

# Incremental Innovation through Adhocracy Culture: Mediating Evidence from the Intellectual Capital Triad

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Adhocracy culture aims to build a dynamic workplace by extending learning and creativity. The study empirically investigates the relationship between adhocracy culture and incremental innovation through intervention of the intellectual capital triad. The snowball reference-based sampling technique was used, and data was collected from 160 IT professionals. Partial least square (PLS) and structural equation modeling (SEM) was used for analysis of measurement and structural model. The findings reveal that adhocracy culture has a significant impact on intellectual capital which leads to incremental innovation. Moreover, it is suggested that the intellectual capital triad partially mediates the association between the adhocracy culture and incremental innovation. The research also ponders how the individual intellectual capital triad impacts the incremental innovation and it is evident that all three dimensions of intellectual capital, namely human, structural and social, exhibited a positive relationship with incremental innovation. The study offers practical implications for policy makers and senior managers in the domain of technology and knowledge-based organisations. The managers should consider the importance of adhocracy culture in facilitating knowledge creation and sharing, which ultimately results in sustainable competitive advantage through incremental innovation.

**Key words:** *Intellectual capital triad; Adhocracy culture; Incremental innovation; Partial least square; Structural equation modeling*



## Introduction

Today's business environment is witnessing intense competition, extraordinary technological advances and dynamic markets (Al-Sa'di, 2017). Ikram et al. (2018) suggested that enterprise in the industrial clusters usually strives for cost benefits, and the benchmark of cost minimisation for competition leads to imitation rather than innovation. However, on a positive note, the current marketplace has a better sense of competition, as technological innovations are making our lives more proficient (Ikram et al., 2017). The periods of economic recession call for networking and pursuance of continuous process innovation. Continual innovations are hard to get because of high uncertainties in the market (Pihlajamaa, 2017). It is indispensable to develop a new product for firm survival and competitive advantage. The best way for an enterprise to attain a competitive advantage originates from incessant innovation in technology (Martín-de Castro et al, 2013). In traditional business settings, creativity and learning ability are significant factors to boost innovation levels (Sutanto, 2017). The organic form of organisational culture and structure expedite innovation for the reason that they permit organisations to change their view point. We might say that innovations start from modifications in the sense of a service or product within a firm, which can transpire from collaborations with exterior sources; the agenda set powers of senior managers and the passions of empire-building employees (Green, 2014).

Although prior studies on organisations' culture classifies four types of culture, we emphasise organic forms of organisational culture, residing in adhocracy culture for the reason that it tends to be persistent in organisations instigating in evolving marketplaces (Chuang, Morgan, & Robson, 2012). A variety of cultures might occur within an organisation, but it is the governing culture inside an organisation that will have the highest impact on the behaviour of every person who is concomitant with the firm (Lee, 2013). The core peculiarity of adhocracy culture is to cut through usual routines, incarceration chances, resolve teething troubles, and get results. The main signs of the adhocracy organisation culture comprise of, inventiveness, innovation, risk taking, entrepreneurship and adaptability (Cameron, 2011). A crucial competitive advantage for organisations ruled by organic adhocracy cultures is the capability to nurture transformation in uneven or volatile environments (Lee, 2013).

Intellectual capital institutes a key resource of innovation because it denotes the development of extremely unique or exceptional product/service or production procedures and the related organisational capabilities (Delgado et al, 2016). Increasing intellectual capital within the organisation is necessary for the organisations to identify the proper structure for augmenting knowledge sharing and knowledge flow (Ramezan, 2011). Intellectual capital is a communal mental capability or a significant knowledge in the form of an assemblage (Iranzadeha, 2015). Significance of avoiding product outmodedness has made the organisations to concentrate on innovations with a uniqueness of higher degree (Jansen, 2006). Innovation is considered as hunt of complete novel and unique knowledge and expertise in a new-fangled service/products growth that would considerably change purchasing, depletion patterns or

delivery (Cheng, 2016; Ramezan, 2011). A theoretical framework is given which shows that there is a connection between organic culture and intellectual capital; however, it is not empirically investigated. Green (2014) theoretically proves that organisational organic structure and organic culture facilitate incremental innovation. Lee (2013) suggests that adhocracy culture is an organic type of organisational culture, and impacts the firm effectiveness in the high-tech sector.

Although significant theoretical research is done on the relationship of intellectual capital and adhocracy culture, its empirical evidence is scarce so it will be logical to check the impact of adhocracy culture on incremental innovation through mediation of intellectual capital. Even though the knowledge assets and intellectual capital and culture are anticipated as the aim foundations of an organisation' product inventions it is essential to develop an unfathomable know how of the composite relationship amongst these features, because more gaps persist in the research field. Moreover, the paucity of pragmatic research utilising the above-mentioned framework demands novel tentative theoretical and practical work and is the objective of this research which has dedicated on backing experimental data and inferences on the topic. Although a number of studies are found in literature on the relationship of culture and innovation and its types, empirical evidence is scarce for the relationship of culture and innovation with the mediation of intellectual capital.

## Literature Review

Intellectual capital refers to the knowledge stock of an organisation embedded in its individuals, teams, practices, systems and process. It is also viewed as the sum of all knowledge that a business entity employee has to gain competitive advantage. Intellectual capital is sum of all knowledge that resides within an organisation. The organisation values the structural capital more than their material value. Resource based theory considers intellectual capital as a strategic resource; a firm uses intellectual capital to attain competitive advantage and fashions value that can be hired to develop its performance (Clarke, Seng, & Whiting, 2011).

With respect to dimensions of intellectual capital, there is disagreement among researchers. Intellectual capital is categorised into modules of human, organisational and social capital as acknowledged by Alipour (2012). Intellectual capital comprises five constituents, namely, human capital, organisational capital, technological capital, business capital, and social capital. Human resource is essential as the preliminary source of innovation, tactical rejuvenation of a company and the company as a consequence can comprehend and create worth in the knowledge-based economy. Human capital can also be defined as a blend of employee's competency, assertiveness and creativity (Ramezan, 2011). Moreover, external social capital can be helpful to the organisation (Madhavaram, 2017). A firm's potential absorptive capability in intensity, speed, and direction is influenced by the acquisition of external knowledge. New external knowledge acquirement contributes to strengthening



prospective absorptive ability and knowledge stock revitalisation; it has also been revealed that firms with better absorptive capacity are extra proactive and able to capture an external acquaintance because external knowledge has a tendency to be easier to incorporate than internal knowledge (Scaringella, 2017). The corporate performance improves by relational capital and process capital. Human capital positively moderates the effects of innovation capital on firm performance. Firms which profoundly focus on human capital development get returns from investment on R&D (Scafarto, Ricci, & Scafarto, 2016).

Elberdin, Kianto and Saenz (2017) proposed that the companies managing complex knowledge needs more qualified employees because knowledge and information should be regularly updated, while the dependence on structural capital in case of low-tech firms is explained by the considerable dependence of low-tech firms on explicit knowledge as compared to high tech companies. Size adversely affects the firms' innovativeness because large firms take time in deciding and implementing innovations. Manzaneque et al (2017) explored that in family managed business firms, infrequent association results in enhanced personal affiliation with employees and protection of knowledge and experience over a longer horizon producing firm specific implicit knowledge. We can say firms having entrepreneurial culture within an organisation are more likely to have innovation in the market and subsequently achieve competitive advantage. Intellectual capital denotes the development of extremely novel products/services or invention procedures and the related organisational proficiencies; it also institutes a key source of innovation because it is effectively incorporated into the firms' activities (Delgado et al, 2016). The innovation ability of an enterprise depends strictly on its intellectual and/or organisational knowledge resources and its capability of deploying them (Castro et al, 2013). Three different types of IC, that is, "employees' knowledge of customers, technical knowledge and abilities, and organizational creativity, make firms more effective at customizing business to business specialized services" (Madhavaram, 2017).

Product innovation encompasses introduction of new products as well as improving existing ones (Chang, 2012; Polder, 2010, Ali et al., 2020); product innovation is not considered an easy process since it gets affected by ever changing customer needs, new technologies, and an enhanced global competition (Gunday, 2011; Arshad et al., 2020). It includes alterations in design which consecutively results in significant and progressive changes in the product's usability (Madhavaram, 2017). Studies indicate that emerging market organisations are led by an organic type of culture (Fiaz et al., 2021). In the beginning, these firms are usually a ride by far-sighted frontrunners and are ruled by a culture of adhocracy (Cameron, 2011). As compared to clan culture, adhocracy culture has a tendency to build an approachable workplace, and it has strong belief that the organisation's trust in and obligation to employees enables uncluttered communiqué and employee association. Firms working in technological industries are more reliant on technological innovations in order to introduce newfangled or better-quality services and products. Adhocracy culture might be considered as more perilous in conniving the appropriate response to competitors' & customers moves, ever-changing

preferences by an organisation in technology industries as compared to clan culture. It is suggested that community structure plays a significant role in the innovation diffusion. Moreover, the social pressure acts as a hindrance in the adoption process of innovation regardless of the structure of the organisation (Sáenz-Royo et al., 2015). According to Pihlajamaa (2017), the connection in between the primary procedures that sustenance supervision of technology centred assets and products necessitates extra organisational factors, such as culture. A suitable culture that is braced by appropriate procedures and systems is vital to the strategic management of innovations. With respect to innovation, the dynamic culture is imperative for entrepreneurs and teams (Kratzer, 2017). Further, Ikram et al. (2021) suggested that the accomplishment of social enterprises is contingent on the degree of their pursuance of the culture of open innovation.

Key success factors of new product innovation comprising of human capital, structural capital, and social capital might relate to organisational culture. Intellectual capital may influence new product innovation through organisational learning ability, including the competencies in launch, marketing, anticipating, information congregation, etc. On the basis of above literature, we would emphasise three aspects. First, the illustrative power of intellectual capital is greater as far as product innovation is concerned. Second, human capital is the most critical component to attain product innovation, whereas as we are concerned with process innovation it is structural capital and social capital, and last is adhocracy culture to stimulate and facilitate (Castro et al, 2010).

### **Conceptual framework & Hypotheses development**

An organisational climate of trust that stimulates individual's innovative capabilities, accepts risk, and wires personal growth and improvement, is important (Menzel et al, 2007). In this way, the cultural & societal perspective of an organisation could have an imperative impact on the innovativeness of the firm. The appended hypothesis endeavours to synthesise the previous arguments:

**H<sub>1</sub>**: Adhocracy culture has a significant relationship with incremental innovation

A vigorous and conducive organisational culture adds to elements of IC, such as human, technology, business, social and structural capital (Uma G. et al, 2016). It is further stated that that intellectual capital flourishes only when the organisational culture fosters the individual employee, by creating an environment that is conducive to risk-taking, innovation and flexibility. Hence the following hypotheses are proposed.

**H<sub>2</sub>** : Adhocracy culture and human capital have a significant relationship

**H<sub>3</sub>** : Adhocracy culture and structural capital have a significant relationship

**H<sub>4</sub>**: Adhocracy culture and social capital have a significant relationship

“The dominant features of human capital are bright , and extremely skillful workforce, with proficiency in their functional zones, who set up the major source of various skills, ideas, creativity and knowledge from the knowledge based view” (Goffin & Koners, 2011). Based on this proposition, team mates and their human capital are critical for a creative way out, new commercial prospective, and improved and suitable new service/product development upshots (Griffiths-Hemans & Grover, 2006; Atuahene-Gima & Wei, 2011). This argument leads us to the following hypothesis.

**H<sub>5</sub>:** Human capital has a significant relationship with incremental innovation

The manner in which knowledge is kept in and usurped from a firm’s sources, such as information systems, organisational culture and structure, effect the impact the organisational capital on performance and innovativeness of new product (Erickson and Rothberg, 2009; Chung-Jen et al, 2014). Zhou and Li (2012) argue to support a positive impact of structural capital on incremental innovation and technological capital is the part of structural capital. Therefore, we propose next hypothesis:

**H<sub>6</sub>:** Structural capital has a significant relationship with incremental innovation

As Subramaniam & Youndt (2005) state that solid interconnections between vertical social capital managers, customers & suppliers of the firm can affect the acceptance of drastic technologies and rise the set up base of innovations. This leads us to the proposition of our next hypothesis:

**H<sub>7</sub>:** Social capital has a significant relationship with incremental innovation

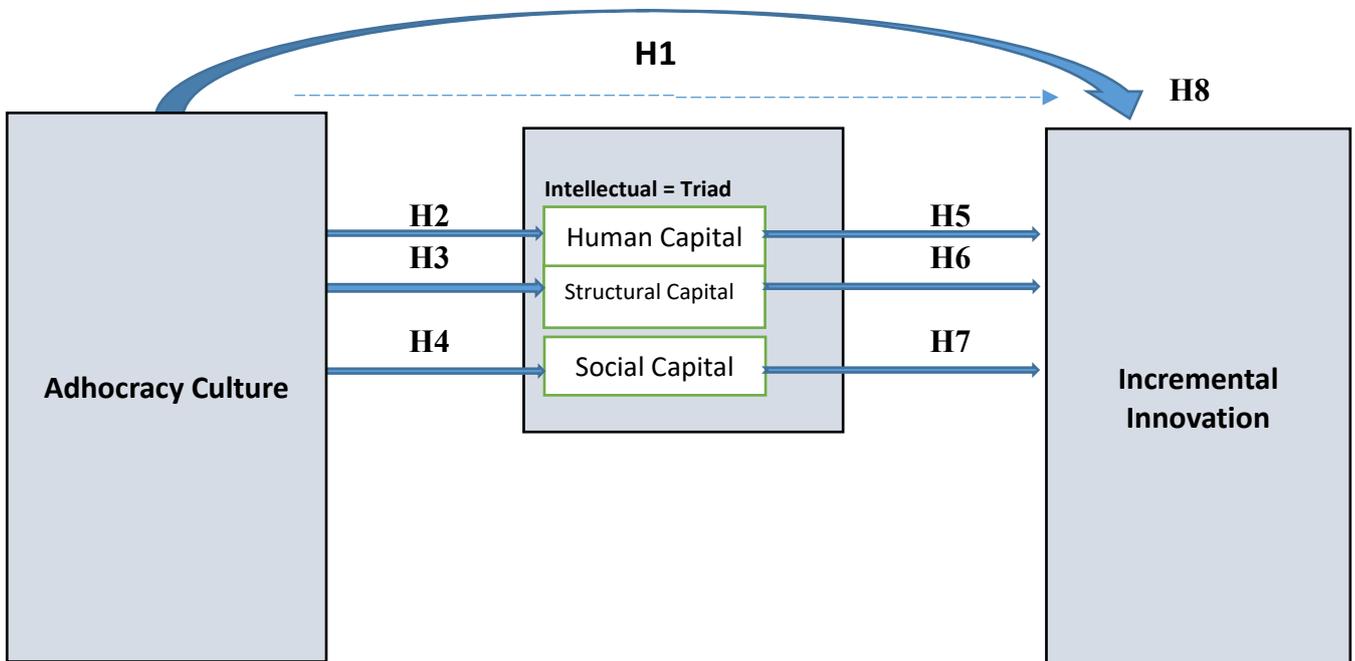
Former studies also confirm that customer input is a key component to new product succession in the early stages of developing a new product (Capello & Faggian, 2005). On the basis of the above arguments, we can develop following hypothesis:

**H<sub>8</sub>:** The intellectual capital triad (Human capital, Structural capital, Social capital) mediates the relationship between incremental innovation and adhocracy culture

### **Theoretical Model**

On the basis of the aforementioned hypothesised relationships, the study proposes a conceptual framework, which comprises of adhocracy culture human capital, structural capital, social capital and incremental innovation. All constructs and their relationships are presented in Figure 1.

**Figure 1.** Theoretical Framework of Adhocracy Culture and Incremental Innovation with Mediating Role of Intellectual Triad



**Figure 1.** Theoretical Framework of Adhocracy Culture and Incremental Innovation with the Mediating Role of the Intellectual Triad

### Research design

This study has empirical analysis and a sample was collected from senior managers of technological firms; self-administrated pre-structured, standardised instruments are used to collect data and for testing of the theoretical framework. Instruments used for data collection belong to adhocracy culture, intellectual capital (human capital, structural capital, social capital) and incremental innovation. The instrument is purposely designed on the basis of previous studies. Research items were adopted from previous similar research (Delgado-verde.M et al, 2016; Wei.susan et al, 2014; Gregorio Martín-de Castro et al, 2013). A variance based PLS-SEM was used for data analysis in this study. The choice of software was on the basis of nature of this study (Hier et al., 2017).

### *Population and Sample size*

Respondents were selected from IT firms of Pakistan. A sizeable proportion of Pakistan's IT firms are run privately, thus with the purpose of ascertaining a more descriptive sample of organisations, a list of IT firms was obtained from Pakistan Software Export Board that consists of 1500 companies belonging to different regions of Pakistan. Among 1500 companies the criteria was well-thought-out for tracking down our population of 654 firms in Lahore & Karachi of Pakistan. The first criteria was that the firm must be knowledge-based organisation and should have a strong dependency on intellectual capital that is suitable for technology based firms. The second criteria was that the firm must have a suitable size to ripen the different size of intellectual assets and that the organisation should have 50 or more employees as smaller organisations may not have required a variety of intellectual capital component required for this research in this way. With regard to above criteria, the information technology sector is included in the research because they entail frequent efforts in research and the dense ground of technology. Further technology base firms are characterised by prompt renovation of knowledge therefore it is extremely related to innovation. Based on the above criteria 470 firms were selected.

For the current study it is not feasible to adopt the probability sampling technique as it is not feasible to approach all IT firms of Pakistan; therefore, this study will use Non-Probability sampling technique which is called snowball sampling (Filza Hameed, 2016). For the purpose of data collection, senior managers either R&D executive or top management like CEO were requested to respond on the construct. Senior managers were chosen as respondents in this study because top management have a thorough understanding of the organisation and their rivals. In particular all respondents were either knowledgeable expert senior area managers employed in that area such as general managers CEO's or Operations head or Senior R&D managers with more than 2 year experience within firm to make sure that they have sufficient knowledge to respond the questions. A 5 point Likert scale was used (1=strongly disagree, 5=strongly agree).

Moreover, to escape from potential common method variance, the questioner was at first piloted with 20 organisations with the aim to check the clarity of the questions by lessening the unfamiliar questions. After, a few questions were amended and rephrased to increase the clarity of the construct with respect to research objective.

The snowball sampling technique were used for this research in order to collect data; data was collected through a reference-based approach and through mail courier. The procedure yielded 160 responses out of which 131 questioners were usable/valid; these questionnaires were kept for analysis purposes. The response rate was 27.06 % which was consistent within the firms' top management survey response rate (Zhou et al, 2005; Krumwiede, 2012; Hung, 2010; Cheng et al, 2016; Delgado-verde et al, 2016).

## Results and Research findings

### *Assessment of Measurement model*

The collected data was analysed using Smart-PLS. Table 1 depicts that Cronbach's alpha values for all of the items such as adhocracy culture, human capital, structural capital, social capital and incremental innovation are at par or above the critical value that is 0.70 . Reliability was also examined using composite reliability (CR) and found to be above threshold values i.e. 0.70 for all items. For the valuation of validity, two subtypes of validity are typically tested: the convergent and the discriminant validity. The convergent validity was assessed using AVE and it was observed that AVE for this study was above the threshold critical value of 0.5.

**Table 1. Validity and Reliability**

Latent construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Adhocracy Culture	0.831	0.880	0.596
Human Capital	0.891	0.925	0.754
Incremental Innovation	0.877	0.915	0.730
Social Capital	0.911	0.938	0.790
Structural Capital	0.854	0.901	0.696

### **Discriminant Validity**

Discriminant validity was validated through Fornell-Larcjer criterion, Cross loading and HTMT as shown in Table 2, Table 3 and Table 4 respectively. A Fornell-Larker criterion was used to evaluate discriminant validity and findings revealed that AVE was more than average and shared variance of the variable and below the threshold critical value of 0.85. Discriminant validity was also assessed using cross loadings of indicators and all the values were above the standard threshold of 0.70. Discriminant validity was also calculated by the Heterotrait-Monotrait ratio of correlation (HTMT). This approach is used to assess the discriminant validity in variance-based SEM. A HTMT value below 0.85 represents the sufficient discriminant value. All values were found to below the threshold level.

**Table 2. Fornell-Larcker Criterion (Square root of AVE compared to Construct Correlation)**

Latent Construct	Adhocracy Culture	Human Capital	Incremental Innovation	Social Capital	Structural Capital
Adhocracy Culture	0.772				
Human Capital	0.497	0.868			
Incremental Innovation	0.666	0.676	0.855		
Social Capital	0.498	0.465	0.738	0.889	
Structural Capital	0.520	0.534	0.709	0.720	0.834

**Table 3. Cross Loadings**

	Adhocracy Culture	Human Capital	Incremental Innovation	Social Capital	Structural Capital
AC-1	0.713	0.223	0.404	0.286	0.350
AC-2	0.758	0.409	0.479	0.358	0.381
AC-3	0.778	0.492	0.573	0.451	0.363
AC-4	0.818	0.349	0.589	0.430	0.427
AC-5	0.788	0.402	0.497	0.372	0.481
HC-1	0.393	0.834	0.507	0.421	0.509
HC-2	0.394	0.865	0.579	0.382	0.472
HC-3	0.533	0.920	0.670	0.441	0.492
HC-4	0.384	0.852	0.576	0.368	0.384
I-1	0.576	0.451	0.827	0.622	0.617
I-2	0.548	0.640	0.869	0.654	0.660
I-3	0.591	0.569	0.876	0.612	0.595
I-4	0.565	0.642	0.846	0.635	0.552
SC-1	0.432	0.428	0.581	0.642	0.846
SC-2	0.451	0.434	0.592	0.638	0.880
SC-3	0.325	0.363	0.463	0.463	0.746
SC-4	0.501	0.531	0.695	0.634	0.859
SCC-1	0.442	0.442	0.674	0.854	0.627
SCC-2	0.432	0.364	0.609	0.889	0.606
SCC-3	0.420	0.415	0.640	0.923	0.644
SCC-4	0.473	0.425	0.692	0.887	0.676

**Table 4. Heterotrait-Monotrait Ratio (HTMT)**

	Adhocracy Culture	Human Capital	Incremental Innovation	Social Capital	Structural Capital
Adhocracy Culture					
Human Capital	0.558				
Incremental Innovation	0.772	0.756			
Social Capital	0.563	0.514	0.824		
Structural Capital	0.606	0.605	0.808	0.806	

### Assessment of Structural Model and results analysis

The structural model has only one direction of causality and does not contain a direction of loop feedback (Ramli et. al, 2013). In this study, it consists of an independent variable of adhocracy culture, and one dependent variable of incremental innovation for direct model estimation, and taking intellectual capital, i.e. human capital, structural capital, and social capital, as mediator for mediation analysis. “The individual path coefficients of the PLS structural model can be interpreted as standardised beta coefficients of ordinary least squares regressions”. Bootstrapping was run to estimate model and results are shown in Table 5.

**Table 5. Mean, STDEV, T-Values, P-Values (Direct Effect Results)**

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Adhocracy Culture -> Human Capital	0.497	0.502	0.077	6.489	0.000
Adhocracy Culture -> Incremental Innovation	0.258	0.253	0.069	3.743	0.000
Adhocracy Culture -> Social Capital	0.498	0.506	0.082	6.086	0.000
Adhocracy Culture -> Structural Capital	0.520	0.529	0.074	7.021	0.000
Human Capital -> Incremental Innovation	0.298	0.301	0.061	4.884	0.000
Social Capital -> Incremental Innovation	0.357	0.363	0.082	4.342	0.000
Structural Capital -> Incremental Innovation	0.159	0.152	0.074	2.158	0.031

In this study, intellectual capital partially mediates the relationship between incremental innovation and adhocracy culture, and both the direct and indirect effects are significant. This is in line with the relevant literature (Christian jose et al, 2016). As the structural model contains a mediator so results of path coefficients, indirect effects and total effects are also discussed. Table 6 shows that all hypotheses for direct effect are accepted, since T-values are more than 1.96 and P-values are less than 0.05.

**Table 6. Hypotheses Results**

	<b>Hypothesis</b>	<b>T Statistics ( O/STDEV )</b>	<b>P Values</b>	<b>Supported / Not Supported</b>
<b>H<sub>1</sub></b>	Adhocracy culture has a significant relationship with incremental innovation.	3.743	0.000	Supported
<b>H<sub>2</sub></b>	Adhocracy culture has a significant relationship with human capital.	6.489	0.000	Supported
<b>H<sub>3</sub></b>	Adhocracy culture has a significant relationship with structural capital.	7.021	0.000	Supported
<b>H<sub>4</sub></b>	Adhocracy culture has a significant relationship with social capital.	6.086	0.000	Supported
<b>H<sub>5</sub></b>	Human capital has a significant relationship with incremental innovation.	4.884	0.000	Supported
<b>H<sub>6</sub></b>	Structural capital has a significant relationship with incremental innovation.	2.158	0.000	Supported
<b>H<sub>7</sub></b>	Social capital has a significant relationship with incremental innovation.	4.342	0.031	Supported
<b>H<sub>8</sub></b>	Intellectual capital triad (human capital, structural capital, social capital) mediates the relationship between incremental innovation and adhocracy culture.	8.191	0.000	Supported

## R Square

Researchers describe “R<sup>2</sup> values of 0.67, 0.33, and 0.19 in PLS path models as substantial, moderate, and weak, respectively” (Henseler et al., 2009). Table 7 exhibits that R square for human capital, structural capital and social capital is moderate and lies between the range of 0.247 to 0.271, and for incremental innovation it has a substantial effect at 0.749.

**Table 7. R square**

	<b>R Square</b>	<b>R Square Adjusted</b>
<b>Human Capital</b>	0.247	0.241
<b>Incremental Innovation</b>	0.749	0.741
<b>Social Capital</b>	0.248	0.243
<b>Structural Capital</b>	0.271	0.265

## Model Fit

Henseler et al. (2009) introduced the standardised root mean square (SRMR) as fit index specifically for PLS path models, and suggested that a value less than 0.08 is an indication of model fitness and it provides sufficient support for the empirical data (Nitzl et al., 2016). Table 8 shows that the value of SRMR is 0.069, which is below the threshold value of 0.08 confirming a significant fit of empirical data for the research path model used.

**Table 8. Model Fit (SRMR)**

	<b>Saturated Model</b>	<b>Estimated Model</b>
<b>SRMR</b>	0.069	0.08

## Discussion, Conclusion and Recommendations

In line with previous studies, the study indicates the positive and direct effects of human capital, structural capital, social capital, and adhocracy culture on incremental innovation of product. Especially the most noteworthy effects on product innovation are used by human capital, trailed by innovation culture and social capital and structural capital. In product innovation development the impact of adhocracy culture is obvious when human capital is thought out as one of the main internal factors. The rationale behind such a finding is the fact that the employees will be able to better utilise their skills and knowledge if they are trusted, and obliged to be innovative. More importantly, an adhocracy culture provides opportunities to get involved in decision-making. This is an outcome of adhocracy culture that employees feel free to talk about their ideas and opinions. Enterprises should encourage innovative culture among employees so that employees are not only inspired to innovate but also ‘can’ innovate. It is empirically evident that an adhocracy culture constructs a climate of creativity within the organisation and it positively and significantly affects the human capital’s ability to innovate.

Furthermore, this study also provides a relationship between the culture of adhocracy and structural capital. Adhocracy culture represents an environment of creativity. Therefore, whereas the relationship building between product innovation and human capital is the outcome of adhocracy culture, the association between technological knowhow and product innovation might entail promotion of new ideas in an adhocracy innovative culture. Strong structural capital in an organisation will result in an unfavourable condition to utilise human capital and its potential in full and this will ultimately lead to enhancement in the ability of social capital to produce innovatively. It is empirically investigated that adhocracy culture and structural capital have a significant relationship. On the other hand, relationships between customers and suppliers look like they produce better incremental innovation productions, which could be result of a greater confidence among these stakeholders. It is evident that ideas and suggestions by social capital can better generate innovative ideas, as if the customer

and suppliers are trusted they can better guide the organisation about their needs and requirements and on the basis of these requirements they can introduce innovative products. Hence, we can say that if organisations develop a culture to better communicate and with social capital, they can better utilise their knowledge in innovative ideas and competitive advantage can be achieved. Keeping in view the vertical social capital and incremental innovation, and as discussed earlier in previous studies, it can be derived that when organisations sustain relationships with external stakeholders, a collective effect develops that leads them to advance in achieving higher competence to detect and integrate the new external knowledge and consequently to achieve better incremental innovation outputs.

In line with the above argument, it is proposed that senior management should take initiative to promote adhocracy culture within an organisation as this culture motivates the human capital and social capital to generate innovative ideas and structural capital allows the application of these ideas and ultimately an organisation results in incremental innovation and continues the basis which is the very requirement of the technology-based firms. Additionally, the study contributes to the field of innovation management by investigating the mediating role of the intellectual capital triad on the relationship between adhocracy innovation culture and a product's incremental innovation. These intermediating effects may help to produce an understanding of the multifaceted nature of the product innovation procedure.

Empirical results show that there is partial mediation between the intellectual capital triad and adhocracy culture. Based on the thinking above, managers and executives in high-tech manufacturing firms should be able to attain ideas about intangible aspects in an organisation, such as technological and human knowledge assets, that may assist the firm to do product innovation. More specifically, this research suggests that an adhocracy culture is a key capability of an organisation that helps a firm perform well; therefore, it is essential to focus on developing a suitable environment within an enterprise that endorses personal motivation to enhance creativity and advance novel knowledge. With the above study, we provide an answer to the prime objective of this work; first to get an understanding of how an adhocracy culture affects the intellectual triad, the three main types of intellectual capital that is the main source of innovation; second, accumulation patterns in the relationship between intellectual capital and incremental innovations and third how accumulative patterns of intellectual capital triad intermediates the relationship between adhocracy culture and incremental innovation. Further an important contribution is how an accumulative pattern of the intellectual capital triad on the whole mediates the relationship between adhocracy culture and incremental innovation.

It is one of the limitations of this research that results should be interpreted with attention as data was collected from a relatively small sample size. It would be pertinent to use a different data basis to reduce the likely common method bias. Registered patents are usually used in



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the chemical industry due to the nature of the industry and so the case with R&D in the chemical industry as the chemical industry uses more spending on R&D within technology-based manufacturing sectors. So, we may sum up that firms operating in the chemical industry look as if they enjoy more technological opportunities; using the same approach for this industry can give motivating results. Moreover, other approaches to the similar occurrence that takes into account the concerns such as leadership style and remuneration structures of employees could improve the literature and maybe, as already remarked, change the outcome (Fiaz et al., 2017). Lastly, new avenues may be explored on this topic by involving intellectual capital and culture to firm performance.

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