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Innovative Work Behaviour as Determinant of Process Innovation: An Empirical Analysis

Süreç Yeniliğinin Belirleyicisi Olarak Yenilikçi İş Davranışı: Ampirik Bir Analiz

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ABSTRACT

The purpose of this paper is to study empirically the relationships between innovative work behaviour and process innovation. The paper hypothesis was created in the light of the literature. That hypothesis is validated using the Partial Least Squares, by Smart PLS statistical program, data collected by the survey method from the 62 firms located in technoparks in Istanbul. The findings revealed that innovative work behaviour is considered to be one of the key factors in both increasing and inhibiting process innovation. The findings supported our hypothesis. There is significant and positive relationships between innovative work behaviour and process innovation. This research presents findings that firms should support innovative work behaviour in order to increase process innovation. This paper jointly examines as an empirically in the same model the little-researched links between innovative work behaviour and process innovation.

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ÖZ

Bu makalenin amacı, yenilikçi iş davranışı ve süreç yeniliği arasındaki ilişkileri ampirik olarak incelemektir. Bu makalenin hipotezi literatür incelemesi ışığında oluşturulmuştur. Bu hipotez, Smart PLS istatistik programıyla, İstanbul'daki teknoparklarda yer alan 62 firmadan anket yöntemiyle toplanan verilerin, Kısmi En Küçük Kareler metodu kullanılarak analiz edilmesiyle doğrulanmıştır. Bulgular, yenilikçi iş davranışının süreç yeniliğini hem artıran hem de engelleyen kilit faktörlerden biri olarak saptanmıştır. Bulgular, hipotezimizi desteklemiştir. Yenilikçi iş davranışı ile süreç yeniliği arasında anlamlı ve olumlu ilişkiler saptanmıştır. Bu araştırma, firmaların süreç yeniliğini artırmak için yenilikçi iş davranışını desteklemesi gerektiğine dair bulgular sunmaktadır. Bu makale, yenilikçi iş davranışı ve süreç yeniliği arasında, daha önce gözden kaçırılarak az araştırılmış bağlantıları aynı model içinde ampirik olarak birlikte incelemektedir.

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1. INTRODUCTION

Innovative work behaviour is an important organizational capability that provides competitive advantage in management studies. Competitive advantage is the critical key to intense global competition and lasting economic progress (Korzilius et al., 2017). Innovation is a strategy that is part of a firm's strategic plan. A firm produces product innovation, service innovation and process innovation with the innovation capability it has accumulated throughout its history (Eriksson, 2014). Earlier various studies theorically or empirically test the effects, antecedents and outcomes of innovative work behaviour or innovation as separately with other else concepts. Yet there isn't been found that deals with an interactive process which connects these two variables in the same model especially as an empirically.

There has been a great deal of theoretical and empirical interest in product and service innovation. But our knowledge and understanding of process innovation is still underdeveloped. As a result, there is little guidance on how firms can foster process innovation available to managers and policy makers (Dost et al., 2020, p. 1). The focus of earlier researchers, innovation has been traditionally focused on products in the manufacturing sectors at first; processes were apparently thought to be non-innovative, because they were assumed to be unproductive activities (Ramamoorthy et al., 2005). Nowadays, however, process innovation is considered to be a valuable component of the economic order. Firms therefore need skilled and innovative experts (Dost et al., 2020, p. 1). The lack of empirical research between innovative work behavior and process innovation has attracted our attention. Therefore, to address this research gap, we examine the influence of innovative work behaviour on process innovation as an determinant of process innovation.

Innovative work behaviour is defined as the process by in which employees, through their efforts and behaviours, transform their ideas into practices (Kleysen & Street, 2001). Rather than evaluating innovation as not only outcomes, but also it is necessary to think of it as a whole interrelated process (Nieves et al., 2014).

Innovative work behaviour, e.g. the development, adoption and implementation of new product innovation ideas, is a driving force for companies that want to compete globally and is an important capability that enables a company to succeed in a dynamic environment (Yuan & Woodman, 2010, p. 323). Innovative work behaviour differs from other workforce in terms of showing various qualities. These qualities of people in a firm or group that are flexible, help identify problems and encourage creativity in solving problems reflect the degree to which they differ from other staff members (Korzilius et al., 2017). We put forward these micro innovative work qualities contribute to process innovation in the firms.

This paper will contribute to the relevant literature from the perspective microfoundation of dynamic capabilities, as it is carried out on the managers of service and manufacturing firms with an innovation agenda in technoparks. We have drawn on microfoundation of dynamic capabilities literature in our theorizing. Winter (2003, p. 983) defines a capability as "*a high level routine that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type*". Dynamic capabilities are set to affect overall organizational change and development (Felin et al., 2012; Frishammar et al., 2012).

In the microfoundation of dynamic capabilities context, through the ability to innovatively change the way the firm solves its problems, managers can, in the presence of rapidly changing problems, navigate through them by creating process innovation. For this, we believe that the firm's behaviour of discovering the firm's problems, generating and implementing innovative solutions can lead to an increase in the firm's management capability, thus, that managers' micro-based innovative work behaviour can be a key internal antecedent of process innovation. In the studies conducted so far, the relationships between innovative work behavior and process innovation have been neglected in the empirically and theoretically context we have drawn. Therefore, this paper can theoretically and empirically expand on previous research.

2. LITERATURE

2.1. Innovative Work Behaviour (IWB)

Janssen (2000, p. 288) defines innovative work behaviour as "*the deliberate creation, promotion and implementation of innovative ideas to benefit the role, performance, group or organization*". It involves rethinking and changing the principles underlying work considerations in an innovative way. According to Messmann and Mulder (2012, p. 45), IWB "*reflects the sum of physical and cognitive work activities performed by employees, either alone or in a social setting, in their work context to perform a set of tasks*". According to De Jong and Der Hartog (2010), IWB is a four-dimensional process that includes "*discovering a problem related to a task or organization, defining it, producing a solution, advocating for the solution, and translating it into practice*". While defining the problem by discovering and producing a solution is related to creativity; advocating and transforming creative ideas into practice is about innovative work behaviour. Most researchers see IWB as a multi-step process and creativity is reflected in its first phase. The employee first identifies problems at work and then generates new ideas; then gets support for the new idea(s) from others (e.g. managers or colleagues; in the next stages), implements the working idea(s) and makes it a reality by producing a new prototype or business model. Each stage of the process consists of different behaviours that deliberately introduce new ways of do-

ing things that create innovation in a new product, process, market or organisational structure (Janssen, 2000; Scott & Bruce, 1994; Wu, de Jong, Raasch & Poldervaart, 2020).

Creativity is generating new and useful ideas at the individual level; innovation is the process that includes taking these ideas as commercializable, developing them and transforming them into marketable (McLean, 2005, p. 240). Therefore, innovative work behaviour is a broader concept that includes the discovery, generation, advocacy and application of creative ideas and includes creativity, which is necessary for innovation. As a matter of fact, innovation is basically a process consisting of innovation initiation and commercialization, and some theoretical studies (Bos-Nehles et al., 2017) argue that IWB are the essence of innovation.

2.2. Process Innovation (PRCI)

In order for a process to be considered new, it must be new in terms of end users, firms, producers, distribution channels and production technology (Brockman and Morgan, 2003, p. 388). According to previous literature, PRCI is recognised as a critical factor to reduce costs, increase production volume, reduce product development time, improve product quality and reliability, improve performance, increase market share and dominance, gain efficiency and competitiveness and achieve economic success (Dost et al., 2020, p. 1; Frishammar et al., 2012, p. 1; Robertson, Casali & Jacobson, 2012, p. 824). For this reason, all firms use some PRCI that directly or indirectly contribute to their competitiveness. Despite the importance of PRCI for firms, it has received relatively little academic attention. Instead, most previous studies have focused on product innovation and PRCI has been largely ignored. In fact, there are important interdependencies, tightly links between process and product innovation. For example, when product innovation involves unusual techniques that have not been used before, it is often necessary to change processes. If the new product or service is successful, further process improvements will be needed as production scales up (Frishammar et al., 2012, p. 526; Robertson, Casali & Jacobson, 2012, p. 824; Chirumalla, 2021, p. 1). But there are a many challenges in front of a PRCI. Sjödin et al. (2018) categorized that challenges for PRCI as (Chirumalla, 2021):

- lack of a shared vision and challenges for people in relation to capability development
- an uncertain business situation and related technology challenges,
- the difficulty of changing conventional routines and related business processes
- lack of systematic approach in adopting modern project models and related process challenges
- the existence of a rigid culture and difficulty of changing it.

3. HYPOTHESIS DEVELOPMENT

In order to understand a firm's processes and key raw materials for manufacturing products and services, PRCI is a key requirement. PRCI often involves both technological, managerial and practical changes in the firm's processes, such as blockchain, ICT use, transformation to digitalisation, adoption of new management practices and introduction of new equipment (Chirumalla, 2021). Another example is that the Japanese superiority in various sectors -automobiles, motorbikes, consumer electronics, etc.- is mainly due to their superior production abilites, which are the result of continuous process innovation (Davenport, 1993, p. 2). In particular, the Japanese firms' decomposition of processes into their basic components (e.g. 5S, 6 Sigma, Total Quality Management), measurement of their performance and continuous improvement of these components has been an important factor in their achievement of a worldwide competitive advantage (Cumming, 1998, p. 21). Gaining a competitive advantage may not progress simultaneously with maintaining it at the same time. As a solution to this, a well-developed dynamic capability can adapt and transform other abilities. Firms need dynamic capability that allows them to innovate and restructure their PRCI activities across times (Frishammar et al., 2012, pp. 7–8). PRCI requires changes in the way the firm does things (Chirumalla, 2021, p. 1). Innovative work behaviour as a dynamic capability can generate, adapt and transform process innovations into other process innovations. In this way, firms achieve maintaining in its competitive advantage. IWB involves turning problems into innovative opportunities, "*understanding the problem", "generating new solutions", "finding support for solutions*" and ultimately "*implementing*" them. In terms of dynamic capabilities, innovative work behaviour may be associated with a wide variety of interrelated activities of problem discovery, solution generation, knowledge acquisition, modification, integration, dissemination, application as well as established creativity to develop and implement PRCI (e.g., Teece, 2007; Zollo & Winter 2002). As a matter of fact, the development and implementation of innovations takes place through the efforts of motivated individuals who use their knowledge and skills to produce innovative products and processes (Taghipour & Dezfuli, 2013). The value of process innovation through the lens of dynamic capabilities has only recently begun to emerge, although there is a growing body of academic work on dynamic capabilities in new product development (e.g. Chirumalla, 2021). According to Teece (2007), dynamic capabilities ensure sustained firm performance and facilitate the creation, deployment and protection of intangible assets. The micro-foundations of dynamic capabilities that underpin the "*sensing, capturing and reconfiguring of capabilities*" at the firm level are difficult to develop and implement (Teece, 2007). In this paper, by asking whether managers' innovative work behaviours sup-

port to process innovation as one of the microfoundations of dynamic capabilities, we aim to establish a link between dynamic capabilities and process innovation in the technology and innovation management (TIM) literature. Thus, we want to be able to deduce that if there is process innovation in a firm, there will be managers in critical positions who exhibit innovative work behaviours in that firm. We would like to small contribute to the development of this theoretical framework and to the verification of the theoretical constructs adopted in the literature, which are still open to question, with our quantitative research discussed in this article. So, the following hypothesis was formed.

Hypothesis: *Innovative work behavior positively relates to process innovation.*

4. RESEARCH DESIGN, METHODOLOGY AND FINDINGS

4.1. Data Collection and Sample

In that context, we worked on firms that have made research and development, technology and innovation a part of their firm mission. It has been researched with objective methods and tools by taking the Technology Development Zones (TDZ) in the Marmara Region of Turkey and Istanbul into the lens, during the peak period of COVID-19. The sampling of the research consisted of firms located in technopark firms. Data was collected through a survey method. 75 top, middle or sub-level managers provided feedback. This paper is a firm-level research, thus, we were used responses from 62 firms in its.

4.2. Measures and Scales

As a data collection tool, a questionnaire with 14 questions consisting of two different scales were used. These scales are as follows; the "*innovative work behaviour scale*", a 10 item instrument developed by De Jong and Den Hartog (2010), was used to measure IWB in knowledge-intensive firms. The scale used was loaded on a single factor in a factor analysis. It was developed by De Jong and Den Hartog as 17 items and then 10 items were considered as a single dimension in their 2010 study. The second scale used in this paper is the "*process innovation scale*" which consist of the one-dimensional and 4-questions. It was used by Akgün et al. (2009). They were derived from the scale by Wang et al. (2004). We asked the participants to answer the questions "*considering the past three years*".

These both scales have 5-points likerts type ("1: never" to "5: always"). The data in the research were collected from the managers of the firms with a process innovation agenda by the survey method.

4.3. Analysis of Data

Data were analyzed with Smart PLS programs. "*Descriptive analyzes, validity and reliability analyzes, hypothesis testing*" were performed on the data of this study. Among the tests performed, the reliability and validity of the scales, the goodness of model-data fit and the results of the hypothesis test are explained in detail below in Tables and Figure.

4.4. Descriptive Statistics

The 62 firms, participating in this research, are mainly small and medium-sized. And they stated that the age of the firm in terms of total industry experience is between mainly 11-20 years and 21-30 years. The descriptive statistics of the participants firms are presented in Table 1 and Table 2.

The scales' descriptive information and correlation table are shown. Accordingly Table 2, there is a significant relationship between innovative work behaviour and process innovation at the 0.01 significance level. There is no significant relationship between the size or age of the organization and other variables.

Table 2. Correlations (Pearson) and Descriptive Statistics for Scales

	1	2	3	4	Mean	Std. D.
1 Size	1				2,55	1,32
2 Age	,300	1			3,27	1,22
3 IWB	-,171	-,079	1		4,13	,50
4 PRCI	-,238	,066	,589**	1	3,79	,78

**. Correlation is significant at the 0.01 level (2-tailed). N: 62.

Table 1. Descriptive Statistics for Participants

Size of Firm (Number of employees)			Age of Firm (Number of years since the firm was total industry experience)		
	n	%		n	%
Micro (1 to 9)	9	14,5	5 years and less	4	6,5
Small (10 to 49)	4	6,5	6-10 years	2	3,2
Medium (50 to 249)	10	16,1	11-20 years	9	14,5
Large (250 to 499)	3	4,8	21-30 years	10	16,1
Larger (500 employees and above)	3	4,8	31 years and above	4	6,5
Sum	29	46,8	Sum	29	46,8
Non-responded only this question	33	53,2	Non-responded only this question	33	33
Sum	62	100,0	Sum	62	100,0

Table 3. The number of questions of the scales, construct validity and reliability analysis

	Cronbach's Alpha	rho_A	Composite Relabiltiy (CR)	Average Variance Extracted (AVE)	N of Items
Innovative Work Behaviour	0,911	0,932	0,907	0,534	9
Process Innovation	0,838	0,883	0,842	0,582	4

4.5. Reliability and Validity Analyzes

The reliability of the reflective variable for the analysis of the research were found to be high.

Table 3 presents results of reliability of constructs by using Cronbach Alpha and rho-A scores.

All constructs fulfilled the threshold of 0.70 (Hair et al., 2017; Nunnally, 1978). Construct validity (discriminant and convergent) was assessed based on confirmatory factor analysis using the criteria recommended by Hair et al. (2010; 2017), i.e. item factor loadings must be greater than 0.50, composite reliability must be greater than 0.70, average variance extracted (AVE) must be greater than 0.50, and AVE must be greater than the squared correlation of that construct with other constructs (Chin, 1998). When the factor loadings were analyzed, among the factors measuring innovative work behaviour, the loading of a factor, corresponding to the first question, was dropped, because it was far below the acceptable thresholds (< .30). Since the AVE and CR coefficients of all other factors were above the threshold values, they were kept in the measurement model. The information on factor loadings is given in the Figure 1. Table 3 presents Cronbach's Alpha, rho_A, CR and AVE scores are within the acceptable range.

According to Table 4, Fornell and Larcker (1981) given discriminant validity is accepted since a diagonal value bold is higher than the value in its row and column. Repeatedly, the bold value is represented for square root of AVE while the other value is the correlation of latent constructs.

According to Henseler et al. (2015), HTMT coefficient should be smaller than 0.85. When the HTMT coefficient is checked, it is seen that the research model satisfies the criterion of discriminant validity. This measure is given in Table 5.

According to Table 3, Table 4 and Table 5 structure achieves the need for convergent, divergent and structural, validity and reliability.

4.6. Research Model and Data Goodness of Fit Values

According to Cohen (1988), the R^2 effect size is classified as small ($.02 \leq R^2 < .13$), medium ($.13 \leq R^2 < .26$) and large ($.26 \leq R^2$). Our research model found the calculated effect size to be .28, so innovative work behaviour broadly explains 28% of the variation on process innovation.

According to Stone-Geisser (1974), the evaluation of the Q^2 statistic, in other words predictive fitness, is used to check whether the endogenous variables are estimated correctly. According to Chin (1998), if the Q^2 value is greater than 0, the research model has a good predictive explanatory level. According to this approach, for the model to have predictive power, $Q^2>0$ should be (Becker et al., 2012; Hu & Bentler, 1999). It shows at what level the independent variable (innovative work behaviour) predicts the dependent variable (process innovation) according to predictive power analysis (Q^2). $Q^2> 0$ for the model to have predictive power. The fact that the Q^2 value of our research model was found to be .12, proves that it has a good explanatory level.

According to Cohen (1988), the f^2 effect size is classified as low ($.002 \leq f^2 < .15$), medium ($.15 \leq f^2 < .35$) and high ($.35 \leq f^2$). Our research model found the calculated effect size to be .37, innovative work behaviour was found to have a high effect size on process innovation.

SRMR (Standardized Root Mean Square Residual) value is used to determine the model-data fit in PLS-SEM. As the SRMR value approaches "0", the goodness of fit of the model increases. If the model has an SRMR value of less than 0.05, it is in good fit; if it has an SRMR between 0.05 and 0.10, it is in acceptable fit. According to Hu and Bentler (1999), the SRMR < .08 condition is an indicator of goodness of fit. In our research, it has been proven that the model-data goodness-of-fit condition is met with SRMR< .08.

According to Hair et al., (2017) the variance inflation factors (VIF) level must be < 5. When we examined the multicollinearity levels between the variables and we found the result was 1.01. This result was shown, there was no linearity problem between the variables.

Table 6 presents VIF, R^2, Q, f^2 and SRMR scores are within acceptable range.

Table 4. Discriminant Validity Results (Fornell & Larcker Criterion)

	Innovative Work Behaviour	Process Innovation
Innovative Work Behaviour	,731	
Process Innovation	,525	0,763

Table 5. Discriminant Validity Results (Heterotrait Monotrait Ratio-HTMT Coefficient)

	Innovative Work Behaviour
Process Innovation	,514

Table 6. Model-Data Goodness of Fit Values

	Path	VIF	R^2 Adj.	Q^2	f^2	SRMR
Hypothesis	IWB → PRCI	1.01	0.28	0.12	0.37	0.08

4.7. Hypothesis Testing

The paper uses a SEM methodology to test the hypothesis. As a result of the good validity and reliability results of the research shown in the tables above, the following model created in the Smart PLS program has emerged.

According to Figure 1 and Table 7, the research findings show that innovative work behaviour predicts process innovation statistically positively (β = .37, p<.01), therefore hypothesis is supported. Table 7 presents the results.

5. LIMITATIONS AND FUTURE RESEARCH

There are some limitations of this paper that may provide an opportunities for future research.

The first limitation of this study is that this study was conducted at the management level of the firms. The effect between two groups of employees' IWB and managers' IWB on PRCI can be investigated.

The second limitation is that this research is a quantitative. Mixed type of research -qualitative and quantitative- can be conducted in which qualitative questions are also used.

The third limitation is that the focus of this paper is one internal determinant based on microfoundation of dynamic capabilities. Conducting the research with structural, external or environmental determinants would help to broaden the scope and conclusions of the study. In addition, other internal resources within the firm that may have an impact on process innovation -such as, organisational culture, etc.- could be added to the study. The impact of the role and interaction of complementary resources and capabilities on process innovation may be considerable. Firms' process innovation may depend on the interaction of internal and external factors. It would be valuable to examine the interaction between intrinsic and extrinsic antecedents and to identify inhibiting factors. Variables from the field of organisational behaviour and human resource management can also be selected, especially about what the inhibiting factors are. Future research may continue to focus on examining the antecedents as a whole.

The fourth limitation is that this paper only examined IWB on PRCI. Product innovation is the most studied type of innovation, but other types require research. Future research could contribute to extend the results by investigating other types of innovation, -e.g. incremental-radical innovation, open-close innovation, etc.-. It would also be useful to examine the change of effect of antecedents into outcomes for sustainable innovation and competition.

In addition, it could be investigated whether there are effects that weaken or strengthen the relationship between IWB and PRCI. In other words, it would be useful to know the contribution of innovative work behaviour, its role among other sources known to have an impact on process innovation, whether it is enabling or inhibiting and under what conditions. As a matter of fact, under which conditions the positive effect of individual level contributions to process innovation at firm level is repetitive. In order to investigate this, it may be suggested to approach this issue with different perspectives.

Another future research suggestion is that if IWB is divided into two or more dimensions on a larger sample, it can show which dimension is more effective on process innovation. Because, according to De Jong et al. (2010), the measurement of IWB is still at an evolutionary stage.

Table 7. Hypothesis Test Result

	Path Model	β	St. D.	t	p	%95 (CI)	Result
Hypothesis	IWB → PRCI	0.37	0.09	3.00	0.003**	0.31; 0.74	Supported

p<0.05*, p<0.01**, p< 0.001***, 2-tailed.

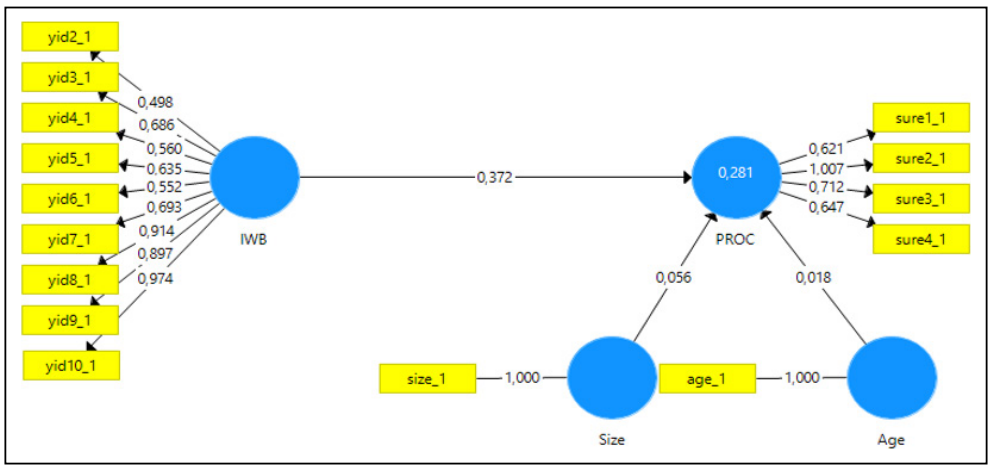

Figure 1. Construct Structural Model Path and Factor Analyses.

6. CONCLUSION

Schumpeter was the first economist to consider product innovation as a driver of economic progress and product innovation has retained the same strategic importance ever since (Garcia & Calantone, 2002; Schumpeter, 1941), thus, despite the increasing number of studies on product innovation through the lens of dynamic capabilities, PRCI research has only just begun to be addressed through the lens of dynamic capabilities (Chirumalla, 2021).

In fact, product and PRCI or development are two complementary elements. Because price sensitivity becomes a strategic variable when products are similar in the market. According to Porter (1980), firms that produce goods and services at a lower cost on the basis of more efficient processes will increase their market share and market dominance (Robertson et al., 2012, p. 824). Therefore, firms have a strong incentive to consider any IWB and PRCI, whether internal or external, that offers productivity gains and lower costs. Considering that firms are faced with technological opportunities, changing markets, new customer demands and new competitive environments today, it is thought that the need to focus on IWB, which is one of the basic microfoundation, deserves a conscious awareness that requires determination. Because, at the same time, gaining a competitive advantage may not progress simultaneously with maintaining it over time (Frishammar et al., 2012, pp. 7–8). So, we highlighted, as a determinant solution, a well-developed innovative work behaviour can generate, adapt and transform other innovative capability as well, such as process innovation We argue that firms require IWB as a microfoundation of dynamic capabilities that enables them to renew and reconfigure their PRCI activities over time.

Originating from a capability-based perspective, this article focuses on the importance of IWB in order to create process innovations suitable for all these driving and attractive forces within the framework of dynamic capabilities. Because, there is a lack of empirical evidence in the relevant literature to support this relationship that this article explores. The studies so far, the relationship between innovative work behaviour and process innovation have been ignored in the empirical or any context we have drawn. Therefore, this paper can empirically extend and support the results of previous research in the context of microfoundation of dynamic capabilities.

Our findings support our hypothesis. This paper presents empirical evidence from Turkey. According to this study, innovative work behaviour has an important link on process innovation, Accordingly this paper result, PRCI requires IWB. Managers should develop IWB of both themselves and their employees. PRCI is closely related to IWB. This article from the perspective microfoundation of dynamic capabilities, "*exploration of opportunities, generation solutions, championing and implementation*", which are components of innovative work behaviour are found to be interrelated activities that enhancing process innovation and empirically support the relevant literature (e.g., Teece, 2007; Zollo & Winter, 2002). IWB as a microfoundation of dynamic capability can generate, apply or adapt and transform PRCI into other process innovations.

Innovative work behaviour represents changes or modifies in the way the firm does work and process innovations require understanding firm's product processes and its raw materials use to the product and change it. Based on the empirical results of this article, which contributes to the ongoing studies in the related field, can be easily said that it is difficult, for companies that ignore innovative work behaviour, to implementing process innovation. IWB as a microfoundation of a dynamic capabilities is a key role to the evolution of PRCI.

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