

# **THE IMPACT OF VALUE CO-CREATION OF INTELLECTUAL CAPITAL ON SUSTAINABILITY PRACTICES IN HIGHER EDUCATION INSTITUTES IN PAKISTAN**

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## **ABSTRACT**

The recent inclination of universities towards incorporating marketization concepts such as value co-creation has triggered the need to bring new frameworks that fetch both goodwill and sustainability in society. This study investigates the impact of co-creation by integrating the intellectual capital, as the major operant resource, on universities' sustainability practices. While there can be an exhaustive list of resources to be considered, this study includes only Intellectual; capital for co-creation between students and the university. This study encapsulates Intellectual Capital as the main resource which has further three components human, relational and structural capital. Three hypotheses were proposed to study the impact of Value co-creation on University sustainability practices. The quantitative methodology was used in this study. The data was gathered through an online survey on a Five-point Likert scale. Stratified Random sampling was employed to use those students as samples who are in the last years of degree completion in their universities and are about to graduate. The data was collected from five top HEC-ranked universities in Pakistan. A total of 384 student respondents filled out the questionnaire. SEM –PLS was used for data analysis. The measurement confirmed the preliminary results and then the Structural model confirmed the proposed hypothesis. The study further contributes to the research of SD Logic, value co-creation, and the current needs of Higher Education institutes of being sustainable and beneficial for society by incorporating Sustainable Development Goals in their policies and agenda.

**Key Words:** Value Co-creation, Sustainability Practices, Intellectual Capital, Human Capital, Structural Capital, Relational Capital

## **Introduction**

In the international arena, the growing developments in sustainability initiatives have made the issue highly relevant to the education sector (Ferguson & Roofe, 2020; Pedro et al., 2020; Gutierrez-Bucheli et al., 2022). Moreover, incorporating sustainability into the function and working model of Higher Education is the primary issue faced by Universities (Pedro et al., 2020; Crawford & Cifuentes-Faura, 2022). They need a more flexible atmosphere for students to increase their performance and efficiency in an environment where they can interact and co-create value to strengthen attributes, capabilities and contribute more skills for the welfare of the community (Foroudi et al., 2019; Menon & Suresh, 2022). For a greater understanding, efficiency and strategies of the higher education market, numerous international for-profit and non-profit organizations have come to the forefront. "The OECD Tertiary Education Assessment (OECD, 2008) reports that" Education policy on the national agenda is becoming increasingly relevant.

Public policy mandates have recently been drawn up by both the UNESCO Global Action Programme (GAP) and the UN Sustainable Development Goals (SDGs) to help embed sustainability through education frameworks (UNESCO 2014b; UNESCO 2015). GAP seeks to foster action to reorient and enhance the incorporation of sustainable growth of education in all fields of education. In addition, UNESCO finds equality to be an important part of Quality Education (SDG 4) and accepts countries' efforts in this regard and recognizes the need for renewed efforts to improve well-informed higher education frameworks, focused on solid normative instruments and structures with an emphasis on access for all. Among the 17 Sustainable Development Goals (SDGs) introduced in 2015, education is the priority of SDG 4. Inclusive, equal, quality and lifelong education is primarily the goal of SDG 4 (Quality Education). Though prioritized as one of the 17 goals, all the other goals are underpinned by SDG 4, as it is a vital necessity for their achievement. Of course, this goal can be applied in formal and non-formal education and at all levels of education, but HEIs have a special role to play in its application and implementation (Ferguson & Roofe, 2020; Crawford & Cifuentes-Faura, 2022).

Recently various researchers studied the process of co-creation and the involvement of stakeholders in institutional activities for Sustainability (Cossío-Silva et al., 2016; Aquilani et al., 2018; Monavvarifard et al., 2019; Font et al., 2021; Crawford & Cifuentes-Faura, 2022). These studies emphasize the integration of the resources, expertise, skills and capacities of different university activists to enhance educational facilities and research programs based on requirements for sustainable development (Monavvarifard et al., 2019). However, such programs are still in their infancy in higher education institutions, and they confront several obstacles (Leal Filho et al., 2019; Pedro et al., 2020; Crawford & Cifuentes-Faura, 2022). Our premise in this study is that the latest advances in S-D logic (Vargo & Lusch, 2004) and its link to operant resource integration (for details, see Vargo & Lusch, 2016), and service science as the analysis of service system functionality (institutional arrangement), that provide valuable tools and perspectives for universities to successfully incorporate sustainability practices (Pedro et al., 2020; Menon & Suresh, 2022; Mihailova, et al., 2022). The innovativeness and contributions of this article are rooted in three areas: First, the newly developed concept of 'Value co-creation of intellectual capital' guides on how to select relevant resources and stakeholders for sustainability practices and by that addresses the research gap to elaborate a process for involving stakeholders i.e. students to engage in sustainability practices. Second, the concept applies SD Logic, not the mere notion of integration of operant resources, in the domain of sustainability practices but it prevents disconnecting integration of resources from conventional integration of operand resources. Third, as a result of the above, 'Value co-creation of intellectual capital' facilitates the generation of resource information which enhances value co-creation for stakeholders.

Given the restricted theoretical and analytical tools of the study on the role of the value co-creation process in understanding the degree of sustainable development in the academic setting, a gap has been identified for more research in this area is felt more than past (Aquilani et al., 2018; Monavvarifard et al., 2019; Ferguson & Roofe, 2020; Font et al., 2021; Crawford & Cifuentes-Faura, 2022). In so doing, the paper addresses the research question of how value co-creation and Intellectual capital can be integrated to incorporate the key ideas of SD Logic into sustainability practices in HEIs. To address this research question, the paper elaborates on SD Logic perspective on value co-creation and integration of resources for sustainability. Thereby, this paper uses SD Logic as a method theory to inform the integration of resources as a domain theory. In so doing, the concept of 'Value co-creation of Intellectual Capital' is developed.

Based on the above-mentioned premises this study addresses the following questions

Q1. What is the impact of value co-creation in human capital on sustainability practices in higher education institutes of Pakistan?

Q2. What is the impact of value co-creation in structural capital on sustainability practices in higher education institutes of Pakistan?

Q3. What is the impact of value co-creation in relational capital on sustainability practices in higher education institutes of Pakistan?

The following is how the rest of the article is structured: The following section reviews the literature on SD Logic theory and its current remit on the value co-creation, Intellectual capital, and its reconceptualization, and Sustainability practices in HEIs. The notion of value co-creation of intellectual capital and sustainability practices in HEIs' is established in Section 3 using a conceptual model approach. The final section of the study discusses the findings of this paper to previous research and concludes for future research and practice.

## **Literature Review and Hypothesis Development**

### **SD Logic and Value Co-creation in HEIs**

A central concept in the S-D Logic by Vargo and Lusch (2004) is that resources do not get value per se; rather, when resources are used and shared, value is co-created with customers. Resources do not have an inherent value in this context and need to be deployed and incorporated to be beneficial for an individual to realize the benefits (Vargo & Lusch, 2016). SD Logic emphasizes and differentiates between two main resource types: (1) operand resources, usually tangible (raw materials or physical objects); and (2) operant resources, predominantly human (employee and consumer experience and knowledge), institutional (routines, languages, skills), insightful (competitor, business and technology knowledge) and related (provider and consumer relationships) (Hunt & Derozier 2004; Edvardson et al., 2011; Font et al., 2021). According to Vargo and Lusch, (2004), competitive advantage is created mainly by operant resources, since knowledge and abilities rely on resources to solve challenges, satisfy needs and create a valuable customer experience.

By applying skills and expertise, operant resources can be both created and extended by learning; thus, they can nurture because of their dynamic nature (Lusch & Vargo, 2014). Therefore, each actor does not generate value by themselves and VCC could only occur when the actors communicate and share resources, with each other (Vargo & Lusch, 2004; Font et al., 2021). The degree of interaction reflects the level of involvement of actors with each other and with other participants. The level of interaction is thus recognized as an essential feature in the advancement of VCC (Davey et al., 2017). Cook-Sather (2013), discusses the roles and the relationship between students and faculty and suggests that incorporating students as partners in pedagogical practices constitutes a threshold concept" in education, because of the ways these roles and the relationship have been shaped traditionally and the disruptive changes may evoke an alternative view on these roles and the relationship. This dynamic resource viewpoint differentiates S-D logic and conventional static resource approaches, resonating the focus on resource utilization in the value generation and competitive advantage of universities. Therefore the current study incorporates IC as the main operant resource that needs to be further investigated from the value co-creation

perspective for a sustainable university.

### **Value Co-creation in HEIs**

Value Co-creation (VCC) is described as the joint value-creation between the organization and the customer; allows customers to design the service experience in accordance with its context (Prahalad & Ramaswamy, 2004; Arnold, 2017). Through this, organizations and their customers can jointly define and resolve problems while creating an experiential environment in which customers can engage in active communication and co-construct personalized experiences innovatively (Cossío-Silva et al., 2016; Prahalad & Ramaswamy, 2004; Foroudi et al., 2019).

VCC in practice implies the relationship between operators to achieve mutual value (Vargo & Lusch, 2017). In strengthening the mechanism of co-creation in university, its stakeholders have a vital position (Cossío-Silva et al., 2016). Similarly, Strobacka et al., (2016) have confirmed that members of the academic community are intrinsically skilled in co-creating value and establishing their inter-personal relationships and embracing a variety of roles. However, their progress in VCC relies on the ability of an organization to combine resources. It is necessary to combine potential resources of actors in the VCC process, because; 1) individual resources and capabilities cannot be used alone in the VCC process and can be useful when combined with other resources (Xie et al., 2018) and; 2) Innovations are always the product of existing resources being recombined. Similarly, a prospect for VCC is created in the HEIs when there are interactive connections between students as users of goods and services and universities as suppliers (Gronroos & Helle, 2010). Frow et al., (2015) thus suggested that the building of physical and communicative structures across management influence the enhancement of educational facilities and the mechanism of VCC in HEIs.

Though the studies have focused on extended topics related to VCC in various fields such as consumer loyalty to the organization (Cossio-Silva et al., 2016), market-oriented knowledge creation (Jaakkola & Hakanen, 2013), infrastructure planning (Reed et al., 2009), rural development and community engagement (Thabrew et al., 2009) and tourism (Font et al., 2021) there is restricted theoretical and analytical tools of the study on the role of the VCC process in HEIs context needs more studies in this field (Aquilani et al., 2018). Therefore the following hypothesis has been proposed:

Hypothesis H1: Value co-creation of intellectual capital has an impact on university sustainability practices.

### **Value co-creation and Intellectual Capital**

Recently, the world economy experienced a shift from a production-based structure, focused on the rigorous use of tangible resources, to an information-driven viewpoint arising from the intensive use of information (Romano et al., 2014; Uden & Del Vecchio, 2018; Font et al., 2021). That means wealth creation through the production and management of intangible assets, known as Intellectual Capital (IC) (Dumay & Garanina, 2013). Researchers and practitioners are broadly in agreement on IC components at the organizational level (Sultanova et al., 2017) consisting of three main components: structural, human and relational capital (Veltri et al., 2014). It was recognized, even in the beginning that every aspect of IC should not be taken in isolation (Edvinsson & Malone, 1997) and it makes sense to investigate their interrelations in HEIs.

IC is a relatively emerging field, and over the past few decades its body of literature, theoretical impact and practical contribution has increased (Sultanova & Auken, 2016). Some attempts have been made over the last two decades to extend IC models to HEI's, especially in European countries (Ramirez & Gordillo, 2014; Veltri et al., 2014; Secundo et al., 2017) but lack empirical evidence in developing or underdeveloped countries. Dumay (2016) recently criticized, the obvious quest to create further IC frameworks when there is already a multitude of IC measuring frameworks. In addition, Dumay (2016) urges a need for further IC theory to be developed and suggests a way forward towards a critical approach to practical research and implementation of IC. In recognizing IC as a competitive collection of intangible properties, bringing this perspective further, it is crucial to emphasize that its significance derives not just from the "quality" of the intangibles themselves, but rather from the capacity of the organization to handle them to stimulate and (co-)create value for themselves and the organization (i.e., VCC) (Rossi & Magni, 2017).

### **IC and its reconceptualization for Value Co-creation**

IC as a mix of intangible activities and resources helps a company to gain a competitive edge by combining a bundle of content, financial, and human capital into a program capable of creating stakeholder interest and organizational innovation, (Marr et al., 2004; Edvinsson & Malone, 1997; Sultanova, 2017; Font et al., 2021). Intellectual Capital, defined as a dynamic system of intangible, knowledge-based resources and activities capable of creating value for stakeholders (European Commission, 2006), enables management to be competitive using corporate resource theory principles (Uden, 2018; Sultanova, 2017). Although different meanings are used, all IC principles are based on transforming knowledge assets into values to improve the competitive advantage of an organization (Cabrita, 2006; Ali & Anwar, 2021).

Researchers and practitioners are broadly in agreement on IC components at the organizational level (Sultanova, 2017). Human, structural, and relational capital are the three fundamental components of IC (Veltri et al., 2014, Uden, 2018; Ali & Anwar, 2021). Furthermore, Secundo et al., (2017) went on to say that the value of IC as a competitive asset is based on the relationships that exist between them and the activities; this allows us to identify, measure, report, and expose organizational knowledge (Uden & Vecchio, 2018). It was recognized, even in the beginning that every aspect of IC should not be taken in isolation (Edvinsson & Malone, 1997) and it makes sense to investigate their interrelations in HEIs. That being so, a combined effect of components of IC should be examined on performance (Davey et al., 2017; Sultanova et al., 201; Ali & Anwar, 20217). A detailed examination of IC components along with their VCC capabilities is discussed in the following section.

### **Human Capital and Value co-creation**

Human capital refers to the staff of an organization and their attributes, such as knowledge, experience, skills, individual values, attitudes, abilities, commitment, behaviour, motivation, the potential for innovation, creativity, know-how, expertise, capacity for teamwork, talent, adaptability of employees, the openness of ambiguity, satisfaction, learning strength, skills, loyalty, formal training and education (OECD 2008; Bontis, 1999; Hussinki et al., 2019; Khalid, 2017; Hudec, 2017; Zapata-Cantu & González, 2021). Cricelli et al., (2014) also stated that HC is the combination of competency, attitude and intellectual agility. In the HEI sense, human capital is the amount of overt and implicit expertise possessed by all the human resources in the

organization (teaching, study and development, management, directing and administrative personnel in all services), gained by formal and non-formal education as well as through the training programs used in their operations. (Ramírez-Córcoles et al., 2011, Ramírez-Córcoles & Gordillo, 2014; Veltri et al., 2014; Zapata-Cantu & González, 2021).

Associated with the vision articulated by Puukka and Marmrejo (2008) and Pedro et al., (2020), human resources play a significant role in Sustainable practices by intermediating the different stakeholders and national players, by illustrating good practices such as the creation of management strategies, strategic planning, building programs, maximizing energy consumption and sustainability waste and practices, and leaders have opportunities to deliver recognizing and praising workers for participating in scholarly and national community-leading Sustainable societies. Based on the identified strong link between the creation, education and training of human capital (Becker, 2009; Zapata-Cantu & González, 2021). Khalid (2017) stated that the human capital of universities is a necessary ingredient for developing a culture of knowledge and innovation, which is the basic element of value co-creation.

Hypothesis H1: Value co-creation of human capital has an impact on university sustainability practices.

### **Structural Capital and Value co-creation**

Structural capital comprises of "all non-human storages" of organizational information (Bontis, 1999; De Silva et al., 2021). Significantly different from human capital, structural capital can be described as the information that stays inside the organization even though workers go home or change their workplace (Hussinki et al., 2019; De Silva et al., 2021). According to Hudec (2017), structural capital (SC) includes hardware, software, organizational structure, databases, trademarks, patents, and all other resources that promote efficiency and creativity through information transfer and exchange. Additionally, in the HEI perspective, institutional capital encompasses all specific knowledge interlinked with the internal processes of the development, collaboration, and management of science and technological expertise in the enterprise, which covers all organizational dimensions (operating environments arising from the relationships between research management and the organization of processes, organizational practices, organizational culture and principles, and operational processes, within the framework of consistency and information systems, among others), and strategic factors (strategic tools available in the institution, such as bibliographic and historical materials, libraries, scientific innovations, patents, licenses, software, and databases, among others) (Ramírez-Córcoles, & Gordillo, 2014; Pedro et al., 2020; De Silva et al., 2021).

Khalid, (2016) addressed Structural Capital (SC) as an organizational structure that combines Knowledge with tangible assets for procedures of value co-creation. Marr (2005), defines it as the substance enabling the organizations to advance. In Tonial et al., (2019) study, structural capital was linked with sustainability activities aimed at enhancing such corporate structures and procedures, such as systemic changes focused on emerging technology (databases, intellectual property) and organizational culture centered on environmentally sustainable activities management. Mesa (2007), focuses on the value-creation of structural capital through mutual exchange between the beneficiary and the service provider. Therefore this study encapsulates structural capital as the dimension of displaying value co-creation between students and the HEI through the integration of organizational infrastructural competency.

Hypothesis H2: Value co-creation of structural capital has an impact on university sustainability practices.

### **Relational Capital and Value co-creation**

Interactions with stakeholders are the prerequisite for building, retaining, and renewing resources, structures, and procedures over time, as critical and complementary resources can be accessed through relationship organizations (Cabrita & Vaz, 2006; Cavallone et al., 2021). In the context of HEIs, all cultural, political and organizational relationships with non-academic partners (corporations, public bodies, government, prospective students, graduates, society) as well as credibility, goodwill, appeal, transparency, etc. are included (Hudec, 2017; Cavallone et al., 2021).

For HEIs, it can be considered to include partnerships between academics from local and global educational institutions leading in the sharing of information such as program reviews, student exchange programs, collaborative R&D partner conferences, image, consumer loyalty, customer satisfaction, supplier ties, market power and negotiating ability with financial institutions (OECD 2008, Khalid, 2017; Cavallone et al., 2021). Access to a large network of trustful and mutual relationships would dramatically boost the development of consumer interest by not only allowing expanded capacity for merging and sharing information with external parties but also by generating new knowledge through value co-creation (Hussinki et al., 2019; Cavallone et al., 2021). With regard to HEI value co-creation, relational capital represents the comprehensive array of cultural, political, and institutional connections that have been formed and retained between HEIs and their non-academic stakeholders (companies, NGOs, local government, and general society), as well as other views of the organization in terms of its identity, attractiveness, trustworthiness, and security, among others (Ramírez-Córcoles et al., 2012; Cavallone et al., 2021).

Hypothesis H3: Value co-creation of relational capital has an impact on university sustainability practices.

### **Sustainability Practices in HEI**

Sustainability has been a buzzword or idea over the last few decades and has gained a great deal of interest in almost every aspect of life (Zahid et al., 2020; Gutierrez-Bucheli et al., 2022). This has also changed, among other things, the landscape of HEIs to expand support and highlight emerging sustainability issues (Findler et al., 2019). Several reports and other conferences laid special stress on sustainability to the innovative education policy, which is strongly focused on different expectations, metrics and priorities (Boeren, 2019; Gutierrez-Bucheli et al., 2022). Sustainability practices are progressively being integrated into university curricula, operations, research, outreach, reporting and assessment (Lozano, 2011; Lidgren et al., 2006). In a similar direction, Velazquez et al., (2006) define a sustainable university in terms of outreach and partnership, teaching, research, and on-campus sustainability practices. Furthermore, various researchers argue that higher education institutions can promote sustainability through research and teaching by disseminating knowledge about the value and significance of sustainability (Delakowitz & Hoffmann, 2000), improving environmental protection (Boca & Saraçlı, 2019), as well as transmitting knowledge to the community (Wali et al., 2017)

According to UNESCO IIEP (2017), Higher Education is a key contributor to Sustainable Development. The SDGs for 2030 represent an ability to harmonize the fiscal, social and

environmental aspects of life. SDG 4, which is specifically related to Quality education, stresses the pursuit of such harmony through equitable and equal quality education and lifetime learning opportunities for everyone through the fulfillment of 10 targets. More crucially, SDG 4, Target 4.3, focuses on higher education and states that by 2030, all nations must provide equal access to affordable and high-quality technical, vocational, and tertiary education, particularly university education, for both men and women. The goal was marked as "transformative and universal" and a link to the earlier EFA agenda and the MDGs associated with education in addressing global and national issues in higher education (FFA-2030 Agenda, Goal 4, 2019). These goals aim to ensure that education at the level of higher education is nevertheless offered but is available to all men and women of the highest standard and the quality education for individuals, societies and countries can contribute to better development results, thus helping to eradicate poverty (Ferguson & Roofe, 2020; Gutierrez-Bucheli et al., 2022).

Within the idea of sustainability, Seiffert and Loch (2005) highlighted five fundamental dimensions: environmental, social, economic, cultural, and educational. Every aspect of a university, from classrooms and labs to housing, transport, and other services, as well as the entire campus, is affected by sustainability (Alshuwaikhat & Abubakar, 2008). Meanwhile, four SD dimensions, including environmental, economic, sociocultural, and educational/political issues, have been proposed for sustainable practices and SD incorporation in universities (Ceulemans, 2015; Alonso-Almeida et al., 2015; Larrán et al., 2019; Aleixo et al., 2018). A sustainable campus, according to the literature, entails a better balance of economic, social, and environmental goals in strategic planning, as well as a long-term view of the effects of today's campus operations (Newman, 2006). The sustainability of universities has now appeared to be an important concern to education providers similar to any other commercial organizations (Malik et al., 2019). There is, therefore, a dire need in, to explore the sustainability practices of HEIs from students' perspectives, as to see what benefits students can have in the long term through these sustainability initiatives.

### **Conceptual framework**

Based on the review of the literature presented, co-creation has rarely been used in higher education (e.g. Elsharnouby, 2015; Flesichman et al., 2015; Gros & López, 2016; Font et al., 2021), and thus a comprehensive model was needed to better understand how co-creation occurs and adapts to the higher education context (Dollinger & Lodge, 2020; Mihailova, et al., 2022). The suggested conceptual model focuses on value co-creation by taking students as the co-creators in HEIs. With mediating and moderating variables, it depicts the impact of co-creation on university sustainability practices. The model is based on the key principle of SD Logic of Operant Resource Integration for Value Co-creation. Value Co-creation is a higher-order multidimensional construct in this study that integrates three dimensions of Intellectual Capital components, namely Human, Structural, and Relational Capital, to engage students in VCC activities (Rossi & Magni, 2017; Cavallone et al., 2021). Integration of intangible assets (here intellectual capital) in university highlights the importance of utilizing Human, Structural, Relational and Social capital by students and staff for better Co-creation (Pralhad & Ramaswamy 2004; Gros & López, 2016; Mihailova, et al., 2022).



### Value co-creation in Intellectual Capital

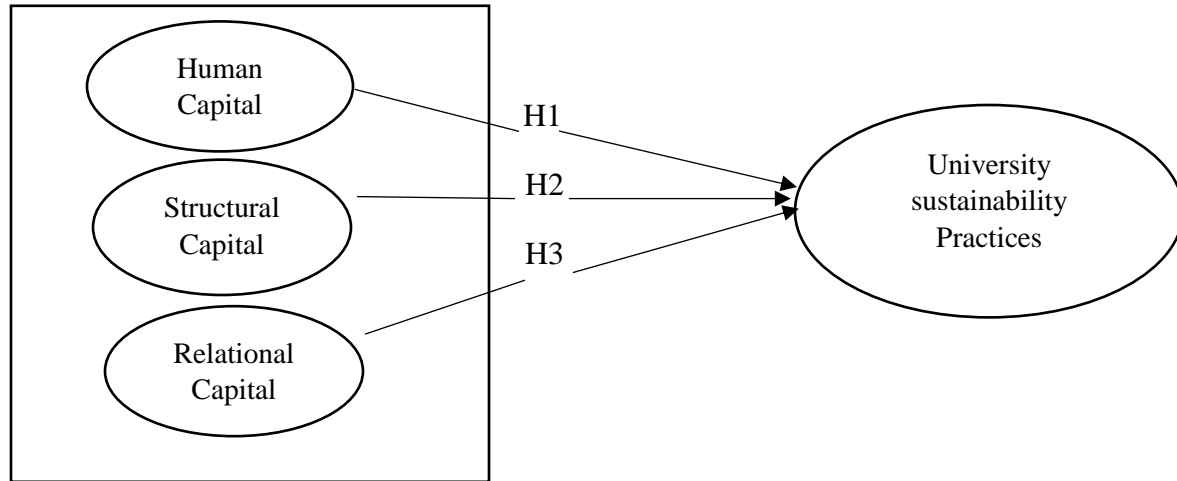


Figure 3.1 shows the conceptual framework, which demonstrates the relationships between constructs (value co-creation, and university sustainability).

This approach also supports the idea that sustainability is difficult to pinpoint to a single aspect because the diversity of the student population will influence what is most important to them. However, the current model considers that the operator's participation in value co-creation can develop new competencies for the university, which can ultimately lead to a sustainable university, based on the frameworks provided by Pedro et al., (2020), Rossi and Magni (2017), and Maxwell-Stuart et al., (2018).

### Research Methodology

This study is based on the quantitative research methodology. The researcher intends to follow the positivism paradigm with the deductive approach. Surveys were designed to take responses to a Five-point Likert Scale questionnaire. Value co-creation construct is based on three dimensions of Human capital, Structural capital and Relational capital. The items developed have been adapted from Pedro et al., 2019, Khalid 2017; Córcoles et al. 2013; Rossi & Magni, 2017; Dollinger et al., 2019; Prahalad & Ramaswamy, (2004). The dependent variable is sustainability practices in HEIs is based on four dimensions; Environmental, Social, Economic and Educational presented by Aleixo et al., (2018); Niedlich et al., (2020); Findler et al., (2019) and Lozano et al., (2013).

The population of this study include the students of final semesters of different universities. This study used a purposive convenient sampling technique to take the sample of students from the higher education institutes of Pakistan. The G\*power software showed a minimum sample size of 119 students. The criteria for the selection of the sample was that the student must be enrolled in undergraduate program and must be in the final years of the program so that they may studied all the courses and might have more experience at the campus then other fresh students. The universities are selected on the bases of the HEC (higher education commission) Pakistan ranking of universities. One top university is selected from each category of university ranking. The selected universities were Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, The National University of Computer and Emerging Sciences (NU-FAST) Islamabad, Lahore

University of Management Sciences Lahore, Engineering and Applied Sciences, Islamabad, and the University of Punjab Lahore. From each university the researcher collected data from almost 50 students studying various programs. Due to COVID-19 restrictions, Google forms were used and data was collected through an online survey. Initially more than 1000 forms were distributed and only more than 100 responses were collected. Then after reminder researcher were able to collect data from more than 400 respondents. After initial screening dropping the unfilled questionnaire, 384 responses were used for final analysis.

### Data Analysis

To achieve the study objective data were analyzed by applying the structural equation modeling (SEM) using the Smart PLS 3. PLS is based on a variance-based approach and data is analyzed in two steps. In the first measurement model is analyzed and in the second step structural model is assessed to test the hypotheses. Before measuring the actual model, data screening was done by means of the “Statistical Package for Social Sciences” (SPSS 26) for the data accuracy, missing values and biasness issue. For the current study, missing value analysis has been done on SPSS 26 using the random maximization method. Whereas no missing values have been found. When study data is acquired from similar respondents by self-reporting, a bias known as common method variation (CMV) emerges. Because the data for this study was collected from students, it is possible that it will be prone to common method variance. Harmon's single factor test at SPSS is commonly used in social science research, where all items are put on a single factor. Its threshold value is 0.50, which means that a deviation of 50% is allowed. The CMV test was performed using SPSS 26, and the cumulative percentage of variance was 27.858, indicating that the result is below the threshold and that the data is not troublesome for the study. The information for this study was gathered using an online survey utilizing Google forms, due to COVID-19 restrictions. All of the items were graded on a Five-point Likert scale, with the range being strongly disagree to strongly agree. Whereas responses regarding demographic questions were obtained using certain codes to ensure convenience. Data was collected from the 384 respondents the demographic profile of respondents is shown in Table 1 given below.

**Table 1. Respondents' Profile**

Demographics	Codes	Labels	Frequency	Percentage
<b>Gender</b>	1	Male	195	50.8
	2	Female	189	49.2
<b>Age</b>	1	Under 18	01	<.1
	2	19-23	25	6.5
	3	24-28	83	21.5
	4	29 – 33	199	51.1
	5	33 or above	76	19.8

<b>Institution Name</b>	1	Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi	86	22.3
	2	National University of Computer and Emerging Sciences (NU- FAST), Islamabad	50	13.0
	3	Lahore University of Management sciences, Lahore, Pakistan Institute of Engineering and applied sciences, Islamabad,	83	21.6
	4	University of Punjab Lahore.	80	20.8
	5		85	22.1

### Measurement Model Assessment

The Measurement model can be assessed through Confirmatory Factor Analysis (CFA) (Hair et al., 2019). It evaluates the reliability and validity of particular constructs specified in the research hypotheses and framework. It is mainly comprised of item reliability (loadings), construct reliability (Cronbach's alpha and composite reliability), convergent validity (average variance extracted) and discriminant validity (HTMT ratio). In the current study, CFA has been conducted in order to evaluate the measurement model. Hair et al. (2019) suggest evaluating the measurement model at Smart PLS in terms of indicator loadings, internal consistency reliability, convergent validity, and discriminant validity for a reflective model. Reliability analysis determines the consistency of scale reflecting the constructs. It is depicted by the value of Cronbach's alpha and composite reliability which shows the internal consistency reliability between the constructs. The acceptable value for construct reliability measures of each individual construct is supposed to be 0.7 or above (Hair et al., 2019). Cronbach's alpha values are above the threshold i.e., 0.7 and it is lower than the problematic range (0.95) as indicated by (Hair et al., 2019). Values for composite reliability are also out of the challenging area. In Table 2 the construct reliability values of all the constructs are given.

Construct validity is analyzed in order to ensure that the construct being evaluated reflects the theoretical latent construct those measures are intended to measure. The measurement model assessment, is assessed concerning convergent and discriminant validity. Convergent validity demonstrates that all indicators of a certain construct are logically coherent whereas, discriminant validity illustrates that each construct is divergent from other ones in the hypothesized model. The convergent validity of constructs is determined by Average Variance Extracted (AVE). According to Henseler et al., (2009), the AVE threshold value is 0.5, indicating that the constructs describe

at least 50% of the variance in items, confirming the measurement scale's convergent validity. Table 2 entails the average variance extracted for all the constructs and all of them are above their respective threshold. The discriminant Validity defines how distinct several constructs are while they are being studied. The Fornell-Larcker criterion and the Hetero-Trait Mono-Trait ratio ensure this. In SmartPLS3, Hair et al. (2019) do not believe the Fornell-Larcker criterion is a reliable estimate of discriminant validity. In Smart PLS, they proposed the Hetero-Trait Mono-Trait ratio as a broader and less regulated approach to discriminant validity appraisal. According to Henseler et al. (2015), the cutoff value for HTMT is 0.9. As can be seen in table 2, all of the HTMT values are below the threshold, ensuring discriminant validity.

**Table 2: Measurement Model Analysis**

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	HM	RC	SCC	SP	USEC	USED	USES	USS
HM	0.818	0.863	0.518								
RC	0.829	0.876	0.542	0.539							
SCC	0.900	0.922	0.629	0.656	0.695						
SP	0.920	0.929	0.552	0.589	0.759	0.714					
USEC	0.854	0.892	0.579	0.441	0.612	0.637	0.837				
USED	0.858	0.892	0.541	0.516	0.697	0.607	0.757	0.739			
USES	0.866	0.900	0.602	0.532	0.708	0.663	0.860	0.600	0.636		
USS	0.818	0.865	0.569	0.380	0.456	0.350	0.730	0.519	0.470	0.306	

*HM=Human Capital, RC= Relational Capital, SC=Structural Capital, SP= Sustainability Practices, USEC= Economic, USED= Educational, USES=Environmental, USS=Social*

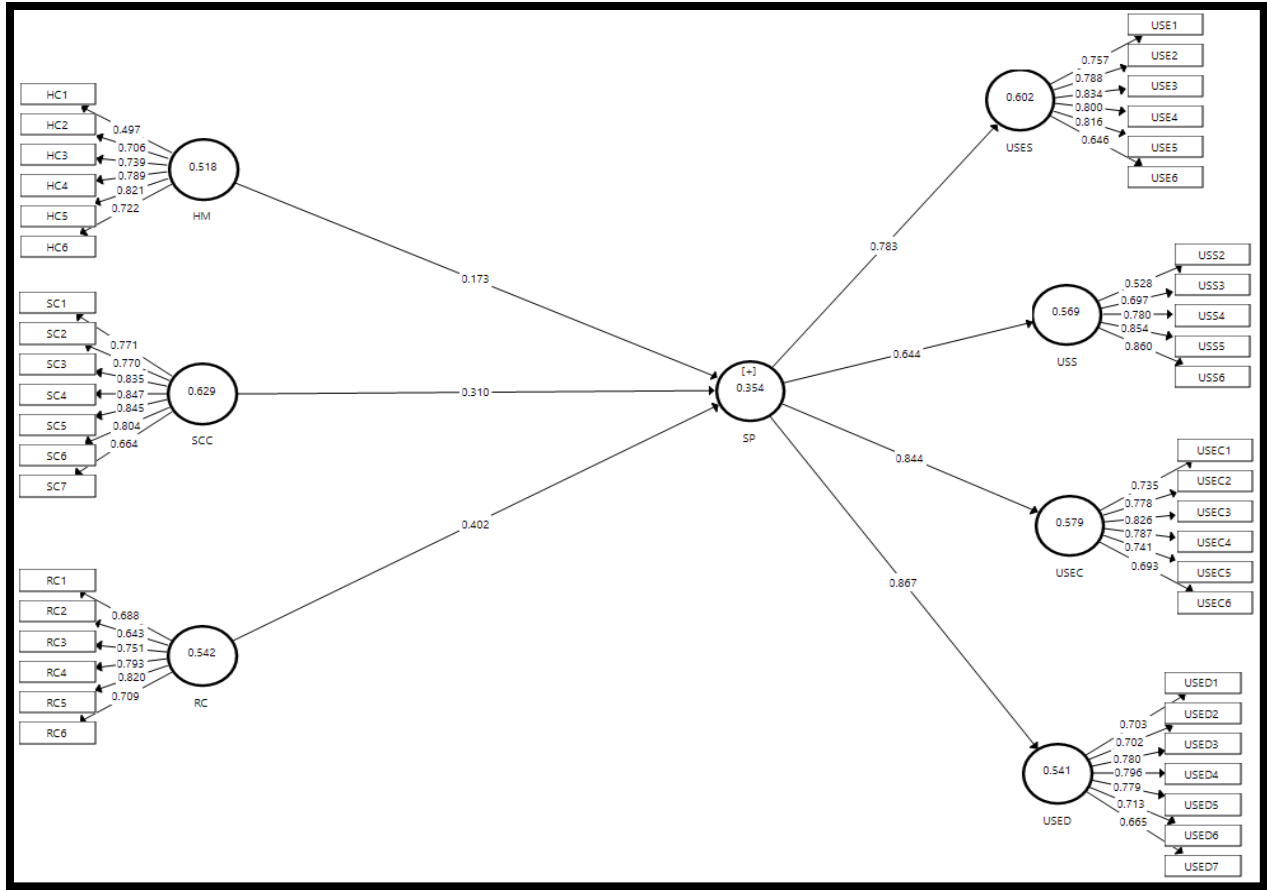


Figure 4.1: Measurement Model

### Structural Equation Modeling (SEM)

After the hypothesis testing through Structural Equation Modeling (SEM) at Smart PLS3, the results are analyzed in terms of Collinearity, Beta coefficient, t-value, the goodness of fit ( $r^2$ ) and effect size ( $f^2$ ) (Hair et al., 2019). Depending upon their respective values, the decision regarding accepting a hypothesis is made. T-values greater than 1.64 (for directional hypotheses) and p-value less than 0.05 are considered significant at a 95% confidence interval. Before assessing the structural relationships, Collinearity needs to be assessed so that the regression results do not get biased. It is ensured by the values of Collinearity statistics also called Variance Inflation Factor (VIF). Hair et al. (2019) suggest the ideal VIF values to be around 3 or lower. For the current model, VIF for all constructs is less than the threshold value indicating that there is no multicollinearity issue.

The results of tested hypotheses are depicted in terms of coefficient of determination (also denoted as  $R^2$ ). It is the variation percentage in the dependent variable triggered by the predictor variables. It provides an indication of how well the model replicates observed outcomes based on the model's total variance of outcomes.  $R^2$  is an indicator that provides the goodness of fit of the model. Its values range from 0 to 1. According to the results, 56.4 % variation is caused in sustainability practices due to all independent variables. Hypotheses testing shows that HM has a significant

impact on sustainability practices. The Beta value for this relation is 0.176 which shows that there is a 17% change in sustainability practices due to the value HM and this relation is significant at a 99% level of the confidence interval as t value is 3.397 and p is 0.001. Moreover,  $f^2$  effect size is also measured which show that the effect size is 0.043 which is also significant as the lower limit confidence interval (LLCI) is 0.034 and the upper limit confidence interval (ULCI) 0.034. Results indicate that hypothesis is significant at 99% level of the confidence interval.

Hypotheses testing shows that RC has significant impact on sustainability practices. The Beta value for this relation is 0.401 which shows that there is a 40% change in sustainability practices due to the value HM and this relation is significant at a 99% level of the confidence interval as t-value is 9.340 and p is 0.000. Moreover,  $f^2$  effect size is also measured which shows that effect size is 0.233 which is also significant as the lower limit confidence interval (LLCI) is 0.292 and the upper limit confidence interval (ULCI) 0.292. Results indicate that hypothesis is significant at 99% level of the confidence interval.

Hypotheses testing shows that SCC have significant impact on sustainability practices. The Beta value for this relation is 0.309 which shows that there is a 30% change in sustainability practices due to the value SCC and this relation is significant at 99% level of the confidence interval as t-value is 5.626 and p-value is 0.000. Moreover,  $f^2$  effect size is also measured which shows that effect size is 0.111 which is also significant as the lower limit confidence interval (LLCI) is 0.142 and the upper limit confidence interval (ULCI) 0.142. Results indicate that the hypothesis is significant at 99% level of confidence interval.

*Table 3: Hypothesis Testing*

<b>Sr.no</b>	<b>Hypotheses</b>	<b>B-Coefficient</b>	<b>T-Statics</b>	<b>p-value</b>	<b>F<sup>2</sup></b>	<b>LLCI</b>	<b>ULCI</b>
H <sub>1</sub>	HM->SP	0.176	3.397	0.001	0.043	0.034	0.034
H <sub>2</sub>	RC->SP	0.401	9.340	0.000	0.233	0.292	0.292
H <sub>3</sub>	SCC->SP	0.309	5.626	0.000	0.111	0.142	0.142

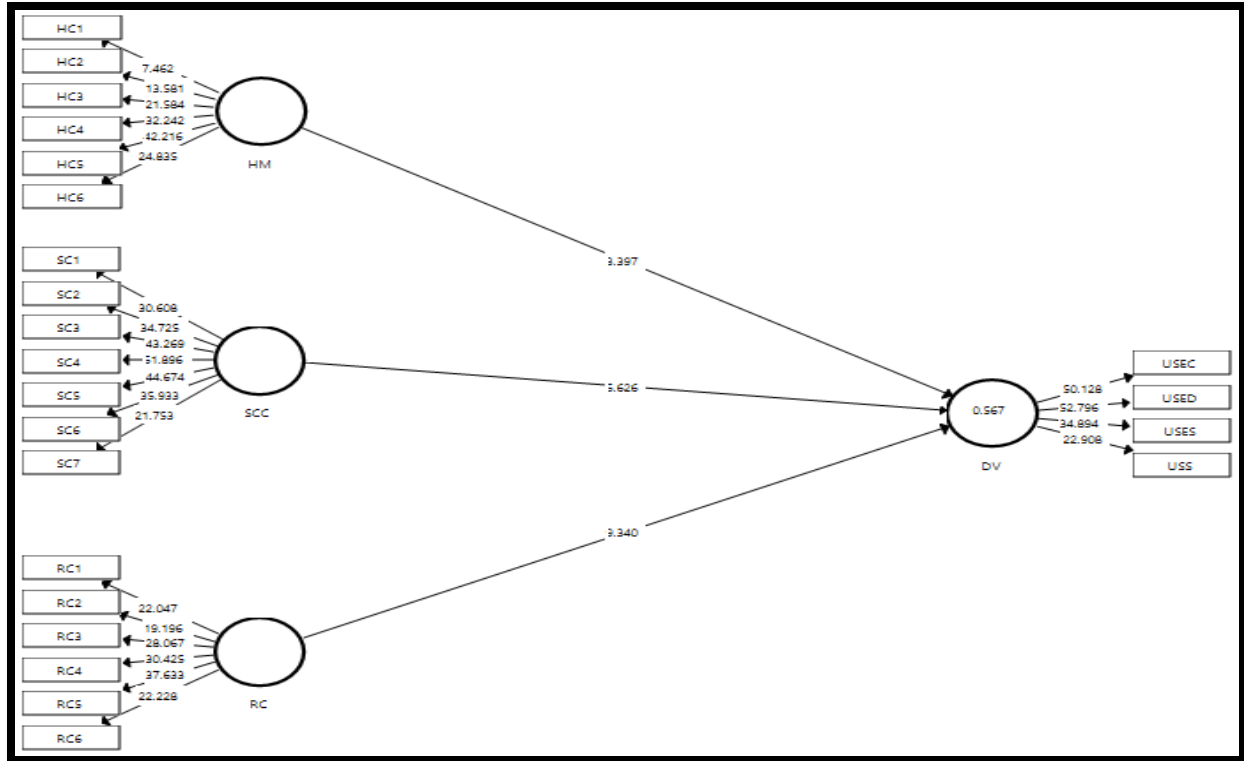


Figure 4.2: Structural Model

Further, the results indicates that relational capital has a higher impact on sustainability practices as beta value of 0.40 which indicates the 40% change in dv by changing one unit in relational capital. Moreover, the effect size is also greater showing the medium effect size. Whereas, the other two effect sizes are small showing a weak impact on the sustainability practices.

## Discussion

This study has paid attention to the description and concepts encapsulated by co-creation, including its implications. The researcher developed and introduced this principle in the context of higher education in this research. The researcher looked into the relationship between value co-creation of the IC, and sustainability practices in Higher Education from the perspective of students. Previous studies have looked at the relationship of co-creating value with student satisfaction (Elsharnouby, 2015; Maxwell-Stuart et al., 2018) and co-creation behavior (Foroudi et al., 2019), but few have looked at the crucial area of resource integration at the university level (Judson & Taylor, 2014; Rossi & Magni, 2017; Dollinger & Lodge, 2020; Menon & Suresh, 2022). The notion of value co-creation in this study was conceptualized by integrating the intellectual capital as the major operant resource in universities. As shown in the conceptual model the impact of value co-creation was hypothesized on the university sustainability practices. All the hypotheses were confirmed by showing the positive impact of value co-creation on university sustainability practices. Based on the conceptual model, which is the result of an interactive process with the university, this research recognizes the relevance of co-creation as a mean of achieving university sustainability practices (environmental, educational, economic and social practices) that are in the interests of the university.

Similarly on the other hand previous studies also show that such ICT infrastructures help in better communication among the students which strengthens the student networks (Pedro et al., 2019). These networks and the other business networks increase the relational resources which can enhance the co-creation activities. As a result of the impact on other variables, the amount of Value Co-creation at the university may increase (Ramaswamy & Ozcan, 2018; Bovill & Woolmer, 2019; Cavallone et al., 2019; Gutierrez-Bucheli et al., 2022). The second important finding when it comes to the constructs of the VCC is that the importance of human capital cannot be neglected while integrating the resources of the university and students (Karpen et al., 2012; Gronroos & Voima, 2013; Dollinger & Lodge, 2020). The previous studies also argue that the university human resource is inherently capable of VCC as they manage various interaction that are based on their performance and duties in the university (Caputo et al., 2019; Foroudi et al., 2019; Dollinger & Lodge, 2020). They integrate all the infrastructure and other relational resources for better outcomes and this, in fact, benefits the ultimate consumers i.e. the student (Chou et al., 2018; Dollinger et al., 2018; Kaminskiene et al., 2020; Menon & Suresh, 2022). Students' goals for sustainability areas, on the other hand, are considered a source of information, and university management can give the required criteria for students to share these informative sources by providing integrative infrastructures (Hein et al., 2019; Moghtadaie & Jamshidian, 2020). This means that the participants in the Value Co-creation approach at the university pool their resources and build a new type of service that is more efficient and effective than the former one and fits the needs of the operators (Judson & Taylor, 2014; Bovill, 2020; Gutierrez-Bucheli et al., 2022).

The main objective of the study was to investigate the impact of value co-creation of IC on the university's sustainability practices. The results of the study confirm that value co-creation impact university sustainability practices, both directly and indirectly (through a mediator). The results of the study confirmed that all the four dimensions of university sustainability practices are part of university sustainability practices in Pakistan. The findings of this study are consistent with earlier research, which has shown that environmental, economic, social, and educational practices are essential for long-term sustainability (Fleacă et al., 2018; Albareda-Tiana et al., 2018; Findler et al., 2019; Menon & Suresh, 2022). In numerous studies, these dimensions have been described as an important aspect of practically all of the 17 SDGs, and their relevance is also visible in the HEI context in the study's findings (Franco et al., 2019; Chankseliani & McCowan, 2021; Aleixo et al., 2018). However, higher education is mainly responsible for SDG 4 i.e. Quality Education that emphasizes lifelong equitable learning for all. Although the role of sustainable development has been previously studied the impact of value co-creation in sustainability is under-researched however, a few types of research including this one have also strengthened the notion of value co-creation for sustainable development in universities (Longoria et al., 2021; Kumari et al., 2019; Perello-Marín et al., 2018; Gutierrez-Bucheli et al., 2022). In this regard, the understanding of sustainable development practices in universities becomes more crucial as found in the current study through value co-creation in higher education, as earlier few pieces of research have also strengthened the notion of value co-creation for sustainable development in universities (Perello-Marín et al., 2018; Kruger et al., 2018; Cavallone et al., 2019; Gutierrez-Bucheli et al., 2022).

## **Conclusion**

The current study aimed at exploring the impact of value co-creation on sustainability practices in Higher Education Institutes of Pakistan. Furthermore, the impact of the three sub-dimension was also seen separately on the sustainability practices in HEIs of Pakistan. The results confirmed all



the hypotheses. Finally, this research demonstrates that it is a useful tool for universities to take advantage of the potential of co-creation by allowing them to create a competitive strategy that will generate further value for their students while also being difficult to imitate, in relation to working to develop differentiation strategies. Universities will be able to capture a bigger share of the education market as a result of the implementation of an open innovation approach, which will strengthen the higher education for sustainable development programs. Co-creation may also enable students to learn the skills required to promote sustainable development, enabling them to be better professionals and contributors to society. It has been demonstrated that value co-creation when combined with active student participation and cooperation, enables students to develop the competencies and abilities required in the ESD setting. It is demonstrated as a viable option that may be used in higher education degrees in Pakistani universities to establish a sustainable society.

Furthermore, this study can be further expanded in future studies by taking the responses from teachers as they also play a major role in value co-creation. Since this study needs a more in-depth analysis of the sustainability practices from the higher authorities and their perceptions, therefore in future interviews with higher authorities in Universities can be taken in detail. Moreover, the study can be expanded by incorporating more dimensions to the model such as the dimension of curriculum and educational policies from the government is missing, which can be further incorporated after a careful literature review.

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