes occurring in the company that tend to be situated in the context of changes in technology. The role of man, and their capabilities and psychological limitations, are underestimated in the processes taking place in enterprises. S. Borkowska (2010, p. 45) argues that "it is not clear why the role of soft factors, i.e. human resources, is not appreciated. It is a fairly common occurrence that human knowledge, creativity, openness to change, unexhausted learning skills, open communication and team collaboration are wasted [...]. The wise use of human resources in the development of innovativeness is particularly important in the absence of material and financial resources".

The ability to implement innovations, as indicated by C. Gubbins and L. Dooley (2014, p. 162), is currently becoming one of the canons of building competitiveness and of sustainable development. Organizations today must be innovative in order to work out competitive advantage in the market. This is to say they must be capable of creating innovations and implementing them. Man, as a member of the organization, plays the leading role in this process. Considering innovativeness in terms of its growth requires more focus than ever before on the staff element of the company, in line with the catchphrase "innovation by the people". The innovativeness of an enterprise is correlated with the innovativeness of its employees, meaning their ability to come up with new solutions. For an organization to develop, conscious creation of innovative work behavior is required, expressed in the pursuit of activities related to both the creation/promotion of new ideas (own or borrowed), as well as their bringing into being and implementation (Yuan, Woodman, 2010).

Employee innovation is best reflected in innovative organizations, and therefore those which encourage their employees to try out new ideas, activities (Hult, Hurley, Knight, 2004) and approaches regarding new and improved products (Luk, Yau, Sin, Tse, Chow, Lee, 2008). Innovative organizations are able to use the labor market and capital so as to bring potential innovations to fruition (Tellis, Prabhu, Chandy, 2009). In other words, innovation in an organization

stimulates innovative behavior in employees, who can then provide new products, services or processes (Dibrell, Craig, Hansen, 2011; Hurley, Hult, 1998), given that innovativeness prompts a strong desire to move away from existing practices and stimulates engagement in exploration and experimentation. Innovativeness in a company is not limited to the emergence of new ideas, products or processes, but it also implies their active implementation. Innovativeness encourages exploration of new fields, updates the company's position in the existing domain, and provides the ability to seek new opportunities (Kyrgidou, Spyropoulou, 2013).

The aim of the study is to present the concept of measuring innovative employee behavior in the internal perspective of the organization. The above goal was achieved through literature analysis and is reflected in the layout of the content of the study. The partial least squares structural equation modeling (PLS-SEM) was selected as a method to assess the innovative behavior of employees. The article discusses how structural modeling can be used to analyze data describing innovative employee behavior. The obtained desk-research material offers a rough overview of this technique's implications and presents the potential fields of application of structural equation models. Due to the complexity of the considered constructs determining the specifics of the research model, a decision was made to apply structural equation modeling (SEM). The method enables measuring and testing the directional relationship occurring between complex multi-dimensional theoretical constructs. The structural equation model describes and empirically tests causal relationships - between manifest and latent variables - identified against the backdrop of previous theoretical or partial empirical research. Unlike multivariate regression, it adopts the confirmatory, rather not exploratory, approach to raw data analysis. In addition, SEM, in contrast to multivariate regression, allows simultaneous estimation of a series of separately conducted but interrelated multiple regression equations. Importantly, the variable captured in the model can play the role of an independent and dependent variable in relation to other variables included in the model (Hair, Black, Babin, Anderson, 2014).

2. The concept and determinants of innovative employee behavior

Employee innovation, by analogy to organizational innovation, is understood as an ability or a tendency to generate and implement new solutions. It is expressed through innovative behaviors perceived as an unconventional, creative approach to performing tasks by modifying current and finding new, more effective and quality-guaranteeing ways of doing things. Innovative employees can identify opportunities - to modify processes, procedures, services, products, being able to find new applications for existing methods, materials or

equipment. They can not only generate new ideas, but also come up with solutions to current problems, therefore pushing forward the development of the organization as a whole (Moghimi, Subramaniam, 2013).

Literature analysis suggests good agreement exists as to what innovative employee behavior is. The vast majority of authors point out two common themes in this respect: generating ideas (creativity) and pursuing activities related to their implementation (Głód, Kraśnicka, 2015, p. 36). Innovative behavior refers to "[...] creating or adapting ideas and their subsequent implementation, starting from the problem recognition phase, all the way down to the phase of generating ideas and solutions" (Scott, Bruce, 1994, p. 581). Some authors emphasize this may take place at various levels of the organization (Kraśnicka, Wronka-Pośpiech, 2014, p. 116). Thus, the concept of innovative behavior encompasses both creativity (generating ideas - new and useful), as well as innovativeness understood as the ability to implement innovative solutions. Accordingly, innovative behavior follows a certain pattern which can be broken down into: exploration of possibilities, generativity, formative evaluation, propagation and defense, and application (Wojtczuk-Turek, 2012, pp. 28-29). Table 1 shows selected definitions of innovative employee behavior.

Table 1. An overview of selected definitions of innovative employee behavior

Author(s)	Content of definition
S.G. Scott and R.A. Bruce (1994)	a multi-stage process comprising two elements: creativity and implementation; it is a set of behaviors which consists of: generating ideas, promoting them, and implementing them
O. Janssen (2003)	intentional generation, promotion and implementation of new ideas created by employees in the workplace/organization that bring specific benefits to both the employee and the organization
J.P.J. de Jong and D.N.D. Hartog (2007)	behaviors involving activities related both to the creation/proposition of new ideas, as well as their bringing into being and implementation; innovation at individual level (in the workplace) is perceived as initiating and intentional introduction by employees (within a workplace, team or organization) of new and useful ideas, processes, products or procedures
H. Huhtala and M.-R. Parzefall, (2007)	a complex behavior consisting of generating, promoting and implementing an idea in order to achieve the organization's goals in a new way
M.-R. Parzefall, H. Seeck and A. Leppänen, (2008)	involvement in innovative behavior, which include behaviors related to the innovation process, i.e. idea generation, promotion and implementation, with the aim of generating innovation
C. Odoardi, A. Battistel and H.F. Montani (2010)	generating new and useful concepts, as well as experimenting and implementing ideas in the work space

M.M. Hammond, N.L. Neff, J.L. Farr, A.R. Schwall and X. Zhao (2011)	workplace innovations can be broadly understood as a process of generating ideas (creativity) and their implementation in the work setting
S. Aryee, F.O. Walumbwa, Q. Zhou and Ch.A. Hartnell (2012)	innovative employees gather and use a wide range of information to generate new ideas and improve existing innovation processes; behaviors closely linked with the employee's commitment and internal motivation

Source: Own elaboration based on the sources provided.

Based on the research presented in the literature, it can be assumed that innovative behavior is an intended generation, promotion and implementation of new ideas created by employees in the workplace, in the organization. Although this definition is predominant in contemporary studies, attempts have been made to further supplement it, such as that by O. Janssen (2003) who argued that these behaviors bring about specific benefits for both the employee and the organization. It is also worth emphasizing that some researchers are more concerned with the aspect of creativity, albeit they also touch upon topics associated with the implementation of creative ideas (Kraśnicka, 2016, p. 182; Carmeli, Schaubroeck, 2007).

Attention of researchers is also focused on the characteristic features of employees, which increase their propensity for innovative behavior in the workplace. Such attributes include: vigor (eagerness, zeal), dedication and commitment, as well as high energy, enthusiasm, goal-seeking, inspiration, mental resilience and persistence (Kraśnicka, Wronka-Pośpiech, 2014, p. 116; Aryee, Walumbwa, Zhou, Hartnell, 2012, p. 8). Among the skills and attitudes most often cited in the context of employee innovation, the following stand out (Karpacz, 2016; Czaplą, Świątek-Barylska, 2011, pp. 83-84):

- creative modification of work tools and organizational procedures to perform tasks, improve work techniques and look for new improvements, innovative concepts;
- open-minded thinking - overcoming stereotypes and patterns, coming up with new ideas and solutions that are embedded in the company's situational context and capabilities;
- creating new solutions, recognizing different alternatives and possibilities for action, thinking outside the box, as well as developing, improving and enriching others' ideas;
- displaying creative behavior also towards everyday routine tasks and searching for ways to improve them, not accepting the status quo, continually questioning the work methods and showing the willingness to try out new approaches.

Among the expected attitudes, apart from the abovementioned open-minded thinking and approach to tasks, pro-activity, focus on cooperation and sharing knowledge and experience, analysis of the way employees shows that innovativeness is indicative of the increasing importance of openness to the use of intuition and diversified thought models.

There are many factors determining the innovative behavior of employees, and they relate both to the employee themselves (subjective) as well to the organization. The subjective factors include personality traits, psychological capital, knowledge, personal skills, motivation and commitment (Aryee, Walumbwa, Zhou, Hartnell, 2012). The organizational factors, on the other hand, refer primarily to the impact of organizational culture (Martins, Terblanche, 2003) or organizational climate (Chien, Tsai-Fang, Chin-Cheh, 2013, p. 147; Wojtczuk-Turek, 2012, pp. 79-92). The conducted literature review shows that the models of determinants of innovative employee behavior usually explore selected factors as part of the research (Table 2).

Table 2. A list of selected research models of innovative behavior

Author	Factors included in the model (independent variables)	Dependent variables
E.C. Martins and F. Terblanche (2003)	strategy, structure, support mechanisms, behavioral patterns encouraging innovation, communication - as determinants of pro-innovative organizational culture	creativity and innovations
K. Zdunczyk and J. Blenkinsopp (2007)	dimensions of strategy, structure, support mechanism, and behavioral (behavioral patterns - values)	creativity and innovations as learning dimensions (higher-level learning)
S. Aryee, F.O. Walumbwa, Q. Zhou and Ch.A. Hartnell (2012)	transformational leadership, importance of work and responsibility as viewed by employees (as a direct outcome of leadership), employee engagement, relations between the leader and subordinates (mediating variable)	innovative behavior (and how it relates to performance)
Y. Chien, Y. Tsai-Fang and Y. Chin-Cheh (2013)	organizational climate conducive to innovation, knowledge sharing (a two-level model, including the organizational and individual level)	innovative behavior
Y.K. Kheng, R. Mahmood and S.J.H. Beris (2013)	pro-innovative organizational climate, relations between the leader and subordinates, social capital	innovative behavior at work
Wojtczuk-Turek	subjective factors, pro-innovative	innovative behavior at

(2012)	organizational culture, leader's behavior (leadership), organizational commitment factors, practices in human capital management, barriers to innovation	work
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Source: own study based on: Kraśnicka, Wronka-Pośpiech, 2014; Wojtczuk-Turek, 2012; Chien, Tsai-Fang, Chin-Cheb, 2013; Kheng, Mahmood, Beris, 2013; Aryee, Walumbwa, Zhou, Hartnell, 2012; Zdunczyk, Blenkinsopp, 2007; Martins, Terblanche, 2003.

Empirical studies of determinants of innovative behavior confirm that it is influenced by both subjective factors (e.g. competences, psychological capital, personality traits, or expected performances (Wojtczuk-Turek, 2012, p. 169) and organizational ones. Among the latter, a strong impact on organizational behavior is exerted by pro-innovative organizational culture (Wojtczuk-Turek, 2012, p. 169) or different dimensions of leadership (Kraśnicka, Wronka-Pośpiech, 2014, pp. 118-119; Aryee, Walumbwa, Zhou, Hartnell, 2012, pp. 11-12).

An example of a comprehensive set of determinants of creativity and innovation is a model proposed by E.C. Martins and F. Terblanche (2003, p. 70), which accounts for strategy, support mechanisms, behavioral patterns encouraging innovation, and communication. In the 1990s, research on individual innovative behaviors of employees identified the following determinants: leadership, team relations, individual characteristics such as problem-solving styles and a psychological climate conducive to innovation (Scott, Bruce, 1994). In later studies covering the team and individual level, the features of work teams were taken into account, including e.g. diversity of qualifications, skills (Camelo-Ordaz, Fernández-Alles de la Luz, Martínez-Fierro, 2006). In what concerns the most recent research in this area, the influence of leaders and leadership on innovative employee behavior (including transformational leadership, importance of work and responsibility as viewed by employees, employee engagement, relations between the leader and subordinates) are also considered (Głód, Kraśnicka, 2015, p. 38; Aryee, Walumbwa, Zhou, Hartnell 2012; de Jong, Hartog 2007).

The cited research results confirm the complexity of determinants of innovative employee behavior, pointing to the need to look for multidimensional tools to measure employee innovation. One of the methodological challenges for researchers in this field is to ensure the reliability of research findings based on a subjective (and currently predominant) measurement methodology (Blindenbach-Driessen, Van Dalen, Van Den Ende, 2010). Proper measurement of the phenomena under consideration is pivotal for meeting the basic requirements of the methodological rigor of the conducted research (Czakov, 2014) and a prerequisite for eventual reliability and validity of results, and by extension, for the quality of the knowledge created (Venkatraman, Grant, 1986).

3. Application of structural equation modeling to assess innovative employee behavior

While the definition of the concept of innovative employee behavior does not raise too many reservations, its measurement alone is no longer so unambiguous. Due to its complex nature, this construct requires application of the structural equation modeling methodology (Klimas, 2019; Światowiec-Szczepańska, 2015; Bedyńska, Książek, 2012).

It is assumed that the proper preparation of tests is the most important stage of the research procedure (Hinkin, Tracey, Enz, 1997; Venkatraman, Grant, 1986). Methodological requirements for the outline of the research process determine the quality, reliability and validity of both the research itself and the collected empirical material, and hence – of results derived from analyses, of formulated interpretations, and of the conclusions drawn on their basis. It is worth noting that the aspects concerning methodological rigor (Czakon, 2015) were not the only reason for initiating a more profound discussion or providing a more thorough description of the methodological choices, nor the effects of these choices. A methodical description of the research procedure and its subsequent components is also the basis for the possibility of undertaking replication research, which is of immense value to the verification of newly created knowledge, since, as aptly put by K.R. Popper, "singular, individual events [*note: empirical studies*] are of no meaning to science" (1977, p. 74).

The scales developed by Y. Khar Kheng, R. Mahmood, S.J. Hamy Beris (2013) and F. Yuan, R.W. Woodman (2010) will be used to study the level of innovative behavior in employees. Based on literature analysis, it was assumed that individual innovation in employees is a multidimensional construct made up of two dimensions: (1) intentions (wishes, desires) of employees regarding innovative intention: innovation propensity, involvement in company growth, creativity and empowerment, willingness to take challenges and risks; (2) an innovative work environment that provides the necessary support for implementing innovations: an organizational culture supporting innovativeness, i.e. ensuring the availability of resources and the ability to translate ideas into business ventures, encouraging taking risks, creating and sharing knowledge, marked by autonomy and cooperation; support from managers - assistance in the implementation of ideas, friendly leadership, mentoring. In addition, the structure of these dimensions allows to separate two subcategories of a pro-innovative approach in employees: the generation and the implementation of ideas that favor innovativeness.

The research assumes that both variables co-creating the conceptual research model are multidimensional latent variables that are directly immeasurable. However, individual questions included in the measurement questionnaire will be

recognized as single, objective, observable and measurable indicators for a given unobservable variable.

Typical for economic research, the reflective nature of the correlations between measurable and latent variables indicates that specific latent variables are a reflection of the sets of measurement indicators identified for them. The proposed operationalization is the result of exploratory investigations, hence it is necessary to test the validity of the measurement assumptions adopted in it.

To evaluate the research model, the partial least squares path model using raw data from the PLS-PM was selected. This method is considered to be a "soft" alternative to traditional structural equation modeling (SEM) and it allows to overcome excessively restrictive assumptions related to variable distributions and key problems of the model's theoretical specification (Sagan, 2018; Hair, Sarstedt, Pieper, Ringle, 2012). The PLS-PM is less restrictive in terms of assumptions than the traditional SEM. In particular, the PLS-PM enables analysis of more complex models with a greater number of latent or measurement variables in relation to the number of observations (Assaker, Hallak, Vinzi, O'Conner, 2013).

Given the above, the point of departure for the model is: (1) to determine the linear correlations of latent variables (here: employee intentions regarding innovative behavior and innovative work environment), (2) to assign latent variables to observable variables describing their level and determining the nature of the latter.

Parameter estimation for the PLS-PM model will concern estimation of the parameters of the measurement (external) and structural (internal) model. The internal model describes the relationships occurring between the latent variables, while the external model described the relationships between the latent variables and the observable variables describing their level. The internal model will have the form of a system of econometric equations, while the external model will consists of two correlations: ratio (weight) and reflection (mirror). The ratio correlation allows estimating the level of unobservable variables, while the reflection correlation measures the level of reflection of individual latent variables against their respective observable variables. The study assumes that all variables assigned to particular latent variables are reflective (Paliszkievicz, 2019).

The iterative method of the PLS will be used to estimate the parameters defined in the correlation model. The results obtained from estimating the level of latent variables will be used to estimate the parameters of the internal model. To this end, the Classical Least Squares Method (CLSM) will be used, in which individual equations are treated as single regressions. Parameters of the reflection correlation will also be estimated using this method. Having said that, the CLSM does not assume the independence of observable variables or their distribution, nor does it assume the distribution of the random component. Lastly, there are

also no restrictions as to the size of the sample or the scale of the measurement (Vinzi, Trinchera, Amato, 2010; Gatnar, 2003; Rogowski, 1990).

Testing the quality of the model is a very important part of its design, hence the following aspects will be evaluated (Osińska, 2014, p. 74): the quality of the external model, the quality of the internal model, the model as a whole, the significance of parameter estimation. Obtaining a good quality model is not perceived as a proof, but rather as a confirmation that the presumed correlations may indeed arise (Osińska, 2014, p. 74). The quality of the external model is evaluated based on the measures of reliability and validity as well as the homogeneity of the scale. Meanwhile, evaluation of the reliability of variable selection is made on the basis of Cronbach's alpha, Dijkstra-Henseler's rho and Jöreskog's rho. All quality indicators assume values within the range [0; 1]. If all variables assigned to a latent variable are not mutually correlated, then the above measures assume zero values. If all variables are perfectly correlated, the measures take values equal to one. It is assumed that the variable set assigned to a latent variable is reliable if the values of the above measures are greater than 0.7 (Paliszkiewicz, 2019).

Convergent and discriminant validity are tested by the AVE measure (where AVE stands for average variance extracted) and the Fornell-Lacker criterion, respectively. The AVE determines the average percentage of variance of individual observable variables, explained by the latent variable they describe. This measure evaluates only the quality of individual reflective correlations. Values above 0.5 indicate the level of common variance, appropriate for reflective indicators (Bagozzi, Yi, 1988). In the Fornell-Lacker criterion, discriminant validity is confirmed when the medians of the separated variance are higher than the coefficients of correlation with other latent variables.

Last but not least, significance of the parameters is evaluated. However, the use of the PLS-SEM method makes it impossible to use traditional statistical tests for this purpose. In the literature, methods based on resampling schemes can be found, allowing to determine the approximate significance of variables in a model. These include the bootstrap technique and the jackknife technique.

Conclusion

Structural Equation Modeling, and especially its more recent version - PLS-SEM, is being increasingly used for data analysis in economics. It is certainly worth encouraging researchers to apply this statistical technique more widely, as it provides more opportunities than the traditional methods, especially when it comes to constructing and testing complex models of innovative employee behavior. Structural Equation Modeling is gradually replacing conventional statistical techniques, such as correlation analysis, regression analysis or median

equality tests (e.g. analysis of variance, ANOVA), whose main disadvantage is the lack of comprehensive causative modeling. Structural modeling, on the other hand, enables the designing of models that account for latent (unobservable) variables, formative variables, indirect outcomes and inter-group comparisons (Lowry, Gaskin, 2014). It should be emphasized that the starting point for the application of structural modeling should always be a theory assuming the existence of specific correlations between analyzed variables (Bedyńska, Książek, 2012). Models for innovative employee behavior are too complex to be studied by traditional statistical techniques. As a consequence, many researchers are limited to testing only small components of these models, instead of obtaining a full picture of the underlying theory. Another advantage of structural modeling, as compared to traditional statistical techniques, is the possibility of including latent variables in the model, meaning constructs resulting from the summary of several statements contained in the questionnaire (observable variables). What additionally speaks in favor of the SEM is the ability to simultaneously test indirect (mediation analysis) and direct correlations between a large group of variables. This makes it possible to estimate not only simple correlations, but also to analyze the strength of one variable's influence on another (similarly to regression analysis) (Kacprzak, 2018). In traditional statistical techniques, reliability and validity of a research tool must be assessed separately before proceeding to proper analysis. Structural modeling, meanwhile, allows for simultaneous evaluation of a research tool (measurement model) and of a theory being tested (structural model). This is all the more important since the high validity of a single scale may differ from the theory when measured separately and in isolation, if other scales referring to the same theory were used in its measurement.

All these advantages of structural equation modeling are of particular importance to researchers tackling the many different topics of behavioral sciences, an example of which is innovative employee behavior. In such research, complex correlations between variables and measurement barriers often arise.

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