Exploring the effects of individual innovativeness dimensions on performance: a study with pharmaceutical managers*

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Cite this article as: Tarhan, N., & Sar, S. (2021). Exploring the effects of individual innovativeness dimensions on performance: a study with pharmaceutical managers. İstanbul Journal of Pharmacy, 51(2), 256-262.

ABSTRACT

Background and Aims: Innovation is a crucial factor for individuals and businesses, particularly in the period of Industry 4.0. The objectives of the present study are to explore the factor structure of the Individual Innovativeness Scale (IS) in a manager sample, and then to investigate the dimensions’ impact on performance.

Methods: A questionnaire was administered to managers in the pharmaceutical industry. Factor structure of the Individual Innovativeness Scale was determined via exploratory and confirmatory factor analyses. Afterwards, impacts of the dimensions on performance were assigned.

Results: After exploratory and confirmatory factor analyses, three dimensions emerged: resistance to change, openness to experience, and opinion leading. The regression model showed that opinion leading and openness to experience were significant predictors of performance.

Conclusion: The IS is three dimensional in the pharmaceutical manager sample. Performance of pharmaceutical managers are affected from opinion leading and openness to experience. This paper has both theoretical and practical contributions.

Keywords: Individual innovativeness, openness to experience, opinion leading, resistance to change, performance

INTRODUCTION

Innovativeness is becoming increasingly important especially in the Industry 4.0 era. Kagermann et al. (2013) reported that Industry 4.0 is generally referred to as the fourth industrial revolution (Grzybowska & Łupicka, 2017). It leads to new technologies, processes, and important changes in business life (Horváth & Szabó, 2019). Kovács (2017) stated that technical feasibility and social acceptability have an impact on the success of Industry 4.0 (Horváth & Szabó, 2019). The pharmaceutical sector has rapid growth, more qualified managers are needed in the fourth industrial revolution (Grzybowska & Łupicka, 2017), and innovation is an important growth factor for the pharmaceutical industry (Schuhmacher, Germann, Trill, & Gassmann, 2013).

Innovation means generating new knowledge and ideas, as well as adopting external practices and processes and applying them (Scott & Bruce, 1994; Gu, Duverger, & Yu, 2017). According to Rogers (2002), innovation is “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” and innovativeness is “the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system”.

*This article is extracted from the Ph.D. thesis of the corresponding author.
Human resources is a vital parameter in ensuring the dynamism of businesses, mainly in the pharmaceutical industry (Babarpoor, Gholiipour, & Mehralian, 2018). The success or failure of a business is directly associated with the success of employees, and employee performance is effective in achieving business goals (Gümüştekin & Öztürm, 2005). However, employee performance is a challenging issue and every business cares about improving performance and increasing competitiveness (Inuwa, 2017; Wu & Lee, 2011). It has been stated that healthy perfectionists show innovative behaviors while achieving goals (Chang, Chou, Liou & Tu, 2016). The management process is also important and companies need open-minded, creative leaders to implement and standardize new technologies (Horváth & Szabó, 2019). Additionally, managers contribute to companies’ innovation capabilities (Wang & Dass, 2017). It can be said that adopting innovation is essential to stay ahead of the competition. Industry 4.0 forms the basis of Pharma 4.0 (Kumar, Talasila, Gowrav, & Gangadharappa, 2020) and Pharma Industry 4.0 technologies enable pharmaceutical firms to provide a competitive advantage in the long term (Ding, 2018). In this context, pharmaceutical manager innovativeness and performance are crucial factors for this changeover.

In existing literature, the IS has been generally used for students (Ertuğ & Kaya, 2017; Özden, Cevik, & Santaş, 2019), student teachers (Celik, 2013), teachers (Yılmaz & Bayraktar, 2014) or consumers (Pallister & Foxall, 1998; Chao, Reid, & Mavondo, 2012). In addition, this scale has been developed in teacher and student samples (Hurt, Joseph, & Cook, 1977) and adapted into Turkish in student sample (Kılıçer & Odabaşı, 2010). Considering the developments, the measurement of employee innovativeness is important. The present study aims to fill this gap by investigating applicability of IS in business life, and exploring how individual innovativeness dimensions influence working performance. For these purposes, firstly the factor structure of the IS is investigated in a manager sample, after that the dimensions’ impact on performance are determined.

MATERIALS AND METHODS

Innovativeness was measured with the IS developed by Hurt et al. (1977). The IS was adapted into Turkish by Kılıçer and Odabaşı (2010) in a student sample. It contains 20 items (twelve positive and eight negative) and four dimensions, which are resistance to change, risk taking, openness to experience and opinion leadership. The performance scale (consisting of four items) was used to measure performance. This scale was adapted from Kirkman & Rosen (1999) by Sigler & Pearson (2000), and adapted into Turkish by Cöl (2008). Both of them were five point Likert-type scales, and items were ordered from (1) strongly disagree to (5) strongly agree.

Population size of the present study consisted of department managers in the pharmaceutical industry that are members of Association of Research-Based Pharmaceutical Companies, Pharmaceutical Manufacturers Association of Turkey and Pharmaceutical Industry Association of Turkey. The associations were informed about the study and their support was requested. Determining the total number of department managers was not possible so sample size was calculated considering the population size as being unknown. Participants were informed about the study by phone call. After their approval, the questionnaire was sent via e-mail. The questionnaires were administered between April and December 2017. The Ankara University Ethical Committee approved this study with permit number 89 (13.03.2017). The minimum sample size was evaluated as 96; on a 0.05 relevance level, d: 0.1 and p: 0.5. 126 managers replied to the questionnaire. Four of them were excluded from the research due to errors and inconsistencies. In total, 122 surveys were included in the analysis.

RESULTS

46.7% of the participants were female, and 53.3% were male. More than half of the managers (54.1%) were aged between 30-40, 16.4% of them were under 30 and 29.5% were over 40 years old. Nearly half of the managers had been working for five or fewer years in their current department. 32% of the participants were from the sales and/or marketing department (Table 1).

| Table 1: Characteristics of the participants. |
|---------------------------------------------|
| **Gender**                                   |
| Female                                      | 46.7 |
| Male                                        | 53.3 |
| **Age**                                     |
| <30                                         | 16.4 |
| 30-40                                       | 54.1 |
| >40                                         | 29.5 |
| **Working Years**                           |
| ≤5 years                                    | 49.2 |
| 6-10 years                                  | 23.8 |
| >10 years                                   | 27   |
| **Departments**                             |
| Sales/Marketing                             | 32   |
| Research & Development                      | 10.7 |
| Regulatory Affairs                         | 8.2  |
| Supply Chain/Logistics                      | 7.4  |
| Human Resources                             | 6.6  |
| Quality                                     | 6.6  |
| Medical                                     | 5.7  |
| Others                                      | 23   |

Kaiser-Meyer-Olkin (KMO) values were determined as 0.809 and 0.795 for IS and Performance Scale (PS), respectively. Also, Bartlett’s test of sphericity was significant for both (p<0.001). These values exhibit that the sample size was sufficient, and the data were suitable for exploratory factor analysis (EFA).
Principal component analysis with varimax rotation was used to conduct EFA. According to the EFA results after removing nine items, the IS consisted of three dimensions: resistance to change (RC), openness to experience (OE), and opinion leading (OL), and the performance scale emerged as unidimensional. The means of each item and factor loadings are shown in Tables 2 and 3. The Cronbach’s alpha of the PS was 0.828 and the explained variance 66.312%. Table 4 shows Cronbach’s alpha values and variance ratios of IS. Confirmatory factor analyses (CFA) were performed to determine construct validity of the scales. Path diagrams of CFA models are shown in Figures 1 and 2. Rotated factor loadings were over 0.5 for all of the items. Various goodness of fit indices such as chi-square/degree of freedom ($\chi^2/df$), $p$-value, root mean square error of approximation (RMSEA), comparative fit index (CFI), non-normed fit index (NNFI) and standardized root mean square residual (SRMR) were used to examine the fit of model and dataset (Arslan & Şar, 2018; Tarhan, Arslan & Şar, 2017; Arslan, Tarhan, & Şar, 2017). CFA results of IS and PS are shown in Table 5. Goodness of fit indices of three dimensional innovativeness and unidimensional performance scales are: $\chi^2/df= 1.19$; $p$ value=0.184; RMSEA=0.04; NNFI= 0.98; CFI=0.98 good fit; SRMR=0.02 good fit; RMSEA= 0.08 acceptable fit, respectively, according to the intervals of the goodness-of-fit indices (Çelik & Yılmaz, 2016; Hair, Anderson, Tatham, & Black, 1998; Jöreskog & Sörbom, 1996; Raykov & Marcoulides, 2006; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Yılmaz, Çelik, & Arslan, 2010). These results exhibit that the CFA models are acceptable.

The CFA results supported that the IS had a three factor structure in manager sample. Pearson’s correlation analysis was conducted to exhibit the relations between the variables. Significant positive correlations were found between performance and openness to experience ($r=0.433$; $p=0.00$), performance and opinion leading ($r=0.195$; $p=0.016$). However, no significant relation was identified between performance and resistance to change ($r= -0.039$; $p=0.335$). Following correlation analysis, regression analysis was performed to find out the influences of IS dimensions on performance. The regression model was significant ($F=11.576$, $p=0.000$; 22.7% of per-
formance was determined by the variables ($R^2=0.227$) and the dimensions openness to experience and opinion leading. In addition, the effects of the innovativeness dimensions on performance, and revealed that performance is affected by openness to experience and opinion leadership. Besides, in studies with different samples different dimensions were emerged (Pallister & Foxall, 1998; Saroğlu, 2014). In the present study, the managers who had been working in the department for more than ten years had less resistance to change than the ones with between 6-10 years of working experience. Supporting this, older managers are found high in opinion leading. Similarly, Kunze, Boehm, & Bruch (2013) stated that, in contrast to widespread stereotypes, older employees exhibit less resistance to change than their younger counterparts.

Related to the gender of participants, different results occur in the literature. In a study applied to entrepreneurs, females were found to be more open to experience (Hachana, Berraies, & Fititi 2018). On the other hand, in a study with managers and employees in the service and industrial sectors, gender was found to not affect innovation and work performance (Yıldız, Baştürk, & Boz Taştan, 2014). Similarly, in this study, gender did not have a statistically significant effect on the dimensions.

People often try to verify their opinions before reaching a decision. Opinion leaders are described as “those individuals from whom others seek advice and information” and influence other people’s ideas (Rogers & Cartano, 1962). Opinion leaders exhibit high levels of exploratory behavior, engage in intense activities, follow developments in their interests, and have a higher tendency to assess, test, accept and adopt innovations (Chen, Weng, Yang, & Tseng, 2018; Goldsmith & Desbordes, 1991). In this context, the performance of individuals with such behaviors is expected to be high. The current study shows that opinion leading affects performance positively. In the literature, studies about opinion leadership are generally examined on consumers. In a study conducted by Cho & Workman (2011), in the field of fashion, only one shopping channel is used by the consumers with low innovativeness and opinion leadership. However, more channel types are used by the participants with high innovativeness and opinion leadership. Another study conducted on consumers determined that opinion leadership increases the likelihood of subscribing to and reading computer-related journals, and going to computer stores (Shoham & Ruvio, 2008). As mentioned above, it can be thought that intense activities can improve performance.

Innovation is a critical parameter for individuals and the growth of businesses and economies. In the globalizing world, early implementation of innovations helps to gain competitive advantage (Vila, Perez, & Coll-Serrano, 2014). Interactions in the working environment affects innovative behaviors (Anderson, de Dreu & Nijstad, 2004; Zhou & Shalley, 2003; De Jong & Den Hartog, 2007) and managers have important roles in influencing innovativeness in institutions (Kilic & Odabaşı, 2013). Personality affects the opinions, emotions and behaviors of

### DISCUSSION

This study determined the factor structure of the IS in a pharmaceutical managers sample, thereafter it expressed the impacts of the innovativeness dimensions on performance, and revealed that performance is affected by openness to experience and opinion leading. In addition, the effects of gender, age and working experience on the dimensions were examined.

The present study shows that the IS consists of three dimensions: resistance to change, openness to experience and opinion leading in manager sample. Similar to this study, Gürkan & Demiralay (2017), applied IS to surgeons and found three-dimensions: resistance to change, openness to experience and opinion leadership. Besides, in studies with different samples different dimensions were emerged (Pallister & Foxall, 1998; Saroğlu, 2014). In the present study, the managers who had been working in the department for more than ten years had less resistance to change than the ones with between 6-10 years of working experience. Supporting this, older managers are found high in opinion leading. Similarly, Kunze, Boehm, & Bruch (2013) stated that, in contrast to widespread stereotypes, older employees exhibit less resistance to change than their younger counterparts.

Concerning the working years of the managers in the departments, statistically significant differences were found in RC factor ($F=3.130; p=0.047; p<0.05$). Managers over forty were more opinion leaders than the participants under the age of thirty.

### Table 5: CFA results of IS and PS.

| Factors and items | Standardized loadings | t-values | $R^2$ |
|-------------------|-----------------------|----------|-------|
| RC                |                       |          |       |
| ii6               | 0.55                  | 5.97     | 0.30  |
| ii10              | 0.81                  | 9.41     | 0.65  |
| ii17              | 0.77                  | 8.84     | 0.59  |
| ii20              | 0.62                  | 6.91     | 0.39  |
| OE                |                       |          |       |
| ii2               | 0.81                  | 9.85     | 0.65  |
| ii3               | 0.77                  | 9.26     | 0.59  |
| ii5               | 0.68                  | 7.95     | 0.47  |
| ii14              | 0.52                  | 5.68     | 0.27  |
| OL                |                       |          |       |
| ii8               | 0.69                  | 7.76     | 0.47  |
| ii9               | 0.70                  | 7.90     | 0.49  |
| ii12              | 0.79                  | 9.16     | 0.62  |
| PS                |                       |          |       |
| p1                | 0.74                  | 8.75     | 0.55  |
| p2                | 0.76                  | 9.00     | 0.58  |
| p3                | 0.73                  | 8.64     | 0.54  |
| p4                | 0.73                  | 8.63     | 0.54  |
employees, and also it is effective in behaviors in daily life and particularly in the working environment (Darmawan, 2017). Openness to experience has been stated to be a personality trait (McCrae & Costa, 1987; Harris, 2004). Individuals defined as ‘open’ are more prone to new and diverse experiences (Williams, 2004). In the present study, this dimension positively affected performance. Among the dimensions of innovativeness, openness to experience is found to be the most critical factor affecting performance. Individuals high in openness are more open to feedback and more adapted to the activities and relationships in organizations (Bartone, Eid, Johnsen, Laberg, & Snook, 2009). Darmawan (2017) conducted a study with employees from different companies, and pointed out that openness to experience has a positive effect on performance. Moreover, a study conducted with chief managers working in small and medium-sized production enterprises stated that managers’ openness to experience have significant effects on the understanding of budgeting practices (Zor, Linder, & Endenich, 2019). In the literature, there are various results relating to the impact of openness to experience on performance. In a study applied to employees who make telephone sales in two large telecom firms, no relationship was found between openness to experience and performance (Klang, 2012). In another study, it was stated that openness had no effect on leader performance (Bartone et al., 2009). Openness may be an important factor affecting performance in situations where employees have to adapt to changes, but in stable situations its effect is less (Thoresen, Bradley, Bleise, & Thoresen, 2004).

In this study, the resistance to change did not have a statistically significant impact on performance. Additionally, responses to resistance to change was low. In this context, it can be said that managers working in the pharmaceutical industry do not exhibit resistance to change. Success or failure of a company depends on competent employees (Adolph, Tisch, & Metternich, 2014). Resistance to change can be considered as an undesirable condition in fields where many changes and innovations take place, such as the pharmaceutical industry. Therefore, according to the findings, it can be considered that manager traits are taken into account in recruitment and promotion situations. In addition, the managers’ performance was found to be high. Low resistance to change and high-performance are expected findings, especially in the pharmaceutical industry.

CONCLUSION

Innovations and innovativeness are becoming more and more important during the period of Industry 4.0 and are expected to continue to be important as time goes on. The present study has theoretical and practical contributions in business management. IS has a three factor structure in a manager sample. The three dimensional IS can be used in recruitment and promotion stages by organizations. This study provides contributions about exploring how personality traits impact performance. Openness to experience and opinion leading are found to be performance predictors. In recruitment and promotion stages, human resource departments can give priority to the candidates who rank high in openness to experience and opinion leading. The present study sampled managers in the pharmaceutical industry. Future studies can be performed in employee samples and/or different sectors.

Acknowledgement: The authors want to thank Association of Research-Based Pharmaceutical Companies, Pharmaceutical Manufacturers Association of Turkey, Pharmaceutical Industry Association of Turkey and the managers participated in this study.

Peer-review: Externally peer-reviewed.

Informed Consent: Written consent was obtained from the participants.

Ethics Committee Approval: This study was approved by the Ethical Committee of the Ankara University (No:89).

Author Contributions: Conception/Design of Study- N.T., S.Ş.; Data Acquisition-N.T.; Data Analysis/Interpretation-N.T.; Drafting Manuscript-N.T.; Critical Revision of Manuscript- N.T., S.Ş.; Final Approval and Accountability- N.T., S.Ş.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: Authors declared no financial support.

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