

## Exploring Dimensional Structure of Intimate Co-creation: An Exploratory Factor Analysis

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### Abstract

*Different forms of value co-creation have been a source of literary debate in management literature. Management scholars got the early inspiration for this phenomenon of multi-stakeholder engagement from the field of design engineering in the 1970s. Intimate co-creation is a new concept that explores the immediate impact that a co-creation activity might have on an individual at the dyadic, group, or team level. Most of its benefits as conceptually theorized by Rouse (2020) are very positive; however, it lacks a valid measurement scale for which an exploratory analysis of the dimensional structure of intimate co-creation is needed. The current study has addressed the same research gap. For this purpose, a mixed methods study was conducted to explore the dimensional structure of intimate co-creation and operationalize the concept for development of relevant items. This exploratory factor analysis is the prime step in a series of studies to develop a new measurement scale on intimate co-creation.*

**Key Words:** Intimate Co-creation, Exploratory Factor Analysis, Relational Co-creation, Value Co-creation, HR Co-creation

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## 1. INTRODUCTION

Inspired by the concept of co-innovation, management scholars started a debate on co-innovation, co-creation, and creativity at the workplace through a multi-stakeholder engagement process in the early 1970s (Van de Ven et al., 1976). Networking and collaboration at the workplace create a better environment for better relationship building among employees. Hence, network-based organizations are thought to be better compared to organizations with tall hierarchical structures (Perry-Smith & Shalley, 2003;

Shahzad & Ishaque, 2021a). It also supports a better team-building process (Perlow, 1999; Harrison & Rouse, 2015). Hence, different stakeholders get involved in different processes at the workplace due to measures based on co-innovation and co-creation of joint tasks (Bechky, 2003). However, insufficient research on the potential outcomes of co-creation processes has been conducted (Hewett & Shantz, 2021; Rouse, 2020). The purpose of this study was to explore the dimensional structure of intimate co-creation for development of a new measurement scale. The potential outcomes of intimate co-creation have been explored in another qualitative study by the authors (i.e., Shahzad & Ishaque, 2021a).

The concept of co-creation was more popular in the marketing literature in the previous decade and the value co-creation concept was introduced by Ramaswamy and Prahalad in 2004. Some scholars made attempts to integrate the literature on the concept of co-creation with its different forms and manifestations as applied in the different fields (e.g., Roser, DeFillippi, & Samson, 2013). Different popular forms of co-creation include co-innovation in design engineering, value co-creation in marketing, relational co-creation both in marketing and management, HR co-creation and intimate co-creation in the management literature (Hewett & Shantz, 2021; Rouse, 2020; Gronroos, 2012; Zhou & Hoever, 2014; Tse & Dasborough, 2008; Prahalad & Ramaswamy 2004). The recent debate of management scholars has been on the interactional aspects of co-creation (Gronroos, 2012; Zhou & Hoever, 2014; Tse & Dasborough, 2008). This also includes different forms of co-creation being studied in human resource management such as HR co-creation, relational co-creation, and intimate creation (Hewett & Shantz, 2021; Rouse, 2020). All such forms of relational co-creation are based on the idea that personal intimacies at the workplace enhance the overall satisfaction and workplace performance. However, there is no single theory that concisely elaborates or integrates different forms of co-creation (e.g., Hewett & Shantz, 2021; Rouse, 2020; Shahzad & Ishaque, 2021b).

All types of relational co-creation address the human interaction within the organizations. Value co-creation is considered to be the initial form of co-creation based on service dominant logic in which customers and employees of the organizations jointly interact for the development of customized products and services. It has been extensively explored in the domain of marketing. Efforts have been made to study the phenomenon of value co-creation only for the employees but it remained restricted to the level HR co-creation, experiential co-creation, knowledge co-creation etc.;the concepts of organizational involvement as a key stakeholder. The concept that

purely addresses the creativity at the dyadic or group level within the organizations is of intimate co-creation. The empirical evidence for all other forms of co-creation exists in literature but it is needed for intimate co-creation (Hewett & Shantz, 2021; Rouse, 2020; Shahzad & Ishaque, 2021b). The current study has fulfilled the same gap. Rouse (2020) stated that intimate co-creation needs empirical investigation in academia and healthcare sectors. This study has been conducted by obtaining a sample from university academia because it was difficult to acquire data from healthcare sector during COVID – 19.

Rouse (2020) theorized the concept of intimate co-creation for the very first time. However, it needs empirical investigation for further validation. One of the first few steps for that empirical validation is to explore the dimensional structure of intimate co-creation. Following the guidelines proposed by Carpenter (2017), the current study executed ten steps for a new scale development that are typically related to exploratory factor analysis. In different steps for exploring the dimensional structure and for exploratory factor analysis (EFA), a qualitative study was conducted first using in-depth recorded interviews of respondents from service-based organizations and primarily from university academia. An integrative literature review has been conducted for this purpose following by a mixed methods study for exploring dimensional structure of intimate co-creation and for performing exploratory factor analysis (EFA). Qualitative data analysis in QDA Miner Lite software was performed. The study found that intimate co-creation is comprised of a four-dimensional structure and a measurement scale of 18 items based on exploratory factor analysis. Green et al. (2016) do not recommend to follow exploratory factor analysis (EFA) with confirmatory factor analysis (CFA) on the same dataset. Memon et al. (2017) further emphasized the need for conducting only EFA on a single dataset. Hence, a separate study is proposed for confirmatory factor analysis to further validate the current study. The current study follows a ten-step recommendation by Carpenter (2017) for elaborating dimensional structure and for a new scale development on intimate co-creation.

## **2. LITERATURE REVIEW**

Human beings are considerably influenced by their social interactions that shape their personality (Farrell, 2003; Shenk, 2014). Any intimate form of relationship, such as a close friendship at the workplace

where employees might share a cup of coffee once a day for their work-related discussion etc., can potentially be a source of creativity. Such creative interactions may help in the formation of relationships based on intimate co-creation (Markus & Wurf, 1987). The close and intimate relationship of working partners at the workplace is a source of honest discussion and true feedback (Gruenfeld et al. 1996). The increased extent of diversity also fosters creativity and intimate co-creation at the workplace because the employees find more chances to interact with like-minded colleagues for creative tasks based on co-creation. However, the autonomy of work and choice of partner selection for joint tasks should be given to an employee for better output in this regard (Gormar et al. 2021; Shahzad & Ishaque, 2021c).

Creativity concerning intimate co-creation typically occurs at the dyadic level at the start. Such co-creation then has a positive spillover effect on the group and team levels. Past research has explored the co-creation process at the group and team levels. However, a literature gap exists in exploring intimate co-creation, particularly at the dyadic level through empirical means (Rouse, 2020; Chua, Morris, & Mor, 2012). Establishing personal intimacies such as those through intimate co-creation requires workplace persuasion skills by the employees. Workplace persuasion skills are of pivotal importance for establishing relational intimacies. This also needs an empirical examination with an intimate co-creation process (Jena & Pradhan, 2020). This might help in better performance for mutually assigned tasks (Gronroos, 2012; Brands & Mehra, 2019) and for enhancing the value in the services being offered by the organization (Bowen, 2016; Santos-Vijande, 2015). Rouse (2020) defined intimate co-creation as “*a process in which two people form and maintain a shared interpersonal boundary by engaging in a series of intimate creative interactions—interactions that involve unfiltered idea disclosure, supportive elaboration, and idea-focused evaluation—as they work together over time to develop novel, useful ideas and products*”.

At the start of a co-creation process, the dyadic relationship is important. However, later on, co-creation might extend to groups and teams more effectively if better relational intimacies are already established at the dyadic level (Rouse, 2020; Decoster, Stouten & Tripp, 2019). To this end, the socialization process is also important and requires an individuals' capability to socialize (Tse & Dasborough, 2008). If positive interventions for socialization at the workplace are present, then intimate co-creation is an obvious outcome (Rouse, 2020). For such positive interventions in the organization, the role of leadership is of vital importance (Hunter, Cushenbery, Fairchild, & Boatman, 2012). During and after such positive

interventions, managerial communication is very important in translating the effect of the whole process into a true sense (Cordova & Scott, 2001).

Intimate co-creation can be explained as a kind of reciprocal arrangement whereby individuals create a sense of “we” instead of “I” for shared interpersonal boundaries and creative idea disclosure. Close interpersonal relationships and creativity are the two obvious outcomes of the intimate co-creation process (Rouse, 2020). An important aspect of intimate co-creation is creative idea disclosure. However, psychological safety for such creative ideas is also a need of the individuals that should be addressed during co-creation processes as individuals often perceive that their creative ideas might be stolen or they might not have the due credit for their creative ideas (Rouse, 2020; Decoster, Stouten & Tripp, 2019; Santos-Vijande, 2015; Shahzad et al., 20). In some cases, individuals tend to drop their creative ideas (Mannucci & Perry-Smith, 2021). Timely feedback and communication by managers can address such issues. Solano and Dunnam (1985) explained that as the group size increase, the disclosure of creative ideas gets reduced. This explanation provides strength to the argument of Rouse (2020) that creative idea disclosure typically occurs at the dyadic level. Collective creativity in the workplace is increasingly getting the attention of scholars in the management literature (e.g., Harvey & Kou, 2013; Harrison & Rouse, 2014). Relational co-creation-based initiatives are more common in service-based organizations as compared to manufacturing-based organizations (Oertzen, 2018; Rouse, 2020). However, more research is needed to empirically investigate the reasons for the greater prevalence of co-creation-based activities in service-based organizations. Concerning intimate co-creation, academia and healthcare sectors are proposed for further empirical investigation on intimate co-creation (Rouse, 2020).

As the most intimate form of collaboration happens at the dyadic level, (Rouse, 2020; Svejenova et al., 2010) a dyadic relationship helps in the collaborative sense-making process. This collaborative sense-making process at the dyadic level then translates into group and team level relationships based on co-creation processes (Bellis & Verganti, 2019; Rouse, 2020). However, the feeling of an intimately close relationship that happens at the dyadic level cannot be replaced by a new group member or a team member. Old members would have the same strong bonding while existing in a team-based or group relationship (Farrell, 2003; Shenk, 2014). Hence, those employees that are already working on a task would have a better perception of meaningfulness (Svejenova et al., 2010). This leads to the development of

an intimate space of knowledge sharing among the employees. Such tacit knowledge sharing helps in strong bonding, better workplace performance and employee satisfaction (Ahn & Hong, 2019; Hill et al., 2014). The role of gender is also crucial in determining the success ratio of a relationship based on dyadic level co-creation (Gaggioli et al., 2019). Hence, a gap in the literature exists that requires further exploration of the dynamics such as the role of male-female, male-male and female – female types of dyads and their impact on the performance at the workplace in a relationship based on intimate co-creation. However, the social norms and culture of a particular country might be the factors that impact such relationships (Shahzad & Ishaque, 2021a).

From an individual's perspective, the dyad is the first level of the association at which an individual gets involved with other employees for a joint co-creation or co-innovation (Rouse, 2020). It is also a source of intrinsic meaningfulness for individuals (Farrell, 2003; Shenk, 2014). In case the required level of meaningfulness is achieved by the individuals in a relationship of co-creation, it becomes a source of creativity and innovation (Coopey et al., 1997). Even when these dyads enter a team-based relationship then the same meaningfulness tends to transfer in that team-based relationship. This produces the role of clarity and mutual understanding in a team-based or group-based relationship of individuals working on a joint or creative task (Parker & Hackett, 2012). Such association of meaningfulness is somehow dependent on the social aspects of the workplace. For example, the level of introversion and extroversion in the individuals might impact their tendency of meaningfulness about a particular task (Simel, 1902).

Bellis and Verganti (2019) explained that the creative ideas are executed and nurtured in groups and teams, although, most of the creative ideas are generated by the individuals. In that sense, a dyad is the simplest form of association and the first step toward a team-building process (Pearce & Sims, 2002). In the intimate working relationships of dyads, there remains a greater level of trust and psychological support in the relationship if that relationship is good (e.g., Wright & Cropanzano, 1998; Alvarez & Svejenova, 2005). Such intimacies typically at the dyadic level are the source of intimate co-creation at the workplace. Most of the aspects related to the intimate form of co-creation in human resource management need empirical examination (Rouse, 2020). As this concept of intimate co-creation is new, hence, it needs a new measurement scale. The current study has addressed this latest gap in the management literature that would pave way for the future researchers to test this phenomenon of intimate co-creation with multiple other aspects with

a deductive approach of theory testing and for theoretical contribution to the body of knowledge in the management literature.

### **3. METHODOLOGY**

Denzin (2015) explained that triangulation as a post-positivist approach makes use of different methods simultaneously for the study of the same phenomenon. It better elaborates the mixed-use of qualitative and quantitative methods in research (Heath, 2015). This study used methodological triangulation for scale development on intimate co-creation. Such an approach with the use of qualitative and quantitative mixed methods approach helps in exploring dimensional structure for a phenomenon that is new in the literature. For better exploration of a new phenomenon, a qualitative study is helpful at the start of research (Noble & Heale, 2019; Denzin, 2015). Phenomenology is one of the most commonly used qualitative research approaches (Cresswell, 2013). Interpretive phenomenological analysis (IPA) is one of the recent and common approaches used for the precise elaboration of qualitative data (Smith et al., 2009). Using interpretive phenomenological analysis (IPA) with the help of a semi-structured interview guideline, eight in-depth interviews were conducted with personnel working in service-based organizations. All interviews were conducted on Skype with an average interview time of 21 minutes. Data obtained through the qualitative interviews were analyzed using QDA Miner Lite software. Data analysis revealed that intimate co-creation as a phenomenon is represented by five emerging themes. The sixth theme emerged from the literature that was available on intimate co-creation. From those six dimensions, an initial pool of 72 items was generated with the help of literature and interviews data. Interviewees of qualitative study were working in service-based organizations. Five of them were university teachers, two were from the banking sector, while one was from a commercial service-based organization.

After the qualitative study, the dimensional structure was clear. Then, for exploratory factor analysis (EFA), the ten-step approach of Carpenter (2017) was followed. For example, the phenomenon of intimate co-creation was conceptually and operationally defined. Relevant literature support was identified. The qualitative study already conducted had helped in the generation of dimensions and elements. Next, experts' feedback from three academic professors of management sciences was obtained for 72 newly developed items and their proposed six dimensions. Afterwards, pre-testing

and pilot testing was performed. Further steps included establishing sampling procedure, examining data quality, verifying factorability, using principal component analysis, factor extraction method, Parallel / Monti Carlo analysis, rotation method, and item deletion criteria for factor loadings. Execution of EFA after qualitative study helped in refining the measurement scale based on the dimensions of intimate co-creation obtained through a qualitative study. Finally, based on the pattern matrix with the factor loadings of 0.5 and more, a final measurement scale of 18 items has been proposed.

#### **4. QUALITATIVE STUDY FOR EXPLORING DIMENSIONAL STRUCTURE**

In the first phase, a qualitative study was conducted for an in-depth exploration of the phenomenon of intimate co-creation through interpretive phenomenological analysis (IPA) (Smith, 2007). Following four steps for a qualitative study as proposed by Smith and Osborne (2003), a careful analysis of the interview transcripts was done. Next, related codes were clustered for identifying emerging themes. The third step was to identify and elaborate master themes. The fourth was to organize the themes in the form of codes, sub-themes, and quotes etc. Respondents, mostly from university academia as per the directions of relevant literature, were selected through purposive sampling. All respondents were engaged in mutually assigned collaborative tasks such as research and development in universities. The study was conducted in the service-based organizations and university academia as per the recommendations of previous relevant literature on intimate co-creation (i.e., Rouse, 2020).

Generally, for inductive studies based on interviews, non-probability purposive sampling is used (Boddy, 2016). As a rule of thumb, for studies based on phenomenology, usually six to eight participants are selected (Giorgi, 2006). For the current study, eight participants were selected from service-based organizations for in-depth interviews to explore the phenomenon. Recorded interviews of the respondents were transcribed for further analysis in QDA Miner Lite software, a useful software for qualitative data analysis. Repeated codes with similar words in different quotes were identified after careful analysis of the transcriptions using transcribed data analysis in QDA Miner Lite software. Detailed analysis of qualitative data transcriptions, repeated codes and emerging themes finally helped in identifying five emerging themes based on qualitative data and one emerging theme was identified based on available literature on intimate co-creation. The



following table provides detail of the emerging themes, codes, and their respective definitions:

Table 1. Six Emerging Themes  
(Five themes from interviews and one from literature)

| Codes                                                                   | Themes                         | Definition of Themes                                                                                                                         |
|-------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Working together<br>Mutual discussions                                  | Value formation                | Joint working of employees in the form of spending time together and task related mutual discussions that are the source of value formation. |
| Social relations<br>Consensus Trust<br>Sharing of experiences           | Effective socialization        | Knowing each other by establishing trustworthy and friendly relations at the workplace.                                                      |
| Policy status<br>Co-creation<br>Creativity<br>Common goals<br>Team work | Perception of synergy          | The idea that efficiency and output increase with combined working compared to individual work comes under synergy.                          |
| Opportunity<br>Innovation<br>Self-motivation<br>Incentives              | Creative knowledge sharing     | Inner zest of an individual work to develop and achieve workplace targets. For this, motivation may be intrinsic or extrinsic.               |
| Efficiency<br>Idea sharing<br>Innovative capability<br>Learning         | Perception of joint innovation | The individual's belief that efficiency, idea sharing, and learning enhance the innovative capability and joint innovation the workplace.    |
| (Theme emerged from literature only)                                    | Intent of Relationship         | It is the individual's belief that workplace relations are useful for intimate co-creation.                                                  |

With the help of the six identified themes, an initial pool of 72 items for a proposed measurement scale on intimate co-creation was developed. Hence, the qualitative study helped in identifying the dimensional structure of intimate co-creation and the initial pool of items. Table 1 shows the emerging themes of intimate co-creation including value formation, effective socialization, perception of synergy, creative knowledge sharing, perception of joint innovation and intent of relationship. Furthermore, relevant codes of those six themes have also been identified. This exploration of dimensional structure and preparation of the initial pool of 72 items paved way for exploratory factor analysis using ten-step approach (Carpenter, 2017).

Analysis of transcribed qualitative data of interviews in QDA Miner Lite software obtained the following coding frequencies and statistics of qualitative data as provided in Table 2:

Table 2. Coding Frequency of Emerging Themes from Interviews

| Selective Codes /<br>Theme     | Axial Codes           | Count | % Codes | Cases | % Cases |
|--------------------------------|-----------------------|-------|---------|-------|---------|
| Value formation                | Working together      | 7     | 5.50%   | 4     | 5.7 %   |
|                                | Mutual discussions    | 6     | 4.70%   | 1     | 1.3 %   |
| Effective socialization        | Relationship          | 9     | 7.00%   | 7     | 9.4 %   |
|                                | Consensus             | 7     | 5.50%   | 1     | 1.3 %   |
|                                | Trust                 | 11    | 8.50%   | 7     | 9.4 %   |
|                                | Sharing experiences   | 3     | 2.30%   | 1     | 1.3 %   |
| Perception of synergy          | Policy status         | 2     | 1.60%   | 1     | 1.3 %   |
|                                | Co-creation           | 8     | 6.30%   | 4     | 5.7 %   |
|                                | Creativity            | 5     | 3.90%   | 8     | 10.8 %  |
|                                | goals                 | 1     | 0.80%   | 2     | 2.7 %   |
|                                | Team work             | 8     | 6.30%   | 4     | 5.7 %   |
| Workplace creativity           | Opportunity           | 1     | 0.80%   | 3     | 4 %     |
|                                | Innovation            | 4     | 3.10%   | 6     | 8.1 %   |
|                                | Self-motivation       | 7     | 5.50%   | 3     | 4 %     |
|                                | Incentives            | 1     | 0.80%   | 1     | 1.3 %   |
| Perception of joint innovation | Efficiency            | 3     | 2.30%   | 3     | 2.7 %   |
|                                | Idea sharing          | 10    | 7.80%   | 1     | 1.3 %   |
|                                | Innovative capability | 2     | 1.60%   | 1     | 1.3 %   |
|                                | Learning              | 7     | 5.50%   | 3     | 4 %     |

## 5. EXPLORATORY FACTOR ANALYSIS

Upon expert review of the proposed 72 items scale by three professors of management, three dimensions were excluded, and 24 items were finalized. However, upon Monti Carlo Parallel Analysis, one additional dimension of creative knowledge sharing was retained (O'connor, 2000; Carpenter, 2017; Goldberg & Velicer, 2006; Carpenter, 2017). The 24 items

scale was sent to five potential respondents for pre-testing to assess clarity of concept and whether the intended meanings are perceived the same way as the questionnaire was designed (Collins, 2003). Potential respondents provided the feedback that all the items measured the same concept with the intended meanings as the questionnaire (Carpenter, 2017).

After pre-testing, a pilot study was conducted with 50 respondents. A pilot study is a useful strategy before conducting a full-scale survey and for finding the internal consistency of the instrument through Cronbach Alpha values (Carpenter, 2017; Johanson & Brooks, 2009). Instrument reliability was found satisfactory as the Cronbach Alpha value was above 0.7 (Gliem & Gliem, 2003). The instrument reliability was found to be 0.894. Perceived meanings of intimate co-creation by the respondents were the same as the intended meaning (Cherney & McGee, 2011).

Another important step as per Carpenter (2017) was to determine the sampling procedure. As this was a 24-item measurement scale after the review of experts; hence,  $24 \times 5 = 120$  was the minimum sampling criterion adopted for this study as per the recommendations of previous scholars (e.g., Memon et al., 2020). However, Thompson (2004) recommended that a sample size of 150 respondents is useful for exploratory factor analysis (EFA). The next step was to examine the quality of the data collected from employees working in service-based organizations predominantly in university academia (Rouse, 2020). The software used for data analysis for EFA was Statistical Package for Social Sciences (SPSS). Data was collected online, therefore, there was no missing value. Outliers were assessed through a box plot. However, there was no significant concern of outliers due to 5-point Likert scale data (Wen et al., 2013).

The next step was to test the factorability of the data. Bartlett's test of Sphericity and Kaiser Mayer Olkin's test indicate whether the data is suitable for exploratory factor analysis (EFA) or not (e.g., Hutabarat & Hutabarat, 2020). These statistics must be observed before conducting EFA (Goretzko et al., 2019). The following table shows the results obtained for Bartlett's test of sphericity and Kaiser Mayer Olkin's (KMO) test:

Table 3. KMO and Bartlett's Test

|                                                  |                    |          |
|--------------------------------------------------|--------------------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. |                    | .829     |
| Bartlett's Test of Sphericity                    | Approx. Chi-Square | 1312.484 |
|                                                  | Df                 | 153      |
|                                                  | Sig.               | .000     |

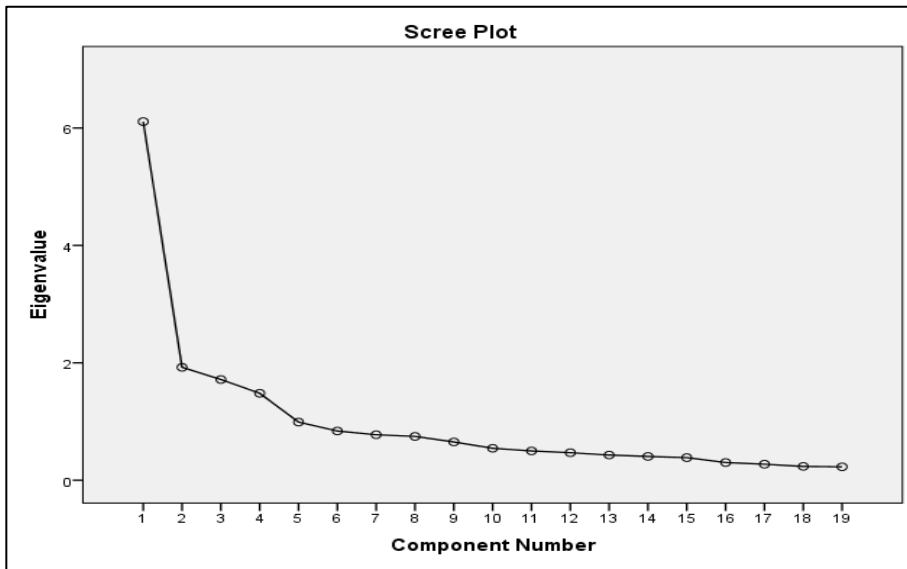
KMO value was greater than the threshold of 0.7 which is in the acceptable range and the value of Bartlett's test of Sphericity value was also significant as its value was below 0.05 (Carpenter, 2017; Tabachnick & Fidell, 2007). Hence, the results indicated that the data was suitable for EFA (Carpenter, 2017).

#### **a. Principal Component Analysis**

Exploratory Factor Analysis (EFA) was performed using principal component analysis (PCA). EFA is a group of techniques involving principal component analysis s used for data reduction (John, 2017). SPSS software was used for PCA that helped in exploring and verifying the factor structure (Hotelling, 1933). Promax rotation was used along with Kaiser normalization, that is useful in verifying the factor structure (Kaiser & Rice, 1974). The criterion for factor loading was fixed to 0.5 and items with cross-loading were eliminated (Maskey, Fei & Nguyen, 2018; Henson & Roberts, 2006). Four dimensions were fixed that were later confirmed through scree plot and Monti Carlo Parallel Analysis using syntax programming in SPSS. The total variance explained by the four dimensions was 60.8.

Scree plot criterion was preferred instead of using the eigenvalues criterion for factor selection. One reason to have four fixed dimensions instead of a three-dimensional structure was that a model with more dimensions explains a greater amount of variance. In social sciences, more than 50 % total variance explained by a model is customary. However, total variance explained the value of more than 60 % is ideal (Finch, 2019; Fabrigar & Wegener, 2012). The one additional dimension added was creative knowledge sharing; also, in line with the initially designed questionnaire where creative knowledge sharing was one of the proposed dimensions of intimate co-creation (Boateng et al., 2018). In commonalities, items with a value of less than 0.3 are thought to be ill-suited (Watson, 2017). Therefore, only items with a communality value greater than 0.5 were retained. The exclusion of items with low values of communalities also enhances the total variance explained by the dimensions of the proposed concept (Pallant, 2016). This also covers the sixth step proposed by Carpenter for scale development via EFA as the decision to retain the specific number of factors is called factor extraction method. This might be through the eigenvalue criterion, scree plot, or by fixing the specific number of dimensions. In the current study, four dimensions were fixed that were confirmed with eigenvalue (Fabrigar & Wegener, 2011).

Figure 1. Scree Plot with Confirmation of Four Factors Above Cut off Value of 1.



Scree plot confirmed the four-factor structure for the dimensions of intimate co-creation as four factors have a value above 1.0 (Creed et al., 2020).

#### b. Parallel Analysis / Monti Carlo Analysis

Carpenter (2017) suggested that it is recommendable to further validate factor structure through Monti Carlo Analysis / Parallel Analysis. SPSS 23 was used for conducting Monti Carlo Analysis (Wood et al., 2015). Even after running Monti Carlo Analysis, the randomization of the same data set generated a four-dimensional structure and it was a confirmation of the earlier proposed four-factor solution (O'connor, 2000; Liu & Rijmen, 2008). The following analysis in SPSS validated the four-factor solution performed using syntax-based programming for Monti Carlo Analysis in SPSS (O'connor, 2000).

Table 4. Parallel Analysis for Random Data Eigenvalues

| Root | Means | Percentile |
|------|-------|------------|
| 1    | 1.722 | 1.833      |
| 2    | 1.604 | 1.699      |
| 3    | 1.504 | 1.574      |
| 4    | 1.429 | 1.500      |

A bootstrap of 100 values was generated with a 95 % confidence interval. For the acceptance of a dimension, it is important that in percentile value must be greater than its mean value (Watkins, 2005; O'connor, 2000). In the current Monti Carlo Parallel Analysis, the first four values had a percentile value more than the mean value. From the fifth value onwards, the value of the percentile decreased as compared to the mean value. Hence, this depiction of the Monti Carlo Analysis further validates the four-factor dimensional structure of intimate co-creation (Watkins, 2005; O'connor, 2000).

## **6. RESULTS AND DISCUSSION**

Minimum factor loading of 0.5 was decided for item retention in the pattern matrix and items with cross-loadings were deleted. Items were also assessed for the theoretical convergence concerning their respective dimension and it was found that all the items were loaded on their respective dimensions (Watkins, 2005). The total variance explained by the four-factor dimensional model of intimate co-creation was 60.8 %. Factor loading based on pattern matrix clarified the factor loadings. After removal of items with factor loading below 0.5 and after removing the items with cross-loadings, the final measurement scale after exploratory factor analysis comprised 18 items. Four dimensions included value formation, creative knowledge sharing, perception of joint innovation and effective socialization. The total variance explained by the model was 60.8 %. The highest variance was explained by the dimension of value formation at 32.8 % and this established its importance as the most valuable dimension (Finch, 2019; Fabrigar & Wegener, 2012). A variance of 10.34 % was explained by the second dimension and 9.4 % variance was explained by the third dimension. The fourth dimension explained the 8.22 % variance. Overall, the model with a total variance of 60.8 % was in the acceptable range (Streiner, 1994; Field, 2013).

It can be observed from the final scale that factor loadings for all the items were greater than 0.5. Four-factor dimensional solution was in line with the available literature, experts' feedback and support gained from the interviews' data (Fabrigar & Wegener, 2012; Pett et al., 2003). Items with communalities less than 0.5 were removed one by one to improve the average variance explained by the four-factor model (Pett et al., 2003).

Table 5. Measurement Scale after Exploratory Factor Analysis (EFA)

| Dimensions & Item Codes        | 18 Items                                                                                                                          | Factor Loadings |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Value Formation                |                                                                                                                                   |                 |
| VF1                            | I believe that working jointly with others produces better results.                                                               | 0.772           |
| VF2                            | I feel that most of the creative tasks are accomplished because of team work.                                                     | 0.878           |
| VF3                            | Employees in our organization are often helpful in joint and creative tasks.                                                      | 0.812           |
| Creative Knowledge Sharing     |                                                                                                                                   |                 |
| CSK1                           | I learn from other employees while working with them.                                                                             | 0.59            |
| CSK2                           | I share my creative ideas at the workplace for better co-creation.                                                                | 0.653           |
| CSK3                           | I have the ability to share the knowledge of my field.                                                                            | 0.858           |
| CSK4                           | I have the ability to learn the pertinent knowledge of my field from different sources at the workplace.                          | 0.721           |
| Perception of joint innovation |                                                                                                                                   |                 |
| PJI1                           | I feel that working with my colleagues is a source of innovation at the workplace.                                                | 0.619           |
| PJI2                           | Collective efforts of the team members in our department are helpful in achieving the organizational goals.                       | 0.809           |
| PJI3                           | We strive for achieving common organizational goals at the workplace.                                                             | 0.744           |
| PJI4                           | Team work environment is encouraged in our organization.                                                                          | 0.754           |
| PJI5                           | I feel that a supportive team work environment is a source of creativity.                                                         | 0.617           |
| Effective socialization        |                                                                                                                                   |                 |
| ES1                            | I tend to socialize with others which helps me in team work.                                                                      | 0.64            |
| ES2                            | I tend to socialize with others for creative task accomplishment which helps us in the creative idea disclosure at the workplace. | 0.782           |
| ES3                            | My relationship with the colleagues is a source of our better collaboration at workplace.                                         | 0.758           |
| ES4                            | I like to work on creative and innovative tasks initiated by my colleagues.                                                       | 0.813           |
| ES5                            | My colleagues help me at workplace for creative and innovative tasks.                                                             | 0.778           |
| ES6                            | I feel comfortable during interaction with the colleagues of my department.                                                       | 0.746           |

A component correlation matrix shows the un-rotated factor solution. It can be observed that the correlation between the first two dimensions is strongest and demonstrates why the first two dimensions have explained the greatest amount of total variance explained (Bandalos & Finney, 2018). It is also another reason why most of the items are loaded on two dimensions (Pallant, 2016). It is expected that the component correlation matrix should have correlation values around 3 (Pallant, 2016). The following table shows the component correlation matrix obtained through exploratory factor analysis.

Table 6. Component Correlation Matrix

| Component | 1     | 2     | 3     | 4     |
|-----------|-------|-------|-------|-------|
| 1         | 1.000 |       |       |       |
| 2         | .318  | 1.000 |       |       |
| 3         | .442  | .299  | 1.000 |       |
| 4         | .372  | .252  | .392  | 1.000 |

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

Concerning factor loadings, three items finally loaded on the dimension of value formation with the factor loading of 0.772, 0.878 and 0.812 respectively. Four items were loaded on the second dimension of creative knowledge sharing with the factor loading of 0.59, 0.65, 0.85 and 0.72 respectively. On the third dimension of perception of joint innovation, five items were loaded with the factor loading values of 0.61, 0.80, 0.74 and 0.75 respectively. On the fourth dimension of effective socialization, six items were loaded with the factor loading values of 0.64, 0.78, 0.75, 0.81, 0.77 and 0.74 respectively. There were no items accepted below the factor loading value of 0.5.

The six emerging themes of this concept finally have reduced to four themes. These four themes include value formation, effective socialization, creative knowledge sharing, and perception of joint innovation. The themes are highly relevant to intimate co-creation. However, they are also relevant to the other forms of relational co-creation such as value co-creation. Hence, a separate study may test these themes for other forms of co-creation such as knowledge co-creation, experience co-creation, and HR co-creation, among others. While a dimension such as “creative knowledge sharing” might be highly relevant to knowledge co-creation., perception of joint innovation is equally relevant to value co-creation. Therefore, these concepts based on co-creation are mutually exclusive but collective exhaustive.



## **7. LIMITATIONS AND FUTURE DIRECTIONS**

As the concept of intimate co-creation is newly theorized on conceptual grounds, hence, its empirical validation was imperative (Rouse, 2020). Conducting a qualitative study is imperative to analyze a new phenomenon (Cresswell, 2013). The same applied to the concept of intimate co-creation as it is a new concept in the body of knowledge in management literature. Particularly, concerning exploring its dimensional structure for further groundbreaking research on intimate co-creation, it was necessary to conduct a qualitative study proceeded by an exploratory factor analysis as per the ten-step recommendation (Carpenter, 2017). Hence, the study using a mixed-methods approach has found that intimate co-creation has five dimensions emerging through inductive study and one from literature. However, the deductive study for EFA has found that intimate co-creation is primarily supported by a four-dimensional structure with an 18-item measurement scale.

Future researchers may test this measurement scale in different contexts, industries, and cultures. However, further validation of this measurement scale is in progress by the authors in which validation of the new measurement scale would be carried out through confirmatory factor analysis in AMOS as well. However, as per the directions of Carpenter (2017) for ten steps for scale development, the current scale can also be used by the scholars for studies on intimate co-creation considering that the EFA and CFA cannot be performed on a single dataset and for the current study, the only single quantitative dataset was used for EFA (Memon et al., 2017).

## **8. CONCLUSION**

The current study is the pioneering study for exploring the dimensional structure of the intimate co-creation concept that was earlier theorized only on conceptual grounds. However, this measurement scale, developed on the basis of Carpenter's (2017) recommendations, is useful enough for future researchers to use it in research on intimate co-creation in different sectors, industries, countries, and organizational cultures. Further validation of this measurement scale through confirmatory factor analysis would further validate this measurement scale. The mixed methods approach used in this research has helped in the identification of emerging themes through inductive and deductive means. Five themes have emerged on

intimate co-creation from inductive interviews and one theme has emerged from the literature. More research is needed by management scholars to explore different dynamics associated with intimate co-creation. As the concept of intimate co-creation is new in the body of knowledge (Rouse, 2020), hence, empirical work on it would positively contribute to the existing body of knowledge in the management literature.

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