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Abstract: The present research aims to prioritise the factors that affect extra-role behaviour (OCB). To achieve this objective, the data were collected from 15 field experts and 559 employees working in the manufacturing industries of India. The fuzzy AHP technique prioritised the factors and structural equation modelling tested the proposed hypothesised relationships. The confirmatory factor analysis validates that leader-member exchange, procedural justice, and employee engagement are essential factors affecting organisational citizenship behaviour. Further, the results of fuzzy AHP show that leader-member exchange ranked first, followed by procedural justice and employee engagement. The structural equation modelling result shows that perceived procedural justice and leader-member exchange positively impact employee engagement. The results further show that employee engagement has a positive impact on organisational citizenship behaviour. The implications of the study can be used by the manufacturing industry as a benchmark for increasing the extra-role behaviour among the employees.

Keywords: leader-member exchange; LMX; employee engagement; organisational citizenship behaviour; perceptions of procedural justice; fuzzy analytic hierarchy process; FAHP; structural equation modelling.

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Biographical notes: Arun Aggarwal is currently working as an Assistant Professor at the Chitkara University Punjab India. His area of interest is human resource management, organisational behaviour and psychology. He has various publications in national and international journals. He has published in journals like *Frontiers in Psychology*, *Benchmarking: An International Journal*, *European Business Review*, *Vision*, *Journal of Public Affairs*, *Journal of Finance and Data Science*, *International Journal of Business and Globalisation*, etc. He has expertise in SPSS and AMOS software.

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1 Introduction

One of the most important resources for organisations includes their employees (Budhiraja and Yadav, 2020; Hannis Ansah et al., 2018). This is because employees are the only active resources that have their thinking abilities (Heaney et al., 1995; Conway et al., 2016). In addition, employees also have knowledge and information about organisations and the environment surrounding the organisation (Akram et al., 2020; Bavik et al., 2018). This is one of the factors necessitating many organisations to invest in developing (Alpander, 1991; Kelley, 1992; Shuck et al., 2014; Aryee et al., 2016) and retaining employee capital (Sheridan, 1992; Mitchell et al., 2001; Bode et al., 2015; Ma et al., 2018). This has led to the development of the employee relationship as an important organisational function (Yang et al., 2011; Strohmeier, 2013; Kang and Sung, 2017; Men and Sung, 2019). The main objective of employee-relationship management is to promote employee engagement (Saks and Gruman, 2011; Mishra et al., 2014; Albrecht et al., 2018) and deepen the employee-organisational relationship (Bell and Menguc, 2002). There have been many studies that have tried to understand the key antecedents of employee engagement (Wollard and Shuck, 2011; AbuKhalifeh and Som, 2013) and how it leads to better performance and increased employee retention (Saks and Gruman, 2011; Truss et al., 2013; Bhattacharya, 2015; Pandita and Ray, 2018; Ismail et al., 2019).

The modern business scenario is characterised by increased employee mobility both in the domestic context as well as in the cross-border context (Bozkurt and Mohr, 2011; Manchester, 2012). Globalisation, accompanied by higher cross-border trade, has opened up more opportunities for employees to connect with a large number of employees

(Stijepic, 2017). This has led to higher employee turnover (Grissom et al., 2016) and greater uncertainty in the workplace (Pearce and Randel, 2004). In addition, higher employee turnover also increases the cost of doing business (Waldman et al., 2004; Iqbal, 2010). This is because higher turnover compels employers to invest more money on recruitment (Kotey and Sheridan, 2004); and training and development (Almeida and Carneiro, 2009) of the new employees. Therefore, more and more organisations are focusing on understanding the factors that lead to higher employee turnover (Sinha and Sinha, 2012; Al Mamun and Hasan, 2017). Besides, employers are also focusing on employee engagement as an important retention tool (Punia and Sharma, 2008).

Many organisations are also utilising employee engagement as a tool to promote higher organisational citizenship behaviour among their employees (Rurkkhum and Bartlett, 2012; Zhang et al., 2017). Organisational citizenship behaviour refers to the 'extra' efforts by employees that promote harmony, cooperation, and dedication in teamwork (Smith et al., 1983; Organ, 1997; Bolino et al., 2015; Aggarwal and Singh, 2016; Singh et al., 2020). It is mostly argued that engaged employees display higher organisational citizenship behaviour as compared to others. Thus, there should be a positive relationship between employee engagement and OCB.

The current study aims at analysing the impact of perceived organisational justice and leader-member exchange (LMX) on employee engagement. The study also aims at analysing the impact of employee engagement on organisational citizenship behaviour. The prime rationale is that though this topic has been studied in detail in the context of developed markets it has received considerably lesser attention in the context of emerging markets. Moreover, a study of this kind will help in understanding the key antecedents and consequences of employee engagement for the employees working in emerging markets. The main contribution of the current study is that it combines the constructs of perceived organisational justice, LMX, and organisational citizenship behaviour. The study also analyses the relationship between manufacturing industries in India. The study also utilises a large sample size of more than 550 respondents. To the best of our knowledge, such a study has not been performed for the Indian markets.

The rest of the research paper is structured as follow: after the introduction to the topic, Section 2 is devoted towards the development of various hypotheses based on research model. Section 3 enlightens the readers on the research methodology adopted in the present study to fulfil the said research objectives. The data analysis and its interpretation are conducted in Section 4 followed by discussion and implications of the study in Section 5. Finally, the study ends with the limitations and future scope of the study (Section 6).

2 Hypothesis development

The conceptual model is tested in the present study is represented by Figure 1. The model shows that perceived procedural justice and LMX act as key antecedents of employee engagement. Similarly, OCB is the key consequence of employee engagement.

2.1 Perceived procedural justice and employee engagement

Procedural justice refers to a process adopted by employees to distribute responsibility and reward to various employees (Moorman et al., 1998; Lipponen et al., 2004; Walters

and Bolger, 2019). It relates to fairness in the method adopted to determine the share of the overall reward that will be accruing to different employees. There are a large number of studies that argue that perceived procedural justice is the key determinant of employee engagement (Biswas et al., 2013; He et al., 2014; Pieters, 2018). The key rationale here is that employees perceiving greater fairness in the distribution of rewards will tend to be more engaged (He et al., 2014; Kim and Park, 2017; O'Connor and Crowley-Henry, 2019; Cenkci et al., 2020). This is because these employees will feel that their efforts will be acknowledged and suitably rewarded by their organisations (Pieters, 2018). The concept of perceived procedural justice is quite vital for employees and organisations in emerging economies (Vachhrajani et al., 2020). This is because these economies are mostly considered to be influenced by the presence of nepotism (Miller et al., 2009), favouritism (Lee et al., 2018), and political motivation in the distribution of rewards (Li and Scullion, 2010). The preceding discussion leads to the formation of the following alternative hypothesis.

Hypothesis 1 Perceived procedural justice positively impacts employee engagement.

2.2 LMX and employee engagement

LMX refers to the interactions among seniors and subordinates that transcend the normal business transactions (Wayne et al., 1997; Martin et al., 2016). These interactions can pertain to the emotional connection and the feeling of shared responsibility among the leader and the subordinates (Aggarwal et al., 2020; Tanskanen et al., 2019; Altinay et al., 2019; Gutermann et al., 2017; Schermuly and Meyer, 2016). These feelings and emotions generally create an environment of harmony and commitment among different employees (Hooper and Martin, 2008). This harmony in turn leads to higher employee engagement. Thus, there should be a positive relationship between LMX and employee engagement. This is especially true for emerging economies because employees of these economies are more relationship-oriented and they look forward to greater emotional support from their leaders (Hoang et al., 2017). The preceding discussion leads to the formation of the following alternative hypothesis.

Hypothesis 2 LMX positively impacts employee engagement.

2.3 Employee engagement and organisational citizenship behaviour

Organisational citizenship behaviour refers to the voluntary behaviour displayed by some employees that leads to organisational excellence (Organ, 1988); better organisational performance (Podsakoff and MacKenzie, 1997); reduced employee turnover (Koys, 2001). Such behaviour is mostly deliberate and is usually not accompanied by any direct reward (Moorman and Blakely, 1995). It is generally argued that employee engagement is the main reason for higher organisational citizenship behaviour (Britt et al., 2012). This is because 'engaged' employees feel that it is their moral obligation to display OCB (Gou et al., 2020; Ng et al., 2021; Zhang et al., 2017; Gupta et al., 2016; Babcock-Roberson and Strickland, 2010) and that they use such behaviour to repay the intangible benefits that they derive from their jobs and their organisations (Ram and Prabhakar, 2011). The preceding discussion leads to the formation of the following alternative hypothesis.

Hypothesis 3 Employee engagement positively impacts organisational citizenship behaviour.

2.4 Perceived procedural justice and organisational citizenship behaviour

Perceived procedural justice can also have a direct impact on employees' organisational citizenship behaviour. This is because employees who perceive that there is justice in the method of distribution of rewards will tend to be more obliged towards their organisation to reciprocate with additional efforts (Moorman et al., 1998). Moreover, these employees can also develop a feeling that their current voluntary actions will be rewarded by their organisations in the times to come (Aquino, 1995; Chan and Lai, 2017). Therefore, a higher level of perception towards procedural justice can lead to the development of organisational citizenship behaviour. Thus, the following hypothesis, relating to perceived procedural justice and organisational citizenship is developed.

Hypothesis 4 Perceived procedural justice positively impacts organisational citizenship behaviour.

2.5 LMX and organisational citizenship behaviour

Apart from procedural justice, how seniors and subordinates interact in an organisation can have an impact on organisational citizenship behaviour. Thus, the LMX can play a pivotal role in motivating employees to develop organisational citizenship behaviour. In addition, subordinates can also observe the organisational citizenship behaviour of their leaders and can themselves develop such behaviour (Deluga, 1994). Thus, the quality of LMX can lead to the development of superior organisational citizenship behaviour (Wang et al., 2005; Tang and Naumann, 2015). The preceding discussion leads to the development of the following hypothesis.

Hypothesis 5 LMX positively impacts organisational citizenship behaviour.

2.6 Employee engagement as mediator

The preceding review of the literature suggests that perceived procedural justice and LMX have an impact on employee engagement. In addition, employee engagement has an impact on organisational citizenship behaviour. The literature review also suggests that perceived procedural justice and LMX can have a direct impact on organisational citizenship behaviour. Thus, employee engagement acts as a mediator between perceived procedural justice and LMX, and organisational citizenship behaviour. Therefore, the following two hypotheses have been proposed.

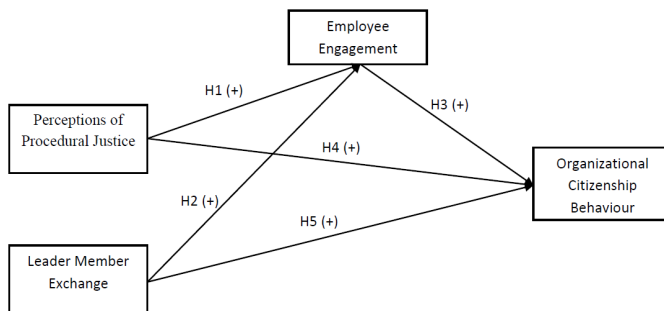
Hypothesis 6 Employee engagement mediates the relationship between perceived procedural justice and organisational citizenship behaviour.

Hypothesis 7 Employee engagement mediates the relationship between LMX and organisational citizenship behaviour.

3 Methods

Data were collected from employees (full-time) working in three manufacturing industries operating in northern India. The major contributors of the manufacturing industry in India are “automobile industry, drug and pharmaceuticals, chemicals (other than fertiliser), food processing, electrical equipment, cement, textile, and electronics” (<https://www.ibef.org/industry/manufacturing-sector-india/infographic>). By 2020, India is expected to become the fifth largest manufacturing country in the world (Deloitte GMCI, 2016). Prior research has shown that employee engagement is a crucial variable in the success of an organisation. Hence, it becomes vital to identify and prioritise the factors that affect employee engagement in the manufacturing industry, which further affect employee’s extra-role behaviour. The sampling framework of the study consists of employees who were either engineers or technicians. 1,864 employees working in manufacturing industries were approached with a 33.85% of return rate, 631 filled questionnaires were received. However, due to unengaged, missing, or outliers data, 72 responses were not considered for final analysis. Hence for final analysis, 559 responses were utilised. Out of these 559 respondents, 362 were male and 197 were females. Around 68% (381) of the respondents were between the age group of 20 to 35 years. In the age group of 36 to 40 years, there was 18.25% (102). 8.60% (48) were between the age group of 41 to 49 years, and 5% (28) were above the age of 50 years. Out of the total, 43.11% of the respondents had 0–5 years of experience; 23.07% had 6–9 years of experience; 23.97% had 10–19 years of experience; 32 employees had 20–29 years of work experience, and 4.11% of the employees had 30–39 years of experience.

Figure 1 Conceptual model



3.1 Measures

The research model was operationalised using four different indicators (see Table 2).

3.2 Perceived procedural justice

To measure the perceived procedural justice, the scale developed by Colquitt (2001) was used. The scale consists of seven items. The sample items are “Have you been able to express your views and feelings during those procedures? Have you influenced the outcomes arrived at by those procedures? Have you been able to appeal the outcomes

arrived at by those procedures? Have those procedures upheld ethical and moral standards?" The Cronbach alpha of the scale was 0.919.

3.3 Leader-member exchange

To measure the quality of the relationship between subordinate and their immediate supervisor, the scale by Graen and Uhl-Bien (1995) was used. The scale consists of seven items measured on five-point Likert scale anchoring from '(1) strongly disagree to (5) strongly agree'. The sample statements were: "Do you know where you stand with your leader... do you usually know how satisfied your leader is with what you do? I have enough confidence in my leader that I would defend and justify his/her decision if he/she were not present to do so? Regardless of how much formal authority he/she has built into his/her position, what are the chances that your leader would use his/her power to help you solve problems in your work?" The value of Cronbach's alpha for the LMX scale is 0.873.

3.4 Employee engagement

Employee engagement was measured with the help of the scale developed by JRA (2007). The scale consists of three sub-dimensions (cognitive, emotional, and behavioural) which consist of two items each. Examples of the items for emotional components include "overall, I'm satisfied with my job" and "I feel a sense of commitment to this organization." Example of the items for behavioural component includes "I feel inspired to go the extra mile to help this organization succeed" and "I look for ways to do my job more effectively." Example of the items for cognitive component includes "I take an active interest in what happens in this organization" and "overall, I would recommend this organization as a great place to work." The value of Cronbach's alpha for the employee engagement scale is 0.924.

3.5 Organisational citizenship behaviour

To measure the organisational citizenship behaviour of the employees, the scale developed by Podsakoff et al. (1990) was used. The scale is divided into five sub-constructs namely, "conscientiousness, sportsmanship, civic virtue, courtesy, and altruism." The factor 'conscientiousness' consists of five items such as "attendance at work is above the norm, obeys company rules and regulations even when no one is watching, believes in giving an honest day's work for an honest day's pay." The value of Cronbach's alpha for 'conscientiousness' is 0.881. The factor 'sportsmanship' consists of five items such as "consumes a lot of time complaining about trivial matters (R), Always focuses on what's wrong, rather than the positive side (R), always finds fault with what the organization is doing (R)." The value of Cronbach's alpha for 'sportsmanship' is 0.843. The factor 'civic virtue' consist of four items such as "attends meetings that are not mandatory, but are considered important, attends functions that are not required, but help the company image, reads and keeps up with organization announcements, memos, and so on." The value of Cronbach's alpha for 'civic virtue' is 0.920. The factor 'courtesy' consist of five items such as "takes steps to try to prevent problems with other workers, is mindful of how his/her behavior affects other people's jobs, considers the impact of his/her actions on co-workers." The value of Cronbach's alpha for 'courtesy' is

0.875. The factor ‘altruism’ consists of five items such as “is always ready to lend a helping hand to those around him/her, willingly helps others who have work-related problems, helps orient new people even though it is not required.” The value of Cronbach’s alpha for ‘altruism’ is 0.871.

4 Data analysis and results

4.1 Common method bias

The data was cross-sectional. Hence, ‘common method bias’ (CMB) might be an issue in the current research. To identify the CMB issue, the researchers used Harman’s single-factor test (Podsakoff et al., 2003). An unrestricted exploratory factor analysis (EFA) was performed to identify whether anyone single factor contributes more than 50% of the total variance explained or not. If a single factor explains more than 50% of the total variance then it is an indication of CMB. Results of EFA show that the single factor contributes 12.96% of the total variance, which shows that CMB is not an issue in the current research.

4.2 Measurement model

The two-step statistical procedure prescribed by Anderson and Gerbing (1988) was used in the present research to test the proposed hypothesised relationships. Initially, the reliability and validity of the measurement model are established through confirmatory factor analysis (CFA). In the lateral stage, the proposed hypotheses are tested using path analysis.

Table 1 Model fit indices

<i>Fit indexes</i>	χ^2/df	<i>RMSEA</i>	<i>RMR</i>	<i>CFI</i>	<i>AGFI</i>	<i>GFI</i>	<i>PCFI</i>	<i>NFI</i>
Threshold	<3	<0.08	<0.08	>0.90	>0.80	>0.90	>0.50	>0.90
Model	1.531	0.031	0.040	0.968	0.896	0.909	0.889	0.913

Source: Authors’ compilation

Table 1 renders the values of model fit indices, which depicts good model fit as the value of $\chi^2 = 1,210.719$, $df = 791$, $\chi^2/df = 1.531$, $p = 0.000$; $SRMR = 0.040$, $GFI = 0.909$, $TLI = 0.965$, $AGFI = 0.896$, $CFI = 0.968$; $RMSEA = 0.031$, $PCFI = 0.889$, $NFI = 0.913$ (Hu and Bentler, 1999). Results of the model fit indices show that all the indices achieved their set cut-off values which indicates that the present measurement model has a good model fit. Further, the reliability of the constructs was measured through composite reliability (CR). The measurement model shows that all the latent variables have CR values higher than 0.70 (Hair et al., 2011). This indicates the presence of reliability of data. Further, discriminant and convergent validity help in measuring measurement model validity.

The convergent validity was measured through the procedure mentioned by Fornell and Larcker (1981). As per this procedure, the standardised factor loading of each variable should be higher than 0.70 and it should be significant at a 0.05 level of significance. Further, the average variance explained (AVE) should be higher than 0.50

and the value of CR should be higher than AVE’s value. Finally, the value of ‘maximum shared variance’ (MSV) should be lower than the AVE value.

Table 2 Convergent validity

<i>Construct</i>	<i>Items</i>	<i>SFL</i>	<i>CR</i>	<i>AVE</i>	<i>MSV</i>
<i>Leader-member exchange (LMX)</i>					
LMX1	“Do you usually know how satisfied your leader is with what you do?”	0.758***	0.874	0.536	0.030
LMX2	“How well does your leader understand your job problems and needs?”	0.686***			
LMX3	“How well does your leader recognize your potential?”	0.493***			
LMX4	“Regardless of how much formal authority he/she has built into his/her position, what are the chances that your leader would use his/her power to help you solve problems in your work?”	0.767***			
LMX5	“Again, regardless of the amount of formal authority your leader has, what are the chances that he/she would bail you out, at his/her expense?”	0.748***			
LMX6	“I have enough confidence in my leader that I would defend and justify his/her decision if he/she were not present to do so?”	0.719***			
LMX7	“How would you characterize your working relationship with your leader?”	0.711***			
<i>Perceived procedural justice (PPJ)</i>					
PPJ1	“Have you been able to express your views and feelings during those procedures?”	0.755***	0.921	0.624	0.011
PPJ2	“Have you influenced the outcomes arrived at by those procedures?”	0.748***			
PPJ3	“Have those procedures been applied consistently?”	0.894***			
PPJ4	“Have those procedures been free of bias?”	0.782***			
PPJ5	“Have those procedures been based on accurate information?”	0.770***			
PPJ6	“Have you been able to appeal the outcomes arrived at by those procedures?”	0.758***			
PPJ7	“Have those procedures upheld ethical and moral standards?”	0.813***			
<i>Employee engagement (EE)</i>					
EE1	“I really throw myself into my job”	0.811***	0.926	0.714	0.002
EE2	“Sometimes I am so into my job that I lose track of time”	0.849***			

Notes: ***p < 0.01; R: reverse item; MSV: maximum shared variance; AVE: average variance extracted; CR: composite reliability; SFL: standardised factor loading.

Source: Author’s compilation

Table 2 Convergent validity (continued)

<i>Construct</i>	<i>Items</i>	<i>SFL</i>	<i>CR</i>	<i>AVE</i>	<i>MSV</i>
<i>Employee engagement (EE)</i>					
EE3	“This job is all-consuming; I am totally into it”	0.793***	0.926	0.714	0.002
EE4	“My mind often wanders and I think of other things when doing my job”	0.886***			
EE5	“I am highly engaged in this job”	0.882***			
<i>Organisational citizenship behaviour (OCB)</i>					
<i>Conscientiousness</i>					
Cons1	“Attendance at work is above the norm”	0.658***	0.884	0.606	0.130
Cons2	“Does not take extra breaks”	0.837***			
Cons3	“Obeys company rules and regulations even when no one is watching”	0.876***			
Cons4	“Is one of my most conscientious employees”	0.724***			
Cons5	“Believes in giving an honest day’s work for an honest day’s pay”	0.777***			
<i>Sportsmanship</i>					
Sport1	“Consumes a lot of time complaining about trivial matters” (R)	0.708***	0.844	0.520	0.015
Sport2	“Always focuses on what’s wrong, rather than the positive side” (R)	0.708***			
Sport3	“Tends to make mountains out of molehills” (R)	0.688***			
Sport4	“Always finds fault with what the organization is doing” (R)	0.730***			
Sport5	“Is the classic squeaky wheel that always needs greasing” (R)	0.770***			
<i>Civic virtue</i>					
CV1	“Attends meetings that are not mandatory, but are considered important”	0.886***	0.920	0.742	0.083
CV2	“Attends functions that are not required, but help the company image”	0.838***			
CV3	“Keeps abreast of changes in the organization”	0.851***			
CV4	“Reads and keeps up with organization announcements, memos, and so on”	0.869***			
<i>Courtesy</i>					
Court1	“Takes steps to try to prevent problems with other workers”	0.774***	0.875	0.584	0.055
Court2	“Is mindful of how his/her behaviour affects other people’s jobs”	0.787***			

Notes: *** $p < 0.01$; R: reverse item; MSV: maximum shared variance; AVE: average variance extracted; CR: composite reliability; SFL: standardised factor loading.

Source: Author’s compilation

Table 2 Convergent validity (continued)

<i>Construct</i>	<i>Items</i>	<i>SFL</i>	<i>CR</i>	<i>AVE</i>	<i>MSV</i>
<i>Courtesy</i>					
Court3	“Does not abuse the rights of others”	0.774***	0.875	0.584	0.055
Court4	“Tries to avoid creating problems for co-workers”	0.710***			
Court5	“Considers the impact of his/her actions on co-workers”	0.773***			
<i>Altruism</i>					
Alt1	“Helps others who have been absent”	0.758***	0.871	0.575	0.130
Alt2	“Helps others who have heavy workloads”	0.755***			
Alt3	“Helps orient new people even though it is not required”	0.765***			
Alt4	“Willingly helps others who have work-related problems”	0.748***			
Alt5	“Is always ready to lend a helping hand to those around him/her”	0.764***			

Notes: ***p < 0.01; R: reverse item; MSV: maximum shared variance; AVE: average variance extracted; CR: composite reliability; SFL: standardised factor loading.

Source: Author’s compilation

Table 2 shows that the SFL of the measurement model is higher than 0.70 except Sport3, LMX2, and Cons1 which have 0.688, 0.686, and 0.658 SFL respectively. However, these three items were retained as per the criterion specified by Bagozzi et al. (1991).

Due to the low SFL of LMX3 (0.493), this item was not considered in the final analysis. Table 2 depicts that all the factors have AVE values higher than 0.5, ranging from 0.520 to 0.742. In addition to this, the CR value for each construct is more than the cut-off value of 0.7 and ranges between 0.844 to 0.926. The value of CR is higher than AVE for each construct. Further, the value of MSV is lower than the AVE value. Therefore, the proposed measurement model achieves good convergent validity (Aggarwal et al., 2018a, 2018b).

Table 3 Discriminant validity

<i>Factor</i>	<i>Sports</i>	<i>Altruism</i>	<i>PPJ</i>	<i>LMX</i>	<i>Cons</i>	<i>Engage</i>	<i>Court</i>	<i>Civic</i>
Sports	0.721							
Altruism	0.056	0.758						
PPJ	0.037	0.104	0.790					
LMX	0.011	0.019	0.043	0.732				
Cons	0.084	0.360	0.039	0.061	0.778			
Engage	0.030	0.004	0.039	0.003	0.011	0.845		
Court	0.124	0.121	0.037	0.082	0.215	0.009	0.764	
Civic	0.120	0.288	0.010	0.172	0.137	0.048	0.234	0.861

Note: The ital numbers in the diagonal are the square root of AVE.

As per the rule suggested by Kline (2015), if the value of the coefficient of correlation among two variables is less than 0.85 then it is an indication of the presence of discriminant validity. The measurement model shows that the correlation among the two variables is less than 0.85. Further, the discriminant validity is established by the procedure prescribed by Fornell and Larcker (1981). As per this procedure, each construct AVE square root value should be higher than the value of the correlation coefficient. Table 3 shows that the ital-diagonal value (square-root of AVE) is higher than the off-diagonal values (correlation coefficients). Hence, the present measurement model has also good discriminant validity.

4.3 Fuzzy analytic hierarchy process

It is named fuzzy analytic hierarchy process (FAHP) and is considered one of the most influential techniques for multi-criteria decision-making. It is an integral part of both the analytic hierarchy process (AHP) and fuzzy set theory. Triangular membership function (TMF) was used in fuzzy theory initially by the authors (Laarhoven and Pedrycz, 1983). But the author's work (Chang, 1996) has popularised the use of fuzzy theory in the analysis and he has used triangular fuzzy numbers while working on FAHP. This technique has been used in the current study to prioritise the identified factors. The details of the procedure are mentioned below:

Step 1 First of all formation of a pairwise matrix is done with the help of equation (1) and it is mentioned below:

$$\tilde{C} = \begin{bmatrix} 1, 1, 2 & \tilde{c}_{12} & \tilde{c}_{13} & \tilde{c}_{14} & \dots & \tilde{c}_{1n} \\ \tilde{c}_{21} & 1, 1, 1 & \tilde{c}_{23} & \tilde{c}_{24} & \dots & \tilde{c}_{2n} \\ \tilde{c}_{31} & \tilde{c}_{32} & 1, 1, 1 & \tilde{c}_{34} & \dots & \tilde{c}_{3n} \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\ \tilde{c}_{n1} & \tilde{c}_{n2} & \tilde{c}_{n3} & \tilde{c}_{n4} & \dots & 1, 1, 1 \end{bmatrix} \quad (1)$$

where $\tilde{c} = (l_{st}, m_{st}, u_{st})$ and $s, t = 1, 2, 3, 4, 5, \dots, n$ are triangular fuzzy numbers.

Step 2 The fuzzy synthetic extent value (FSEV) is calculated for the fuzzy synthetic criteria s as mentioned in equation (2).

$$FCS_s = \left(\sum_{t=1}^n l_t, \sum_{t=1}^n m_t, \sum_{t=1}^n \mu_t \right) * \left(\frac{1}{\sum_{s=1}^n \mu_s}, \frac{1}{\sum_{s=1}^n m_s}, \frac{1}{\sum_{s=1}^n l_s} \right) \quad (2)$$

Step 3 Here, in this particular step degree of possibility (DOP) is calculated using equation (3), equations (4) and (5) of $DP_1(l_1, m_1, u_1)$ and $DP_2(l_2, m_2, u_2)$ triangular fuzzy numbers as:

$$DV(DP_1 \succcurlyeq DP_2) = 1 \text{ iff } m_1 \succcurlyeq m_2 \quad (3)$$

$$DV(DP_1 \succcurlyeq DP_2) = 0 \text{ iff } l_1 \succcurlyeq u_2 \quad (4)$$

$$DV(DP_2 \geq DP_1) = \frac{l_2 - \mu_2}{(m_2 - \mu_2) - (m_1 - l_1)} \tag{5}$$

Equations (6) and (7) helps in the calculation of the fuzzy weight (*Fuz W*), non-fuzzy weight/normalised weight respectively:

$$Fuz W' = (d'(C_1), d'(C_2), d'(C_3), d'(C_4), \dots, d'(C_n))^T$$

where $d'(C_i) = \min DV(FSC_s \geq FSC_t)$ (6)

and $s, t = 1, 2, 3, \dots, n$ and $s \neq t$

$$Fuz W = (d(C_1), d(C_2), d(C_3), d(C_4), \dots, d(C_n))^T \tag{7}$$

4.3.1 Fuzzy analytical hierarchical process procedure

To start the process, criteria for exogenous variables are abbreviated as shown in Table 4. The pairwise scale for linguistic terms is shown in Table 5. Table 6 shows the TFN for all the criteria that have been used in the current study.

Table 4 Criteria with abbreviations

Criteria	Abbreviations
Leader-member exchange	LMX
Perceived procedural justice	PPJ
Employee engagement	EE

Table 5 Fuzzy linguistic assessment variables

Linguistic term	TFNs (l, m, u)	TFNs reciprocal (1/u, 1/m, 1/l)	Linguistic term	TFNs (l, m, u)	TFNs reciprocal (1/u, 1/m, 1/l)
Equal	$\tilde{1} = (1, 1, 1)$	$\tilde{1}^{-1} = (1, 1, 1)$	Moderate	$\tilde{3} = (2, 3, 4)$	$\tilde{3}^{-1} = (1/4, 1/3, 1/2)$
Strong	$\tilde{5} = (4, 5, 6)$	$\tilde{5}^{-1} = (1/6, 1/5, 1/4)$	Very strong	$\tilde{7} = (6, 7, 8)$	$\tilde{7}^{-1} = (1/8, 1/7, 1/6)$
Tremendous	$\tilde{9} = (9, 9, 9)$	$\tilde{9}^{-1} = (1/9, 1/9, 1/9)$	Intermediate value between equal and moderate	$\tilde{2} = (1, 2, 3)$	$\tilde{2}^{-1} = (1/3, 1/2, 1)$
Intermediate value between moderate and strong	$\tilde{4} = (3, 4, 5)$	$\tilde{4}^{-1} = (1/5, 1/4, 1/3)$	Intermediate value between strong and very strong	$\tilde{6} = (5, 6, 7)$	$\tilde{6}^{-1} = (1/7, 1/6, 1/5)$
Intermediate value between very strong and tremendous	$\tilde{8} = (7, 8, 9)$	$\tilde{8}^{-1} = (1/9, 1/8, 1/7)$			

Table 6 TFN decision matrix of the criteria

Criteria	LMX	PPJ	EE
LMX	(1, 1, 1)	(0.95, 1.33, 1.82)	(0.67, 1.00, 1.15)
PPJ	(0.55, 0.75, 1.05)	(1, 1, 1)	(0.86, 1.18, 1.56)
EE	(0.87, 1.00, 1.49)	(0.64, 0.85, 1.16)	(1, 1, 1)

After calculation of the decision matrix, FSEV for all criteria is calculated (see Table 7).

Table 7 FSEV of criteria

Fuzzy synthetic criteria	Fuzzy synthetic extent value
FSC_1 (LMX)	$l_1 = 0.23, m_1 = 0.37, u_1 = 0.53$
FSC_2 (PPJ)	$l_2 = 0.21, m_2 = 0.32, u_2 = 0.48$
FSC_3 (EE)	$l_3 = 0.22, m_3 = 0.31, u_3 = 0.48$

FSEV of criteria is used to calculate the DOP. The DOP shown in Table 8 of $DP_1(l_1, m_1, u_1) \succ DP_2(l_2, m_2, u_2)$ is computed using equations (3), (4) and (5). The minimum DOP is found (shown in Table 9) and they are ranked using equation (6).

$$Fuz W' = (1.00, 0.85, 0.82)^T$$

Table 8 DOP for the criteria

$DV(FSC_1 > FSC_j)$	$DV(FSC_1)$	$DV(FSC_2 > FSC_j)$	$DV(FSC_2)$	$DV(FSC_2 > FSC_j)$	$DV(FSC_2)$
$DV(FSC_1 > FSC_2)$	1.00	$DV(FSC_2 > FSC_1)$	0.85	$DV(FSC_3 > FSC_1)$	0.82
$DV(FSC_1 > FSC_3)$	1.00	$DV(FSC_2 > FSC_3)$	1.00	$DV(FSC_3 > FSC_2)$	0.97

Table 9 Minimum DOP for the criteria

Degree of possibility	$DV(FSC_1)$	$DV(FSC_2)$	$DV(FSC_3)$
Minimum DOP	1.00	0.85	0.82
	1.00	1.00	0.97
	1.00	0.85	0.82

After calculating fuzzy weight using equation (6), normalised weight/non-fuzzy weight is calculated using equation (7).

$$Fuz W = (0.374, 0.317, 0.309)$$

After finding out the normalised weights of criteria, weights are compared and these are ranked as mentioned in Table 10.

Table 10 Comparison of weights and ranking of criteria

<i>Criteria</i>	<i>Normalised weights</i>	<i>Ranking of criteria</i>
LMX	0.374	1
PPJ	0.317	2
EE	0.309	3

Table 10 same process is done for sub-criteria of exogenous variables which is shown in Table 11.

Table 11 Comparative weights and ranking of criteria and sub-criteria of exogenous variables

<i>Criteria</i>	<i>Relative preference weights</i>	<i>Relative rank</i>	<i>Sub-criteria</i>	<i>Relative preference weights</i>	<i>Relative rank</i>	<i>Global preference weights</i>	<i>Global rank</i>
LMX	0.374	1	LMX1	0.087	7	0.033	15
			LMX2	0.144	4	0.054	10
			LMX3	0.179	2	0.067	5
			LMX4	0.185	1	0.069	4
			LMX5	0.113	6	0.042	14
			LMX6	0.172	3	0.064	7
			LMX7	0.119	5	0.044	13
PPJ	0.317	2	PPJ1	0.304	1	0.096	1
			PPJ2	0.157	4	0.050	12
			PPJ3	0.168	3	0.053	11
			PPJ4	0.247	2	0.078	3
			PPJ5	0.077	5	0.025	17
			PPJ6	0.011	7	0.004	19
			PPJ7	0.035	6	0.011	18
EE	0.309	3	EE1	0.095	5	0.029	16
			EE2	0.194	4	0.060	9
			EE3	0.203	3	0.063	8
			EE4	0.300	1	0.093	2
			EE5	0.209	2	0.065	6

The whole procedure is repeated for endogenous variables and the result is shown in Table 12.

Table 12 Comparative weights and ranking of criteria and sub-criteria of endogenous variables

Criteria	Relative preference weights	Relative rank	Sub-criteria	Relative preference weights	Relative rank	Global preference weights	Global rank
Cons	0.253	1	Cons1	0.135	5	0.034	16
			Cons2	0.252	2	0.064	5
			Cons3	0.270	1	0.068	4
			Cons4	0.203	3	0.051	7
			Cons5	0.140	4	0.035	15
SP	0.183	4	Sp1	0.216	2	0.040	12
			Sp2	0.237	1	0.043	11
			Sp3	0.127	5	0.023	19
			Sp4	0.209	4	0.038	14
			Sp5	0.211	3	0.039	13
CV	0.197	3	CV1	0.435	1	0.086	1
			CV2	0.349	2	0.069	3
			CV3	0.109	3	0.022	20
			CV4	0.107	4	0.021	21
Court	0.166	5	Court1	0.433	1	0.072	2
			Court2	0.148	3	0.025	18
			Court3	0.078	4	0.013	23
			Court4	0.052	5	0.009	24
			Court5	0.288	2	0.048	10
Alt	0.202	2	Alt1	0.257	1	0.052	6
			Alt2	0.249	2	0.050	8
			Alt3	0.095	5	0.019	22
			Alt4	0.153	4	0.031	17
			Alt5	0.245	3	0.049	9

Figure 2 Structural model (see online version for colours)

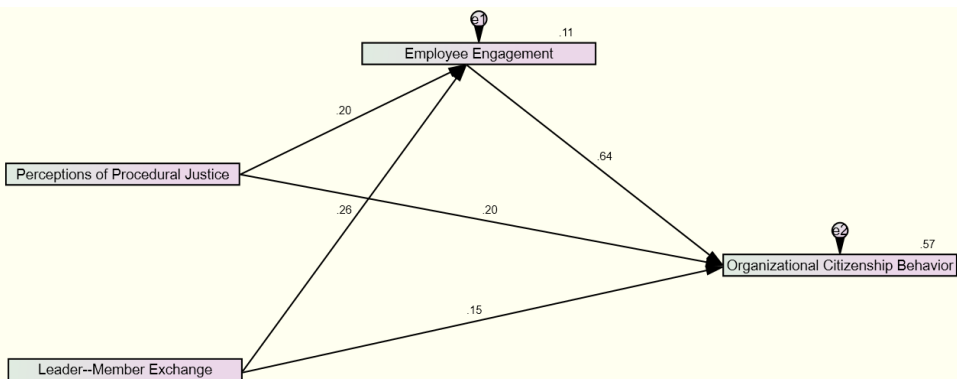


Figure 2 depicts the proposed relationships among the variables. Before testing the hypotheses, the data was checked for multicollinearity issues. For this, a multiple

regression analysis was performed by taking OCB as the criterion variable and LMX, PPJ, LMX, and EE as predictor variables. Regression analysis depicts that the value of VIF, an indication of multicollinearity, ranges between 1.082 to 2.104. This indicates no issue of multicollinearity in the current study (Bagozzi et al., 1991).

Table 13 Structural model analysis

<i>Relationship</i>		<i>Std β</i>	<i>t-value</i>	<i>Decision</i>
H1	Perceptions of procedural justice → employee engagement	0.198	4.960***	Accepted
H2	Leader-member exchange → employee engagement	0.259	5.486***	Accepted
H3	Employee engagement → organisational citizenship behaviour	0.637	21.728***	Accepted
H4	Perceptions of procedural justice → organisational citizenship behaviour	0.202	7.113***	Accepted
H5	Leader-member exchange → organisational citizenship behaviour	0.152	5.278**	Accepted

Notes: **p < 0.05; ***p < 0.01.

Source: Author’s compilation

Table 14 Mediation analysis

<i>Relationship</i>		<i>Direct effect</i>	<i>p-value</i>	<i>Indirect effect</i>	<i>p-value</i>	<i>Total effect</i>	<i>p-value</i>	<i>Mediation</i>
H6	Perceptions of procedural justice → employee engagement → organisational citizenship behaviour	0.202	0.001	0.126	0.001	0.328	0.001	Partial
H7	Leader-member exchange → employee engagement → organisational citizenship behaviour	0.152	0.001	0.165	0.001	0.317	0.001	Partial

Source: Author’s compilation

Table 13 results indicate a significant and positive impact of perceptions of procedural justice on employee engagement ($p < 0.05$, $t = 4.960$, $\beta = 0.198$), such that high perceptions of procedural justice lead to high levels of employee engagement. Hence, H1 was accepted. The results indicates that LMX has positive significant impact on employee engagement ($p < 0.05$, $t = 5.486$, $\beta = 0.259$). The results also indicate that employees who are part of in-group members have high employee engagement as compare to out-group members. Hence, H2 was accepted. Moreover, structural analysis results represented that employee engagement has a positive and significant impact on *organisational citizenship behaviour* ($\beta = 0.637$, $t = 21.728$, $p < 0.05$). It means that employees with high employee engagement have a high level of OCB. Hence, H3 is supported. Moreover, H4 is supported as the value of standardised beta is 0.202, the critical ratio is 7.113 and it is significant at 0.05 level of significance. It means that as the perceptions of procedural justice of employees are high there is a significant and positive impact on organisational citizenship behaviour. Furthermore, results showed that LMX

has a positive and significant effect on employees' organisational citizenship behaviour ($\beta = 0.152$, $t = 5.278$, $p < 0.05$). It means that employees who are part of the in-group, their extra-role behaviour is more as compared to employees who are part of the out-group. Thus, H5 was also accepted.

Mediation analysis (Table 14) depicts that the positive relationship between PPJ and OCB is partially mediated by employee engagement. The results also reflect that employee engagement mediates the relationship between LMX and organisational citizenship behaviour.

5 Discussion and implications

The results of the present study show that the level of employee engagement is an important variable that affects the employee extra-role behaviour (Ng et al., 2021; Zhang et al., 2017). Further, the results of the study show that there are certain individual and organisational factors that affect the employees' perceptions towards their engagement at work. The individual factor consists of employees' perceptions towards organisational justice (Cenkci et al., 2020; Kim and Park, 2017) and LMX (Aggarwal et al., 2020; Tanskanen et al., 2019; Gutermann et al., 2017) is an organisational factor. Therefore, to increase the level of employee engagement among the employees, managers must create a congenial environment. As it will have a positive impact on their perceptions towards procedural justice. For example, the managers can make the employee participate in the decision-making process. Apart from this, leaders should try to increase their interaction with their employees and try to include more and more employees to his/her in-group member. So that their employee engagement level can be increased this, in turn, affects their extra-role behaviour.

6 Limitations and future scope

The current study has provided useful information about the dependent, mediator, and independent factors that have been considered for analysis but this study have also limitations that have to be kept in mind while generalising the results. The first limitation of the current study is based on the data collection method. The data is collected with the help of a self-reported technique and it suffers from the biases of the respondents. To minimise the CMB, data is collected in different phases. Initially, data is collected for predictor variables, and in another phase, data is collected for mediator and criterion variables. Further, Harman single factor analysis results showed that there is no problem with CMB in the present study. The second limitation of the current study is related to the usage of the quantitative method for collecting data. The researchers in the future can use both qualitative and quantitative data for getting more appropriate results. Third, the current study has taken only three predictor variables to predict the extra-role behaviour of the employee. Adding more variables that can impact organisational citizenship behaviour in the future study can open new areas of research. Fourth, the respondents can fill the responses by taking care of socially acceptable answers. This also raises a concern for questionnaire validity. The researcher tried to reduce this bias by including a statement in the questionnaire that the data will be used only for academic purposes and the confidentiality of the data will be maintained.

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