Psychological Test Development: Innovative Behavior at Work for Startup Employee

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Abstract

The majority of Indonesia's startup companies failed during the early phase of the company. One factor contributing to this failure is the lack of Innovation brought up by the company. Human resource in the company plays an important role in fostering Innovation. Studies showed employee innovative work behavior is the main factor that drives company innovation. This research aims to construct Innovative Behavior at Work scale that is reliable, valid, have good items and norms for score interpretation purposes. The research subjects were an employee who works in a startup company. The result showed that the scale has high internal consistency, valid, and the items discriminate individual capabilities. The norm used in this scale is within group norms with a standard score of M=10 and SD=3.

Keywords: human resources, innovative work behavior, psychological test construction, startup company, startup employee

Abstrak

Sebagian besar perusahaan startup *di Indonesia mengalami kegagalan pada fase awal berdirinya perusahaan. Salah satu faktor penyebab kegagalan ini adalah kurangnya inovasi yang dimunculkan oleh perusahaan. Sumber daya manusia dalam perusahaan startup berperan penting dalam mengembangkan inovasi yang hendak dimunculkan. Berdasarkan studi, perilaku kerja inovatif karyawan adalah faktor utama dalam mendorong inovasi perusahaan. Penelitian ini bertujuan untuk membuat alat ukur Perilaku Inovatif dalam Bekerja yang reliabel, valid dalam mengukur perilaku kerja inovatif, memiliki item-item yang baik, dan memiliki norma yang dapat digunakan untuk menginterpretasi skor. Partisipan dalam penelitian merupakan karyawan perusahaan startup. Hasil menunjukkan alat ukur ini memiliki konsistensi internal, valid, dan diskriminasi item yang baik. Norma digunakan dalam menginterpretasi skor alat ukur PIB adalah within group norms dengan* standard score *M=10 dan SD=3.*

Kata kunci: *karyawan startup, konstruksi alat ukur psikologis, perilaku inovasi, startup, sumber daya manusia*

Introduction

Along with rapid technological development in the world, Indonesia's digital industry is also developing, as shown by the emergence of digital startup companies pioneered by young people (Dessyana & Riyanti, 2017). Startup companies are young, innovative, growth-oriented businesses searching for a sustainable and scalable business model (Dee et al., 2015). Three aspects characterize startup companies; established in less than ten years, focused on Innovation, and have a target to grow (European Commission, 2018).

Startup companies can be said to have unfavorable conditions because they indirectly compete with products or services from companies that already exist in a market. However, startup companies are often characterized by a high level of Innovation that has the potential to be superior to established companies (Gimenez-Fernandez & Beukel, 2017). Innovation that will be born by startup companies might be a threat because of its novelty and lack of experience to be used as a reference. Startup companies need to find or develop an innovation that can be adapted to the available resources to minimize that risk.

Varied innovations along with appropriate resources can help a company to outperform competitors and improve company performance (Zhou & Verburg, 2020). Waenink (2012) stated that Innovation requires a variety of behaviors from individual employees. Companies will face the needs of their environment to participate in innovative behavior to compete in an industrial market (Ramamoorthy et al., 2017). Munir & Beh (2019) argued that innovative behavior is the main pillar that supports a business in capturing a competitive market. In addition, employees' innovative behavior is a determinant of the competitive nature and performance of a company or business (Bibi et al., 2020).

Innovative behavior is behavior that forms a new idea and its implementation (Sulistiawan et al., 2017). Innovative work behavior can be interpreted as a process that includes the formation of ideas (creativity) and applying these ideas in the work context (Hammond et al., 2011). Innovative behavior has stages that require the formation of a new idea (creativity aspect), but innovative behavior also means the formation of a solution that can use the existing system first and apply it to a new situation or context (Hammond et al., 2011).

Innovative work behavior activities require the efforts of employees and the company's management team to identify issues in the business, form or develop new ideas, and implement those ideas (Munir & Beh, 2019). This is done by collecting and considering a variety of information to form a new idea and improve existing work processes (Tesluk et al., 1997). Startup companies must be able to select human resources according to the needs of the startup company itself, where the emphasis in this study is the innovation aspect because basically, human resources that are not by the startup needs will worsen the startup condition itself (Jaya et al., 2017).

In practice, not all companies can be successful in innovating. Based on research by the Center for Innovation and Collaboration (CIC) in 2014, as many as 26.5% of companies did not continue the Innovation they wanted to bring, and one of the factors causing the failure to innovate was caused by the competence of human resources within the company (Aryanto et al., 2015). Individual employees' role is important in carrying out sustainable Innovation (De Jong & Den Hartog, 2010). Rohida (2018) stated that human resources play a role in determining the direction and progress of an organization. Startup companies need to consider human resource management in their organizational structure to be able to design and implement an innovation that is beneficial for the company. Zhou & Verburg (2020) stated that startup companies, especially in the technology sector, will benefit greatly if companies are more aware of the influence of their human resources on the development and performance of the company.

The reality in the startup world, only 1% of startup companies can survive. As many as 13% of startup companies fail in their first year, and some others fail two to five years after. One of the factors that cause failure in most startup companies is the lack of Innovation (Figueiredo, 2013; Winosa, 2019). To develop Innovation, startup companies need to focus on human resource management and employee quality within the company itself (Harel et al., 2003; Rohida, 2018; Sirotek & Firlus, 2016). Startup companies need to identify and understand the characteristics of their employee so that companies can foster a culture of innovative behavior (Hardja et al., 2020). Startup companies' employee innovative behavior is a step to obtain beneficial Innovation that supports a business to catch up with a competitive market.

Nowadays, the measurement of innovative behavior has not become commonplace for companies to use. Available innovative behavior measurement tools as published by De Jong & Den Hartog (2008;

2010) contain 17 items that are based on previous innovative behavior studies (Janssen, 2000; Kleysen & Street, 2001; Scott & Bruce, 1994) filled in by the supervisor regarding the innovative behavior of their employees. The author considers that the measurement of innovative work behavior only describes aspects of innovative behavior in general, does not fully describe innovation activities, and presents biased judgment of others. So far, no innovative behavior measurement tool specifically targets startup employees as a reference in making measurement tools. The author considers that it is necessary to measure the innovative behavior of startup company employees that includes aspects of innovative behavior more specifically that can explain the innovative behavior of startup company employees in the form of self-report.

The objective of this study was to obtain an Innovative Behavior at Work (PIB) scale that is reliable, valid, has good items, and has norms that can be used in interpreting the score. This research also contributes to the study of startup companies specifically in the context of human resources in startup companies. Practically, this scale is expected to be one of the measurements in diagnosing and evaluating innovative behavior in working for employees.

Innovative Behavior

Innovative behavior is a construct that is widely discussed in the field of industrial and organizational psychology and management. The innovative behavior construct is said to be similar and closely related to the employee creativity construct, but innovative behavior is expected to have a beneficial outcome (De Jong & Den Hartog, 2008).

De Jong & Den Hartog (2008) defined innovative behavior as individual behavior aimed at achieving a deliberate initiation and recognition (in a job, group, or organizational role) of a new and useful idea, process, product, or procedure. De Jong & Den Hartog (2008) also explained the innovative behavior dimensions that were previously stated by other researchers such as Scott & Bruce (1994) dan Kanter (1998). The dimensions explained by De Jong & Den Hartog (2008; 2010) are (1) Opportunity/idea exploration, (2) Idea Generation, (3) Championing, and (4) Implementation/application.

The author uses the definition of innovative behavior made by De Jong and Den Hartog (2008) to consider that the definition presented by De Jong & Den Hartog is considered current, and the study has a sample with similar characteristics to employees of startup companies. Participants in the study of De Jong & Den Hartog (2008) were knowledge workers in small companies that have a business scale and characteristics similar to startup companies.

Dimension of Innovative Behavior at Work

The first dimension of innovative work behavior is Opportunity/idea exploration, which is an effort to find a new way (new idea) to increase a product, service, or work process. Opportunity/idea exploration requires individual effort to identify a problem or need in context at work (De Jong & Den Hartog, 2008; Dorenbosch, Engen, & Verhagen, 2005; Messman & Mulder, 2012). The second dimension is idea generation which refers to formation/concept formation to improve. Idea generation dimension related to product, service, or new process (De Jong & Den Hartog, 2008). Idea generation is behavior that is shown to generate new ideas and is beneficial to developing or increasing products, processes, or companies' services.

The third dimension, championing, is an effort to find support and coalition to realize the Innovation (De Jong & Den Hartog, 20018; 2010). Anderson & Bateman (2000) argue that championing requires individual effort to make an innovative idea becomes attractive so that it can be offered to the department/company decision-maker. The last dimension is Idea implementation/application, which is the stage where an innovative idea or Innovation itself becomes a part of daily work. Idea implementation

includes behavior such as developing a product, or work process and piloting that Innovation (De Jong & Den Hartog, 2010; Kleysen & Street, 2001).

Factors that Influence Innovative Work Behavior

Several factors can influence innovative behavior. Sulistiawan, Harachwati, Permatasari, dan Alfirdaus (2017) found that employees that have good relationships with superiors tend to believe that innovative behavior shown will increase positive views of the employee. A strong relationship between employees and superiors provides support for employees showing innovative behavior. Ramamoorthy, Flood, Slattery, and Sardessai (2005) suggested that job autonomy can predict innovative behavior. Autonomy in work allows employees to experience 'trial and error and find more effective ways of doing work.

The work engagement construct was found to be associated with a variety of positive outcomes for the organization, especially in the context of employee productivity (De Spiegelaere et al., 2014). Work engagement involves three main aspects; absorption, vigor, and dedication. Innovative behavior involves the creation of new ideas, which make employees concentrate and be absorbed in their work (absorption). Innovation also brings uncertainty that can distract employees from their work (vigor). In making an innovation idea a reality, employees need to dedicate themselves to their work (dedication) (Agarwal et al., 2012).

Methods

The population in the development of the PIB scale are employees of startup companies. The sample of this study are employees in startup companies with at least two-month experience, which is the period that is needed for adaptation to the organization (Gajda, 2019). The sampling technique used is convenience sampling, where participants are selected based on their willingness to respond to the study (Gravetter & Forzano, 2011). The number of participants obtained was 83 (35 males), and the majority had Bachelor's education (77.1%).

The PIB scale is intended for use by startup companies parties as one of the employees' performance evaluation methods (**Table 1.**). This scale is categorized as a typical performance test in form of a self-report where participants will respond to items based on the participant's self-conformance with the statement on the item (Cohen & Swerdlik, 2009; Kaplan & Sacuzzo, 2009). The author uses a 5-point Likert scale.

The items in the scale are arranged based on behavioral indicators derived from the definition of dimensions described by De Jong & Den Hartog (2008). In addition, the author has compiled several similar studies on innovative behavior (Andersson & Bateman, 2000; Day, 1994; Dorenbosch et al., 2005; Janssen, 2004; Kleysen & Street, 2001; Messman & Mulder, 2012; Shane, 1994;) as well as conducted interviews with a startup company owner as an additional reference to arranged the indicators. The author does item pooling twice the target number of final items on the scale (Cohen & Swerdlik, 2009; Gregory, 2004).

Innovative work behavior is individual behavior that aims to achieve an intentional initiation and recognition (in a role, group, or organization) of a new and valuable idea, process, product, or procedure (De Jong & Den Hartog, 2008; 2010). The author used internal consistency with Coefficient Alpha in testing the reliability and used convergent evidence by correlating the PIB scale with other instruments that measure the same or similar constructs in validity testing (Cohen & Swerdlik, 2009). The authors correlate the results of the PIB scale measurement with the measurement of work engagement as one of the theoretically related constructs, such as the study of Hakanen et al. (2008) who found that work engagement is correlated with innovative behavior. The measurement of the work engagement construct that will be used is the UWES-9 Indonesian version adapted by Kristiana, Fajrianthi, and Purwono (2018) which is valid based on evidence of the internal structure with CFA which produces an RMSEA

value of .049, a CFI of .99, and a GFI of .97. The results of the CFA calculation meet the fit indicator (RMSEA) < .05, Comparative Fit Index (CFI), & Goodness of Fit Index (GFI) > .95 which indicates an acceptable fit (Hu & Bentler, 1995).

Table 1. Construction of the PIB Scale

Dimension	Indicator	Number of Items
Opportunity/Exploration: Look for ways or opportunities to improve services and alternative methods related to work processes, products, or services.	Look for opportunities to innovate in solving problems at work	2
	Look for opportunities to innovate to develop conditions that are beneficial to the company.	2
Idea Generation: Create a concept to improve performance and solve a problem.	Combine and rearrange information and concepts in solving a problem.	2
	Combine and rearrange information and concepts to improve performance.	2
Championing: Gain support by offering ideas.	Offer ideas to colleagues and superiors for approval and support for the idea.	4
Application: Application of ideas in daily work.	Demonstrate the proposed new idea.	2
	Apply new ideas at work.	2

The author conducted a qualitative and quantitative item analysis on the Innovation Behavior at Works scale. Qualitative item analysis was carried out on the content and writing of the items (Anastasi & Urbina, 1997). The author reviews the accuracy of the operationalization of constructs and dimensions into indicators and items. The author conducted a quantitative item analysis using the item-discrimination method with the corrected item-total correlation technique. The value limit used in determining good item discrimination ($r \geq .3$) refers to Nunnally & Bernstein (1994). In setting the norms, the author uses within-group norms with a standard score that shows the distance between a test score and the mean in standard deviation units (Gregory, 2004), in this case using a standard score with $M = 10$ and $SD = 3$.

Results and Discussion

Results

In the initial testing with 31 items, the result showed the reliability value of the PIB scale was $\alpha = .878$. The author then analyzed item discrimination and reviewed the items qualitatively. Based on the results of the item analysis, 24 items had good discriminatory power in differentiating individuals ($cr_{it} > .3$). The other seven items indicated weak discrimination power ($cr_{it} < .3$). A total of 24 items with good discriminatory power were selected to represent each dimension proportionally. The integrative item analysis was done to determine the final version of the PIB scale with 16 items.

In the final item (16 items) testing, the PIB scale reliability α = .911 was obtained. This value indicates that the PIB scale has high internal consistency and the items are homogeneous in measuring one construct. The calculation of the standard error of measurement on the PIB scale was 2.68.

The author tested the validity of the PIB scale with convergent evidence. The scores of the 16 selected items were correlated with the scores of the Indonesian version of the UWES-9. The results of the correlation between the two scale showed a significant relationship, $r = .403$ ($p < .01$, N = 83). The normality test using the Kolmogorov-Smirnov test found that the data were normally distributed. Based on **Table 2.** the author performs a linear transformation to formulate norms by calculating the standard score ($M = 10$, $SD = 3$).

Discussion

Based on the result of the reliability test, it is known that the reliability coefficient has improved on the final version of the PIB scale, although Urbina (2004) stated that the alpha coefficient will increase if the number of items from the scale increases or when the ratio of item score variation to the total score variation of the scale decreases. The increase in the reliability coefficient by eliminating 15 items was carried out through qualitative and quantitative integrative item analysis on items that had low discrimination.

Evidence of validity was obtained based on the results of a high and significant correlation between the PIB scale and the work engagement scale, which is a construct associated with the construct of innovative behavior. The significance of the relationship between the two constructs is supported by Agarwal (2014) who found a positive relationship between work engagement and innovative work behavior. Similar to Park et al. (2014) who found a relationship between the two constructs where employees with high levels of work engagement tend to seek new and innovative ideas and seek to improve company effectiveness. Moreover, Chughtai & Buckley (2011) found that when an employee experiences positive emotions in the form of work engagement, they can be motivated to learn about new things which in this case affect job performance and innovative behavior shown by employees.

Based on the results of the construction of norms, it is known that the scores obtained by the participants in the study are said to be relatively high. This happens because the sample from this study is a startup company employee where startup employees are expected to show highly innovative behavior (Anjani & Gatari, 2019). In addition, a startup company is said to be a small and medium-sized business so it is assumed that employees will often be involved with various parties and varied work activities. Hardja et al. (2020) found that most startup employees feel that teamwork (company and employees) encourages employees within the company to think critically which will indirectly be an impetus in creating creative ideas and developing employee innovative behavior.

Table 2. Norms of the Innovative Behavior at Work Scale

Standard Score	Raw Score
16	79 - 80
15	76 - 78
14	73 - 75
13	70 - 72
12	67 - 69
11	64 - 66
10	61 - 63
9	58 - 60
8	55 - 57
7	52 - 54
6	49 - 51
5	46 - 48
4	43 - 45
3	40 - 42
2	37 - 39
1	16 - 36

Conclusion

This study aims to develop an innovative work behavior scale that is reliable, valid, has good items, and has norms that can be used to interpret the scores obtained. Based on the results of the psychometric test, it is known that the PIB scale is reliable with a high internal consistency value and is homogeneous in measuring the same construct. The PIB scale is valid in measuring innovative work behavior based on convergent evidence using the Indonesian version of the UWES-9. Items in the PIB scale are also known to have good discriminatory power so they are said to be able to distinguish between individuals with high and low levels of innovative work behavior. The PIB scale also has norms that can be used to interpret the scores obtained from the PIB scale.

Limitations

In developing this scale, the author realizes that there are some limitations. The first is the relatively small number of participants (N=83) obtained by convenience sampling where the sample is less representative of the population of startup company employees in Indonesia whose exact number is unknown. Moreover, startup companies, especially digital-based ones, are heterogeneous (Hardja et al., 2020). The author suggests increasing the number of participants and considering the various fields of startup companies to get a better picture of innovative behavior in the context of the lives of startup employees.

Second, the development of the Innovative Behavior at Work (PIB) scale only went through one stage of testing (tryout) on a relatively homogeneous sample. So there is a possibility that there will be a more varied spread of scores when tested on samples with heterogeneous characteristics. The authors suggest testing the PIB scale on a heterogeneous sample and providing additional validity evidence with the contrasted group method which shows that the scores obtained by a measuring instrument can be predicted to change when applied to groups with theoretically different characteristics (Cohen & Swerdlik, 2009).

Third, the PIB scale is an instrument in the form of a self-report response, which means that the scale is filled in by the test taker themself. The author considered that individuals know and understand more about the individual's work activities themselves and avoid bias in the judgment of others against the individual concerned (Janssen, 2000). However, Sulistiawan et al. (2017) argue that innovative behavior is a variable that can be socially affected in the sense that there is a possibility that individuals will be involved in an innovation process if the involvement is considered a positive behavior.

According to De Jong & Den Hartog (2008; 2010), innovative behavior at work is unidimensional so that it simultaneously forms an innovative work behavior itself. However, the authors suggest doing factor analysis testing by increasing the number of participants. The author also suggests using job performance appraisals or employee engagement assessments in an innovation project (Scott & Bruce, 1994) as validation of the measurement of this innovative work behavior.

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Appendix

Dimension	Item
Opportunity Exploration	I recognize that there are problems outside of my job that can be solved by Innovation.
	I found the opportunity to do Innovation in solving problems at work.
	I feel motivated to innovate a product that belongs to the company.
	I am motivated to innovate in work activities within the company.
Idea Generation	I break down aspects of problems and rearrange them to create solutions.
	I use the knowledge I have about a problem to create new solutions.
	I use novelty outside of usual procedures to improve my job performance.
	I add new aspects to a job to improve the result of the job.
Championing	I show my innovative idea to my colleagues and my superiors to gain their support for the idea.
	I discuss the result of my innovative idea that I found with my colleagues and my superiors to gain their support.
	I present my findings at meetings of my work department to gain support from members of the department.
	I give a suggestion related to my idea on a work activity with to gain support for the idea.
Application	I put new ideas into practice that can already be used in a job.
	I try out the idea I found in a job.
	I make changes to the work methods commonly used in a job with my findings.
	I use my findings on the company's products.