Psychometric Analysis of Connor–Davidson Resilience Scale in Indian IT Industry

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Resilience is of great importance for individuals working in complex and instable environments. Individual resilience is the ability of an individual to bounce back and sustain in adverse conditions. Research revealed that resilient employees are more likely to be productive, agile and innovative during the turbulent times, thereby making it essential to have an individual centric measure of resilience. The current study examined the psychometric properties of Connor-Davidson Resilience scale (CD-RISC) on a sample of Indian IT Executives including 160 employees of 12 IT firms located in Chandigarh tri-city region. The result of exploratory principal component factor analysis with varimax rotation and confirmatory factor analysis verified the original five factor structure as given by Connor and Davidson (2003). In this study 74% of variance was jointly explained by the five factors. The result supported the dimensionality, reliability (α = 0.85) and validity of the CD-RISC scale for measuring the IT Executives resilience. The results of the study helps in representing individual resilience as first order construct made up of five dimensions: Personal competence, high standards and tenacity; Trust in one's instincts, tolerance of negative affect and the strengthening effects of stress; Positive acceptance of change and secure relationships with others, Control, and Spiritual influences.

Keywords: Individual Resilience, CD-RISC, IT Executives, Psychometric Evaluation.

Service or the tertiary sector is one of the fastest growing segments of Indian Economy and has played a momentous role in positioning India on the global landscape. The sector contributes about 60% of the national GDP and has successfully attracted FDI inflows of US$ 40,684.98 million (Ministry of Finance, 2015). The Economic Survey (2014-15) revealed that IT software and IT enabled services (ITES) as the big ticket items that help in building the Indian service sector as a remarkable brand globally.

Making India Proud, IT-ITES industry emerged as a single major contributor to India's services exports by earning a revenue of US$ 119 billion (Ministry of Finance, 2015) and providing direct employment to about 3.1 million people and indirect employment to 10 million people (NASSCOM, 2014). It is rightly remarked as the sunshine sector that has radically transformed India's image from a rural and agriculture-based economy to a well knit knowledge based economy.

Characteristics of IT and ITES

Despite all the positive vibes around the industry, the VUCA (volatile, uncertain, complex, and ambiguous) nature of today's global business environment can't be ignored. The challenging macro environment characterized by slackening demand, rising costs, cut throat competition is affecting the Indian IT industry at large. This industry feels an intense pressure because of its highly output-driven nature. The fast pace of technological advancement in IT sector is making it more vulnerable to threats. In addition to this, the peculiar work culture and characteristics of IT and ITES sets it apart from other industries of service sector (Sengupta & Singh, 2013). IT workers operate on tight deadlines, high client expectations, multitasking, working in multiple shifts, dissimilar time zones, and prolonged working hours that at times extends beyond 50 hours per week (Budhwar et al., 2006; Sengupta & Singh, 2013). The present working style in IT industry contributes to high level of occupational stress among

the employees (Sengupta and Singh, 2013). The study by GFI Software revealed that 57 percent of IT specialists are under huge stress and are vigorously considering leaving their current roles. The survey by Simoes (2013) to find the companies having most stressful work environment revealed that of the top 200 companies on the Best Employers list, IT/ITeS companies are amongst the most stressful places to work.

Research suggests that it is one's resilience capacity that plays an imperative role in dealing with the stressful and life-changing situations. According to changefirst.com a stressful situation, affect the thinking, feelings and behavior of the people. It disrupts and pushes an individual out of its comfort zone; however, the amount of disruption depends on a person's resilience capacity. More resilient the individual is less disruption he/she feels and with more speed he/she may recover from the stressful situation. Individual resilience or more specifically psychological resilience is defined as an individual's tendency to handle stress and adversity. Luthans (2002a) defined resilience as

> "the positive psychological capacity to rebound, to 'bounce back' from adversity, uncertainty, conflict, failure, or even positive change, progress, or increased responsibility." (pp. 702)

Research revealed that individuals, who are more resilient, are better in coping with the change in the environment, are able to change to a new way of working when the old way is no longer possible and are more likely to be healthier and productive for an organization (Cooper, 2013).

The significance of resilient workforce in a high stress environment thereby makes it essential to have an individual resilience measure. This would enable the empirical investigation in the domain of resilience in work situation; factoring at individual level and helping in understanding the characteristics that enable the employees to cope effectively with stress and adversity. Several researchers and scholars have generated theories, developed frameworks to measure resilience. Among the various instruments, a recently developed measure –

Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) has attracted a widespread attention from researchers for its established psychometric properties. The CD-RISC has been used, tested and validated across several groups, including South African and Chinese adolescents, Korean students, nurses, and Indian students (Jorgensen & Seedat, 2008; Baek et al., 2010; Singh & Yu, 2010; Yu et al., 2011). However, till date no attempt has been made worldwide to assess the resilience capacity of IT executives that are supposed to work under extreme work pressures. The high output-driven nature and faster pace of technological advancement has made this industry more susceptible to stress and makes a unique case for exploration of resilience as a coping strategy. Keeping the peculiar work culture and characteristics of IT and ITES in mind, this study aims to evaluate the psychometric properties of the CD-RISC scale with the broader objective of determining whether it can be used as a reliable and valid tool to assess IT Executives Resilience.

Resilience

Resilience has a persuasive history in psychiatry. It began with the development studies focused on children that performed well despite the adverse family circumstances (Werner & Smith, 1992). Subsequently plethora of literature was generated in the health domain, focusing on the effects of resilience for muddling through the harrowing situations. It was professor Fred Luthans who introduced the concept of individual resilience in the domain of positive psychology via the core concept of psychological capital (Luthans et al., 2004).

Domains of Resilience

The genesis of individual resilience is found in two bodies of literature: the psychological aspects of coping and the physiological aspects of stress (Tusaie & Dyer, 2004). Psychological resilience is concerned with behavioural adaptation, usually defined in terms of internal states of well-being or effective functioning in the state of risk and instability. From a psychological and development perspective it is considered that resilience grows and extends over time. It is argued as a set of traits (Jacelon, 1997),

a process (Olsson et al., 2003) or an outcome (Vinson, 2002), that abates the downbeat effects of stress and fosters adaptation. Simultaneously, it is also considered as a common physiological characteristic of human organs and tissues that facilitates them in enduring and recuperating from an injury (Manji and Duman, 2001). On the other hand, research revealed that everyone possesses a different capacity to handle stress or convalesce from an injury (CIPD, 2011) therefore, resilience is best perceived as a multidimensional construct that varies across time and circumstances.

Protective factors and Resilience

Several factors are found to contribute to resilience and are termed as protective factors. Many studies reveal that one of the primary factors that help bolstering individual resilience is having concerned and supportive relationships within and outside the family (Werner & Smith, 1992). The individual personality characteristics like internal locus of control (control over one's life), insistence, emotional management and awareness, sanguinity, sense of humor, self-efficacy (belief in own capabilities), have major role in building the individual psychological resilience (Werner & Smith, 1992). A study by Winwood and McEwen (2013) grouped the protected factors affecting resilience into network factors, individual abilities and skills and also included values and faith as the existential support.

Measurement of Resilience

Measuring resilience has always been a complicated task for the researchers. However, measuring the positive attitudes of an individual and supporting environment has made it possible to have an operational measure that enables the individuals to measure their resilience capacity. Keeping this in mind, several psychometric scales have been developed to measure psychological resilience. Few such measures include the Dispositional Resilience Scale-15 (DRS-15; Bartone ,1995;2007), Resilience at Work scale (RAW; Winwood and McEwen,2013), Resilience Scale (RS; Wagnild & Young, 1993) Resilience Scale for Adults (RSA; Friborg, Barlaug, Martinussen, Rosenvinge & Hjemdal, 2005), The Brief Resilience Scale (BRS; Smith,

Dalen, Wiggins, Tooley, Christopher & Bernard, 2008) and the Connor– Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) (Refer Table 1).

Among the various instruments, Connor-Davidson Resilience Scale (CD-RISC) has found to be one of the most reliable and valid measures that can be applied in diverse conditions. The instrument gained widespread attention of the scholars and researchers because of its established psychometric properties.

CD-RISC was designed to be widely applicable in different samples thereby establishing norms for resilience in normal and clinical samples. It was premeditated as a self-administered scale consisting of twenty-five items divided into five factors. The first factor personal competence, high standards and tenacity, endorses one's strong sense of power and adherence to one's goal while facing difficult situations. The second factor is known as trust in one's instincts, tolerance of negative affect and strengthening effects of stress focused on one's serenity, decision making capacity, and promptness when coping with stress. The third factor was labeled as positive acceptance of change, having secure relationships with others, and dealing with one's level of adaptability in an environment of risk and instability. The fourth factor, named as control, dealt with having control over achieving one's own goal and the capacity to access assistance from others that is termed as social support. The fifth and the last factor, labeled as spiritual influences, which deals with assessing one's trust in God or in fate (Connor & Davidson 2003).

However, further studies conducted across independent samples of dissimilar ages and settings have revealed instability in the factor structure of CD-RISC. For example, the studies conducted among Chinese and Korean group reproduced the original five factor model of CD-RISC (Yu et al., 2011; Baek et al., 2010). Similarly, an Australian study of nurses replicated the five structure of original CD-RISC (Gillespie, Chaboyer & Wallis, 2009). The study conducted on a sample of Indian Students established the four factor model consisting of hardiness, optimism, resourcefulness, and purpose (Singh

Table 1: Description of various scales measuring Individual Resilience

Instruments	Resilience Scale for Adults (RSA)	Resilience Scale (RS)	Resilience at Work (RAW) Scale	The Dispositional Resilience Scale (3) (USA/ English)	The Brief Resilience Scale (USA/ English)	Connor–Davidson Resilience Scale (CD-RISC)
Author	Friborg et al. (2003)	Wagnild & Young (1993)	Winwood and McEwen (2013)	Bartone (1995; 2007)	Smith et al. (2008)	Connor and Davidson (2003)
Constructs and Items	5(37) personal competence, social competence, family coherence, social support, and personal structure	2(25) personal competence and acceptance of life and self	7(20) Living authentically, finding your calling, maintaining perspective, managing stress, interacting cooperatively, staying healthy, building networks	3(15), commitment, control, and challenge	1(6)	5(25) personal competence, trust/tolerance/ strengthening effects of stress, acceptance of change and secure relationships, control, spiritual influence
Purpose of measure	Designed to measure the protective factors that contribute to adult resilience	To identify individual resilience, a positive personality characteristic that enhances individual adaptation	To understand the elements of workplace-resilience, a skill that could be taught, practiced, and developed	Designed with an aim to measure psychological hardiness	Designed as an outcome measure to assess the ability to bounce back or recover from stress	Designed for clinical practice as a measure of stress coping ability.
Target Population	Patients from an adult outpatient clinic	Adults	Multi-study sample (including health, manufacturing industry workers (various), teachers, bank offices, corrections officers.	Adults	Adults	Adults

Reliability	Internal consistency: full scale ranges from .67 to .90 Test-retest reliability: (Four months) range from .69 to .84.	Internal consistency reliability :estimated for the full scale to be .91	Internal consistency reliability: Cronbach's alpha for the total scale is .84, for individual subscales ranges b/w .60 to .89	Internal consistency: Cronbach's alpha reported for the full scale to be 0.82 Test-retest reliability : (3 week) estimated to be 0.78	Internal consistency: Cronbach's alpha ranging from .80–.91 across all the samples Test-retest reliability: (1 month) estimated to be of .69 and (3 months) estimated to be .62	Internal consistency: Cronbach's Alpha reported for full scale to be 0.89 and item-total correlations ranged between .30 to .70 Test–retest reliability assessed from subjects in groups four and five with correlation coefficient of .87
Validity	Convergent validity and Discriminant validity: Present	Convergent validity and Discriminant validity: Present	Convergent and Discriminant validity: Present	Author reported the good criterion related validity of the instrument across various samples	Convergent and Discriminant validity: Present	Convergent validity-Present: Discriminant validity—not present

Source: Author compilation of literature

& Yu, 2010). The study done by Jorgensen and Seedat (2008) on a sample of 701 South African adolescents were unable to reproduce the original factor structure; rather they identified three factors as tenacity, adaptation and spirituality from their study. Besides, this Campbell-Sills and Stein (2007) conducted a study to enquire about the composition of the original CD-RISC. The result of the factor analysis found the 25-item scale as unstable over two identical populations. Further, this leads to the development of a 10-item comprising of four factor (hardiness, social support/purpose, faith, and persistence) version of the CD-RISC scale.

The literature reveals a dearth of generally acknowledged theory for resilience that demonstrates both a unitary and multi-factorial composition for the CD-RISC scale. Moreover to the best of researchers' knowledge, there is no study that has used CD-RISC with a sample that exclusively includes IT executives in India. The resilience structure of IT executives that are supposed to work under high stress is unexplored till date. Keeping this research gap in mind the study aims to evaluate the psychometric properties of the Connor-Davidson Resilience Scale with the broader objective of determining whether it can be used as a reliable and valid tool to assess IT Executives resilience.

Method

To collect the primary data twelve IT firms were located in the Chandigarh tri-city region, which were registered with NASSCOM. They were contacted and a sample of 160 respondents from various hierarchies was selected using the stratified random sampling method. An equal number of questionnaires were distributed among IT employees classified under five heads (Entry level Executives, Professional level Executives, Senior Management level Executives and Top Management Level Executives). Upon data entry and data cleaning only 152 correct and usable responses were found to be fit for data analysis, corresponding to a response rate of 95%. Personal visits were made to collect the data from the employees. For sample size determination, rule of five i.e. the subjects-to-variables ratio no lower than five (Bryant &

Table 2: Distribution of Respondents

	Number of respondents (N=152)	Percentage		Number of respondents (N=152)	Percentage
Age (years)			Education Qualification		
21-30	72	47.4	Graduate	45	29.6
31-40	57	37.5	Post Graduate	31	20.4
41 & above	23	15.1	Professional Education (B.Tech /M.Tech)	59	38.8
Total	152	100	Ph.D.	12	7.9
Gender			Others	5	3.3
Male	104	68.4	Total	152	100
Female	48	31.6	Total work Experience		
Total	152	100	0-5 Years	69	45.4
Income (monthly)			5-10 Years	51	33.6
< Rs.40,000	58	38.2	10 Years and more	32	21
Rs.40,001-70,000	46	30.3	Total	152	100
> Rs.70,001	48	31.5			
Total	152	100			

Source: Author compilation of primary data

Yarnold, 1995) was used to conduct the factor analysis.

The data in Table 2 shows a spread across various demographic dimensions for the sample (104 males and 48 females). The maximum percentage of respondents (i.e. 47.4%) were falling in the age group of 21 and 30 years with more number of respondents possessing professional qualifications like B.Tech, M.Tech than other graduation and post graduation degrees. IT organizations pay hefty salary packages, attractive incentives and other monetary benefits to their employees, which points to the statistics, which state that 31% of employees receive more than Rs. 70,000 as their monthly salaries.

Measures: A handout containing a covering page of demographic questions, and CD-RISC was prepared. The original English version of the scale was adapted with few changes in verbiage with an aim to prompt readers to identify themselves as active participants in various items. Overall, the author of this study rephrased three items of the study ("Things happen for a reason", was rephrased" to "I believe things happen for a reason"; "Past success gives me confidence for new challenges" was rephrased to "Past success gives me confidence to deal with the new challenges"; "Sometimes fate or God can help" was rephrased to "I believe that when everything looks bleak, sometimes it's fate or God that helps").

For this research the Likert rating was modified and items were rated on a scale from 1 to 5 instead of original 0 to 4, as Indian respondents are more comfortable with 1-5 scaling convention. The range varies from 1 to 125 and a high score leads to high resilience.

Results

The data was analyzed using SPSS-21 and AMOS-21. The measurement scale was refined via four step process.

Firstly, all the data was screened for Normality, Outliers and Multi-collinearity. Univariate outliers were checked via Z-score values in SPSS (z = +3.29 (p< .001, two-tailed test)) (Tabachnick and Fidell, 2001), and indicated in normality of data. Further, Multivariate outliers were checked using the Mahalanobis distance statistics using AMOS and the largest Mahalanobis d-squared value, or the observation of the furthest distance from the centroid, came out to be 45.198 with a probability value > .05 (Afifi and Azen, 1979), which again depicts that the data falls under the normal distribution category. Further, the data was screened for instances of multi-collinearity via analysis of tolerance (TOL) and variance inflation factor (VIF). Multi-collinearity was not present as all TOL indices were > .10 and all VIF measures were < 3 (Hair et al., 2010).

Table 3 represents the mean, standard deviation, skewness, and kurtosis for each item. In terms of standard deviation, there was a range provided from .99 to 1.28. Skewness ($\leq |1.13|$) and kurtosis ($\leq |0.90|$) results demonstrated that none of the items were > the recommended cut-off point's of | 3.00 | and | 8.00 |respectively, pointing that data is free from Univariate non-normality (Kline, 1998).

Exploratory Factor Analysis

An exploratory principal component factor analysis with varimax rotation was performed to assess the 25 items of CD-RISC scale. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity was used to evaluate the
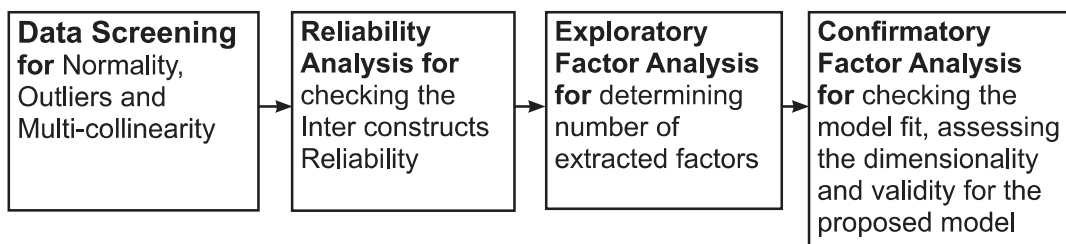
| **Data Screening** for Normality, Outliers and Multi-collinearity | **Reliability Analysis for** checking the Inter constructs Reliability | **Exploratory Factor Analysis for** determining number of extracted factors | **Confirmatory Factor Analysis for** checking the model fit, assessing the dimensionality and validity for the proposed model |

Figure 1: Four-step process for refining the measurement scale

Table 3: Descriptive Statistics

No.	Items	Mean	SD	Skewness	Kurtosis
Personal Competence, High Standards, And Tenacity(PCHT)					
10.	PHT_1	3.86	1.24	-.96	-.17
11.	PHT_2	3.94	1.17	-.99	.04
12.	PHT_3	3.86	1.26	-1.10	.19
16.	PHT_4	3.87	1.20	-1.07	.19
17.	PHT_5	3.89	1.18	-1.01	.18
23.	PHT_6	3.90	1.18	-1.06	.25
24.	PHT_7	3.90	1.2	-1.10	.26
25.	PHT_8	3.90	1.20	-1.13	.41
Trust In One's Instincts, Tolerance Of Negative Affect, And The Strengthening Effects Of Stress(TTSS)					
6.	TTS_1	3.76	1.28	-.75	-.64
7.	TTS_2	3.80	1.20	-.87	-.16
14.	TTS_3	3.81	1.18	-.93	.04
15.	TTS_4	3.78	1.20	-.76	-.42
18.	TTS_5	3.74	1.23	-.88	-.15
19.	TTS_6	3.74	1.23	-.73	-.48
20.	TTS_7	3.85	1.21	-.97	.06
Positive acceptance of change and secure relationships with others (PCSR)					
1	PS_1	3.45	1.09	-.55	-.46
2.	PS_2	3.38	1.18	-.31	-.90
4.	PS_3	3.48	1.22	-.53	-.73
5.	PS_4	3.66	1.11	-.74	-.16
8.	PS_5	3.64	1.18	-.68	-.47
Control (CNTL)					
13.	C_1	3.80	1.08	-.57	-.58
21.	C_2	3.76	.99	-.65	.09
22.	C_3	3.66	1.17	-.66	-.31
Spiritual Influences (SPIF)					
3.	S_1	3.62	1.20	-.62	-.54
9.	S_2	3.19	1.22	-.15	-.74

Source: Author compilation of primary data

appropriateness of factor analysis. The former one ensured the overall measure of sampling adequacy by 0.886 (>0.50) (Kaiser, 1974) and the latter statistics provided support for validity of the instrument as it was 2644.025, df=300, significant at p=0.000 (Stevens, 2012). The five factors with Eigen values greater than 1 were extracted (Fabrigar et al., 1999) and after rotation their values were 5.945, 5.109, 3.793, 2.090, and 1.578. Further, the sum of squared loadings from the five components had the cumulative value of 74.065% in elucidating total variance in the data. Scree plot analysis reflected the point of inflexion at factor 6 and

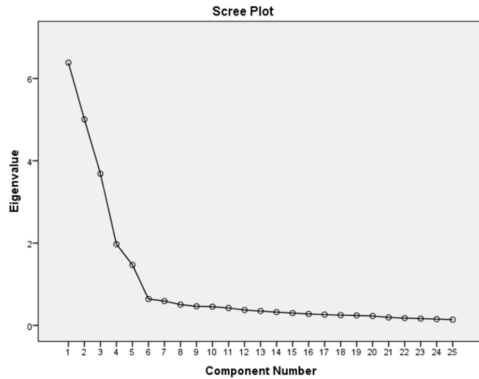thereby it substantiates the five-factor structure of CD-RISC instrument.

Figure 2: Scree Plot and Point of Inflexion

The application of EFA on IT Executives data resulted in the same five factors even after about 4-5 iterations. Moreover, none of the questionnaire items correlates too highly ($r > 0.8$ or $r < -.8$) or too lowly ($-0.3 < r < 0.3$) with other items (Field, 2013). Furthermore, no items warranted removal as none of the item depicts the factor loadings to less than 0.4) and communalities for each variable crossed the cutoff point of 0.5 as suggested by Field (2013) (Refer Table 4).

Reliability Analysis

The reliability analysis of the refined model with 25 items and five factors was undertaken to verify how strongly the attributes are associated with each other (Hair et al., 2010). The Cronbach's

Table 4: Psychometric properties of CD-RISC Measure

Factor	Items	Load-ings*	Commun-alities	Eigen Values	Cumulative Variation	Cronbach's Alpha	CR	AVE	MSV	ASV
PCHT	PHT_1	.850	.757	5.945	23.779	0.903	0.949	0.700	0.025	0.015
	PHT_2	.839	.724							
	PHT_3	.866	.763							
	PHT_4	.845	.722							
	PHT_5	.878	.774							
	PHT_6	.897	.813							
	PHT_7	.868	.761							
	PHT_8	.800	.649							
TTSS	TTS_1	.827	.727	5.109	44.216	0.867	0.932	0.662	0.016	0.012
	TTS_2	.814	.691							
	TTS_3	.827	.721							
	TTS_4	.872	.771							
	TTS_5	.836	.704							
	TTS_6	.880	.790							
	TTS_7	.852	.749							
PCSR	PS_1	.844	.724	3.793	59.390	0.932	0.915	0.685	0.049	0.023
	PS_2	.880	.803							
	PS_3	.859	.747							
	PS_4	.885	.813							
	PS_5	.823	.697							
CNTL	C_1	.812	.673	2.090	67.752	0.752	0.772	0.532	0.028	0.015
	C_2	.839	.730							
	C_3	.810	.670							
SPIF	S_1	.873	.776	1.578	74.065	0.812	0.719	0.564	0.049	0.022
	S_2	.859	.769							

*Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations

Source: Author compilation of primary data

Table 5: Summary of Goodness-of-Fit Indices for alternate models for CD-RISC Instrument

	Absolute Fit Indexes				Incremental fit Indexes			Parsimony-Adjusted Measures	
	χ^2 (df)	P value	χ^2/df	SRMR	NFI	CFI	TLI	RMSEA	PCLOSE
Optimal Value	–	> 0.05a	<3.0b	<.07c	>.90d	>.90e	>.95f	<.06f	>.05a
Hypothesized five factor model	308.574 (265)	0.034	1.164	0.0540	0.904	0.983	0.980	0.033	0.973
Second Order five factor model	323.485 (274)	0.021	1.181	0.759	0.855	0.980	0.978	0.035	0.964

Note: NFI= Normed fit index; CFI= Comparison fit index; TLI= Tucker-Lewis index; RMSEA= Root mean square error of approximation; SRMR= Standardized root-mean square residual; PCLOSE=P of close fit

a. Hair, Black, Babin and Anderson (2010) d. Bentler and Bonett(1980)
b. Kline (1998) e. Bentler (1990)
c. Yu (2002) f. Hu and Bentler(1999)

Source: Author compilation of primary data

Alpha for the full scale was 0.851. The reliability test is deemed to be acceptable when the Cronbach's Alpha value exceeds the Nunnally's reliability criterion of 0.70 level (Hair et al., 2010). Dimension wise the value of Cronbach's Alpha was 0.903 for Personal competence, high standards and tenacity (Factor 1), 0.867 for Trust in one's instincts, tolerance of negative affect strengthening effects of stress (Factor 2), 0.932 for Positive acceptance of change and secure relationships with others (Factor 3), 0.752 for Control (Factor 4) and 0.812 for Spiritual influences (Factor 5) (Refer Table 4).

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis using Maximum Likelihood (ML) estimation was used to examine the hypothesis regarding the number of factors, their loadings, and factors inter correlations. For assessing the model fit, the independence model was compared to the hypothesized model. Results revealed that the independence model, which tested the hypothesis that all variables are not correlated, was a poor fit for the data and therefore, it was rejected, $\chi^2(300,N=152)=2814.908,p< 0.005$. The literature reveals that ideally, the χ^2 value

should be small and its associated probability value should be greater than the selected significance level. However, as this statistics is extremely sensitive to the sample size, it would reject almost every reasonable model in a great statistics power condition (Raykov et al., 1991). Alternatively, acceptable model fit are specified by χ^2 /df values smaller than five (Taylor and Todd, 1995). Thus, the significance of the chi-square test was discounted in the study and other goodness of fit indices was checked to access the model as fit for the hypothesized five factor model (Refer Figure 3). It is because of the lack of consensus on the preferred indices of fit in the literature (Bentler, 1990; Hu & Bentler, 1995; Kline 1998), the researcher decided to rely on multiple goodness of fit indices, residual error terms, modification indices, and accompanying expected parameter change as suggested by the study of Arbuckle and Wothke (1990). The CFA results stated in table 5 reveals that the χ^2 (265, N=152) =308.574, p< 0.005, SRMR=0.0540, NFI=0.890, CFI=0.983, TLI=0.980, RMSEA=0.33 and PCLOSE=0.973 represents a good model fit. Furthermore, a close examination of standardized residuals and modification indices (MI) supported the model's

significant fit as no residual value was greater than 2.58; a value above this is considered as a large indicator of model misfit (Joreskog & Sorborn, 1988). Additionally, the model doesn't reveal a large covariance between any of the error terms, which again supports the model fit results (Refer Table 5).

To check the dimensionality of CD-RISC Scale, the five variables or factors were further analyzed at the second order level (Refer Figure 4). The χ²/df was 1.181, the Comparative fit index (CFI) value was 0.980, the Normed fit index (NFI) value was 0.885, the Tucker-Lewis coefficient (TLI) was 0.978, and the Root mean square error of approximation (RMSEA) value was 0.035. All the measurement indices show a reasonable fit but, the SRMR value exceeded the cut off value of 0.07 (Yu, 2002) and NFI value, which is supposed to be greater than 0.09 was 0.855, which is again below the recommended value given by Bentler and Bonett (1980). The analysis yielded high fit indices for the first-order analysis compared to the second-order, which implies that the first-order is better suited to the data. Thus, the results demonstrated that Individual Resilience should be understood by the first order (Refer Table 5) (Refer Figure 3) construct made up of five dimensions.
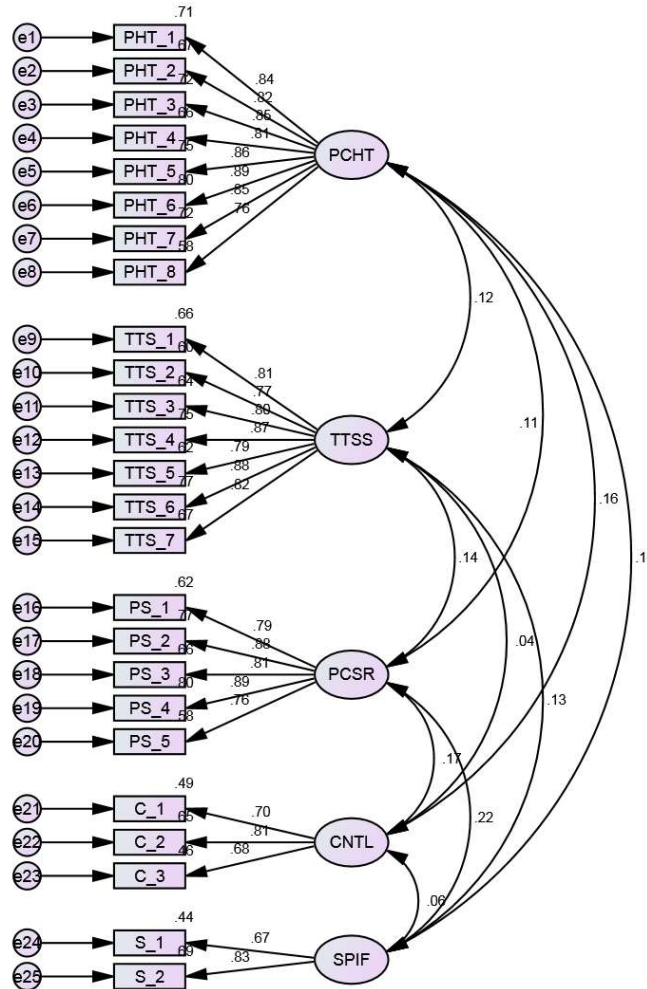

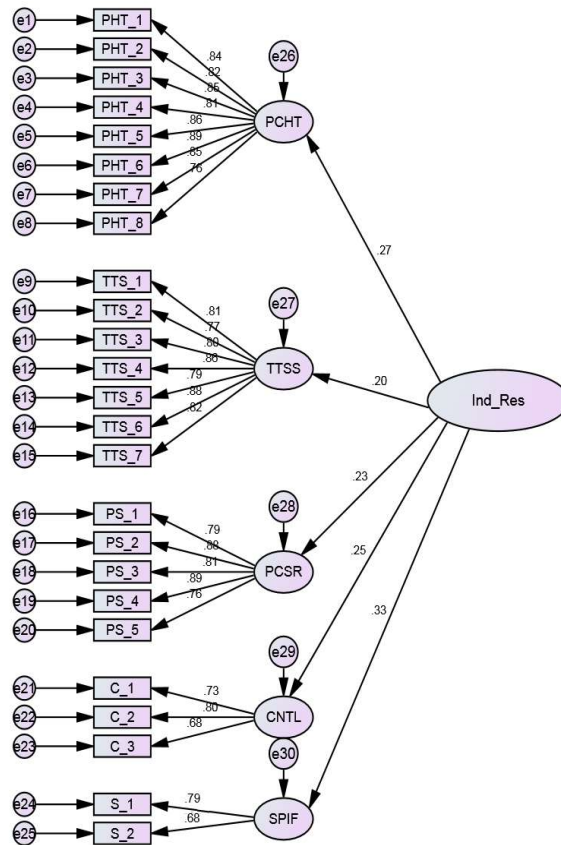**Figure 3: First Order Five Factor Model**

Figure 4: Second Order Five Factor Model

Validity Analysis

Construct validity of the scale items were examined through the convergent and discriminant validity at different stages.

Convergent validity

Factor loadings, Composite reliability (CR) and the Average Variance Extracted (AVE) are used to assess the convergent validities. Factor loadings surpass the acceptable criteria of 0.5 for all the items (Hair et al., 2010; Fornell & Larcker, 1981) with almost all the items exceeding the value of 0.70. The composite reliability exceeds the acceptable criteria of 0.7 (Hair et al., 2010; Fornell & Larcker, 1981) for all the factors and the Average Variance Extracted (AVEs) for all latent variables is greater than the threshold

value of 0.5 (Fornell & Larcker, 1981). Besides this, it is seen that the CRs for all the factors are greater than the AVE's (Hair et al., 2010). Overall, the model shows no convergent validity issues, depicting the latent factors, which are well explained by its observed variables (Refer Table 4).

Discriminant Validity

As suggested by Hair et al., (2010) there were no "cross-loadings" in the factor structure obtained from EFA results, (Refer table 4). Further, the authors suggested that the discriminant validity can be evaluated by comparing the Maximum Shared Variance (MSV) with Average Variance Extracted (AVE) (MSV < AVE) and by comparing Average Shared Variance (ASV) with Average Variance Extracted

(AVE) (ASV < AVE) (Hair et al., 2010). Results in table clearly show that the Maximum Shared Variance (MSV) and the Average Shared Squared Variance (ASV), both are lower than the Average Variance Extracted (AVE) for all of the constructs in the scale (Refer table 4). This means the indicators have more in common with the construct they are associated with than they do with other constructs thereby representing good discriminant validity in the model. From the results, it can be interpreted that these constructs are truly distinct from other constructs (i.e., uni-dimensional), in nature.

Discussion and Strategic Implications

The factor structure of the CD-RISC obtained with a sample of IT executives demonstrates strong evidence of internal structure. Consistent with this study, all the studies have found strong psychometric properties for the instrument (Connor & Davidson, 2003; Yu & Zhang, 2007; Jorgensen & Seedat, 2008; Singh & Yu, 2010). The original five factor structure as given by Connor and Davidson (2003) has been replicated in the study. Both EFA and CFA successfully validate the original five-factor structure. Exploratory factor analysis of the five original factors of the CD-RISC has shown that Factor 1 (Personal competence, High Standards, and Tenacity), Factor 2 (Trust in one's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress), Factor 3 (Positive Acceptance of Change and Secure Relationships with Others), Factor 4 (Control) and Factor 5 (Spiritual Influences) jointly explained 74% of the variance. Furthermore, the results depicts that all the five factors are significantly different, possessing very low intra factor correlations, with no cross loadings across all the factors. The CD-RISC scale across the sample of IT executives presents a good convergent and discriminant validity. To corroborate the dimensionality of CD-RISC scale, the five factors were further analyzed at the second order level. The analysis yielded high-fit indices for the first-order analysis as compared to the second-order, which implies that the first-order is better suited to the data and further helps in representing Individual Resilience as a reflective first order construct made up of five dimensions.

Comparing the results of this study with those of previous studies, the researcher concludes that the observed difference in the factor structure is because of the differences in the characteristics of the sample under study (for e.g. the age, culture, etc). The evidence has shown that the resilience factors vary widely across developmental, social, cultural, and environmental contexts that substantiate the differences in the results.

Additionally, the researcher also analyzed that the statistical methodology adopted in the study might result in the variation of the study for example, the application of CD-RISC among patients with PTSD in the United States (Connor & Davidson, 2003) and South African adolescents (Jorgensen & Seedat, 2008) resulted in a five factor and three factor structure. Both the studies used principal component analysis with orthogonal rotation but, the method of selecting the factors varied in both the studies. Connor and Davidson (2003) used the criterion of Eigen values greater than one and Jorgensen and Seedat's (2008) study applied the criterion of the inflection point in the Scree plot for choosing the factors. This study has adopted both the methods: Eigen values greater than 1 and criterion of the inflection point in the Scree Plot. The result of both the techniques supports the retention of five factor structure of CD-RISC Scale.

Most of the previous studies (Yu and Zhang, 2007; Singh and Yu 2010) have failed in loading spiritual influence as a significant factor, inconsistent with what this study reports here. The result of this study portrays that spirituality plays an important role in determining the resilience capacity of an employee and is an essential sub-construct in CD-RISC scale.

The CD-RISC scale may prove most useful to the researchers and practitioners. The instrument may be used as a reliable and valid diagnostic tool for identifying the individual resilience capacity and thereby acts as a starting point for increasing resilience. The CD-RISC scale may be used repeatedly by the managers to access the effectiveness of any resilience building intervention being initiated in the organization. Moreover, identifying IT

employees with lower resilience scores may assist organizations in tailoring strategies that might improve the individual as well as organizational performance at large.

Limitations of the Study and Scope for Future Research

The current study has several limitations that are worth noting. First, the inclusion of IT firms from Chandigarh tri-city region only may not portray an accurate representation of IT Industry of India. Secondly, the research only considers the service sector and a similar scenario may not be present in the manufacturing sector. This may open new avenues for researchers to extend the scope of the study. Thirdly, the test-retest reliability is not conducted to access the stability of the CD-RISC factor structure. Previous research has failed to substantiate the CD-RISC scale stability even over two identical populations (Campbell-Sills and Stein, 2007), which adds to the scope of further research in this dimension. Fourthly, this study only investigates the internal validity of the CD-RISC instrument. Further, research could scrutinize the link between CD-RISC Scale and other resilience scales. Additionally, as resilience has emerged as a multi-dimensional concept and it may be pretentious by other factors such as biological, demographic, or contextual factors, further research could be conducted to search for these indicators that can enhance or reduce resilience.

References

Afifi, A.A., & Azen, S.P. (1979). *Statistical Analysis: A Computer Oriented Approach* (2nd Ed.) (pp.442-448). New York: Academic Press.

Arbuckle, J. L., & Wothke, W. (1999). *Amos 4.0 User's Guide: SPSS.* (pp. 240-260). Chicago: Small Waters Corporation.

Baek, H. S., Lee, K. U., Joo, E. J., Lee, M. Y., & Choi, K. S. (2010). Reliability and Validity of the Korean version of the Connor-Davidson Resilience Scale. *Psychiatry investigation, 7*(2), 109-115.

Bartone, P. T. (2007). Test-Retest Reliability of the Dispositional Resilience Scale-15, A Brief Hardiness Scale 1. *Psychological Reports, 101*(3), 943-944.

Bartone, P.T. (1995). *A short hardiness scale. Presented at American Psychological Society Annual Convention*, New York. Available on http://www.hardiness-resilience.com. Accessed on 15th July, 2014.

Bentler, P. M. (1990). Comparative Fit Indexes in Structural Models. *Psychological Bulletin, 107*(2), 238-246.

Bentler, P. M., & Bonett, D. G. (1980). Significance Tests and Goodness of Fit in the Analysis of Covariance Structures. *Psychological bulletin, 88*(3), 588-606.

Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & R. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99-136). Washington, DC: American Psychological Association.

Budhwar, P. S., Luthar, H. K., & Bhatnagar, J. (2006). The dynamics of HRM systems in Indian BPO firms. *Journal of Labor Research, 27*(3), 339-360.

Campbell-Sills, L., & Stein, M. B. (2007). Psychometric Analysis and Refinement of the Connor–Davidson Resilience Scale (CD-RISC): Validation of a 10-item Measure of Resilience. *Journal of Traumatic Stress, 20*(6), 1019-1028.

Changefirst.com. *Building Organisational Resilience in Turbulent Times.* Available on http://www.changefirst.com/uploads/documents/Changefirst_Resilience_Whitepaper.pdf. Accessed on 21st February, 2015.

Connor, K. M., & Davidson, J. R. (2003). Development of a New Resilience Scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety. 18*(2), 76-82.

Cooper, R. (March, 2013). *The Bank on Your People. The State of Well being and High Performance Culture in the Financial Sector.* Available on http://www.bwcharity.org.uk/sites/default/files/BWC_Research_Report.PDF. Accessed on 15th July, 2014.

CIPD Research Insights (May, 2011). *Developing Resilience.* Available on http://www.cipd.co.uk/binaries/developing-resilience_2011.pdf. Accessed on 15th January, 2015.

Economic Survey 2014-15 (Volume II) Available on http://indiabudget.nic.in/es2014-15/echapter-vol2.pdf. Accessed on 2nd February, 2015.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the Use of Exploratory Factor Analysis in Psychological Research. *Psychological Methods, 4*(3), 272-299.

Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics* (4th ed.) (pp.665-719). London: Sage Publications.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39-50.

Friborg, O., Barlaug, D., Martinussen, M., Rosenvinge, J. H., & Hjemdal, O. (2005). Resilience in relation to personality and intelligence. International *Journal of Methods in Psychiatric Research, 14*(1), 29-42.

Gillespie, B. M., Chaboyer, W., & Wallis, M. (2009). The influence of personal characteristics on the resilience of operating room nurses: A predictor study. *International Journal of Nursing Studies, 46*(7), 968-976

GFI Software (April, 2014). *Third annual IT Admin Stress Survey.* Available on http://www.gfisoftware.com/Company/GFI-news-detail.aspx?id=138306. Accessed on 13th July, 2014.

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate Data Analysis* (7th Ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hu, L. T., & Bentler, P. M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1-55.

Jacelon, C. S. (1997). The Trait and Process of Resilience. *Journal of Advanced Nursing, 25*(1), 123-129.

Jorgensen, I. E., & Seedat, S. (2008). Factor structure of the Connor-Davidson Resilience Scale in South African adolescents. *International journal of adolescent medicine and health. 20*(1), 23-32.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31-36.

Kline, R. B. (1998). *Principles and Practice of Structural Equation Modeling* (3rd Ed.). (pp. 230-298). New York: Guilford.

Luthans, F., Luthans, K. W., & Luthans, B. C. (2004). Positive psychological capital: Beyond human and social capital. *Business Horizons, 47*(1), 45-50.

Luthans, F. (2002a). The Need for and Meaning of Positive Organizational Behavior. *Journal of Organizational Behavior. 23*(6), 695-706.

Manji, H. K., & Duman, R. S. (2000). Impairments of Neuroplasticity and Cellular Resilience in Severe Mood Disorders: Implications for the Development of Novel Therapeutics. *Psychopharmacology bulletin, 35*(2), 5-49.

Ministry of Finance, Government of India (February, 2015). *Economic Survey 2014-15* (Volume II) Available on http://indiabudget.nic.in/es2014-15/echapter-vol2.pdf. Accessed on 2nd February, 2015.

NASSCOM . (2014). *The IT-BPM Sector in India - Strategic Review 2014.* Review available on http://www.nasscom.in/positive-outlook-itbpm-industry-fy-2014. Accessed on 15th January, 2015.

NASSCOM Member Directory. Available on: http://memberdirectory.nasscom.in/MemberCompanyFreeSearch. Accessed on 10th July, 2014.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd Ed.). New York: McGraw-Hill.

Olsson, C. A., Bond, L., Burns, J. M., Vella-Brodrick, D. A., & Sawyer, S. M. (2003). Adolescent Resilience: A Concept Analysis. *Journal of Adolescence, 26*(1), 1-11.

Raykov, T., Tomer, A., & Nesselroade, J. R. (1991). Reporting Structural Equation Modeling Results in Psychology and Aging: Some Proposed Guidelines. *Psychology and Aging, 6*(4), 499-503.

Sengupta, D. and Singh, S. (April, 2013). *IT honchos say stress levels in IT industry similar to other sectors.* Available on http://articles.economictimes.indiatimes.com/2013-04-29/news/38904779_1_it-sector-industry-gopalakrishnan. Accessed on 25th January, 2015.

Simoes, M. (Februray, 2013). *Don't Work For A Tech Company If You Want A Stress-Free Job.* Available on http://www.businessinsider.in/Dont-Work-For-A-Tech-Company-If-You-Want-A-Stress-Free-Job/articleshow/21363903.cms . Accessed on 20th February, 2015.

Singh, K., & Yu, X. N. (2010). Psychometric Evaluation of the Connor-Davidson Resilience Scale (CD-RISC) in a sample of Indian students. *Journal of Psychology, 1*(1), 23-30.

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine, 15*(3), 194-200.

Stevens, J. P. (2012). *Applied Multivariate Statistics for the Social Sciences* (5th Ed.), (pp.325-394). New York: Routledge.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. Available on http://tocs.ulb.tu-darmstadt.de/135813948.pdf. Accessed on 20th August, 2014.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: a test of competing models. *Information systems research, 6*(2), 144-176.

Tusaie, K., & Dyer, J. (2004). Resilience: A Historical Review of the Construct. *Holistic Nursing Practice, 18*(1), 3-10.

Vinson, J. A. (2002). Children with asthma: Initial Development of the Child Resilience Model: Practice Applications of Research. *Pediatric Nursing, 28*(1), 149–158.

Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of nursing measurement, 1*(2), 78-165.

Werner, E. E., & Smith, R. S. (1992). *Overcoming the Odds: High Risk Children from Birth to Adulthood*. Cornell University Press.

Winwood, P. C., Colon, R., & McEwen, K. (2013). A Practical Measure of Workplace Resilience: Developing the Resilience at Work Scale. *Journal of Occupational and Environmental Medicine, 55*(10), 1112-1205.

Yu, C. Y. (2002). *Evaluating Cutoff Criteria of Model Fit Indices for Latent Variable Models with Binary and Continuous Outcomes*. Unpublished doctoral dissertation, University of California, U.S.

Yu, X. N., Lau, J. T., Mak, W. W., Zhang, J., Lui, W. W., & Zhang, J. (2011). Factor structure and Psychometric Properties of the Connor-Davidson Resilience Scale among Chinese adolescents. *Comprehensive Psychiatry, 52*(2), 24-218.

Yu, X., & Zhang, J. (2007). Factor analysis and psychometric evaluation of the Connor-Davidson resilience scale (CD-RISC) with Chinese People. *Social Behavior and Personality: An International Journal, 35*(1), 19-30.

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