Journal of Management and Research (JMR)
Volume 9 Issue 1, Spring 2022
ISSN$_{(P)}$: 2218-2705 ISSN$_{(E)}$: 2519-7924
Homepage: https://ojs.umt.edu.pk/index.php/jmr

Article QR

Title:	**Towards Effective Co-creation of Value: Case Study of a Public University of Pakistan**
Author (s):	Farwa Saeed, Nasira Jabeen, Yaamina Salman
Affiliation (s):	University of the Punjab, Lahore, Pakistan
DOI:	https://doi.org/10.29145/jmr/91/07
History:	Received: October 20, 2021, Revised: April 05, 2022, Accepted: June 10, 2022, Published Online: July 19, 2022
Citation:	Saeed, F., Jabeen, N., & Salman, Y. (2022). Towards effective co-creation of value: Case study of a public university of Pakistan. *Journal of Management and Research, 9*(1), 160-184. https://doi.org/10.29145/jmr/91/07
Copyright:	© The Authors
Licensing:	This article is open access and is distributed under the terms of Creative Commons Attribution 4.0 International License
Conflict of Interest:	Author(s) declared no conflict of interest

A publication of
Dr. Hasan Murad School of Management
University of Management and Technology, Lahore, Pakistan

Towards Effective Co-creation of Value: Case Study of a Public University of Pakistan

Farwa Saeed*, Nasira Jabeen and Yaamina Salman

Institute of Administrative Sciences
University of the Punjab

Abstract

This study examines the co-creation between a public university and industry and the building blocks that shape co-creation in the context of Pakistan. A conceptual framework has been developed based on the perspective of Service Dominant Logic, which connotes that value is created from the integration of resources through interactions between co-creating partners. The aim of this study is to elucidate the types of resources used for integration by employing different modes of interactions for value creation sought by the university and industry. For this purpose, a case study based on the co-creation between the Centre of Excellence for Molecular Biology (CEMB) at University of the Punjab and Four Brothers (Pvt) Ltd is conducted, to develop Transgenic Cotton technology, which was first of its kind in Pakistan. Qualitative data was obtained through semi-structured interviews from a sample of 13 respondents. Thematic analysis was used after transcribing and importing data to NVivo 12 plus. The study revealed the type of resources, interactions and value or outcome sought that characterized the successful co-creation. It also highlights the challenges faced during the collaborative project. Finally, the recommendations are proposed for the enhancement of co-creation within the context of industry and public university of Pakistan.

Keywords: co-creation, university-industry collaboration, value, service-dominant-logic

Introduction

In today's era of globalized economy, keeping in view the rapidly changing needs of people and industries are under constant pressure for introducing innovative products and new technological developments (Santoro & Chakrabarti, 2002; Monreal-Perez et al., 2012). The reasons attributed for continual effort of Higher Educational Institutes (HEIs) to find novel ways of funds generation are; lean funds generated from students' fees, intense competition in obtaining funds in the form of research grants for collaborative projects and attrition in support funds from the government (Marzo-Navarro et al., 2008). To cope with the challenges of the modern era of global competitiveness, co-creation between university and the

* Corresponding Author: farvasaeed@bzu.edu.pk

industrial sector has received significant attention by governments and policy makers owing to its importance in socio-economic development of a country. Practitioners, policy makers and scholars have emphasized on the critical role of research commercialization and knowledge transfer through the process of co-creation.

Literature defines Co-creation as the phenomenon to solve a shared problem or a task which in turn, creates value for the co-creating partners through constructive exchange of competences, resources, ideas and knowledge by public and private actors. (Torfing et al., 2019; Kristensson et al., 2008). At the heart of this model is the Service-Dominant Logic (SDL) which signifies customer as the active participant in the process of value creation and the associated service. (Payne et al., 2008; Vargo & Lusch, 2004). SDL connotes the customer acting as the potential resource pitching into the value co-creation thereby adding to the conventional types of resources contributed by the firms such as finances and infrastructure etc.

Now the question arises whether the industrial sector and public sector universities of Pakistan have the capacity and the resources to collaborate with each other? To answer this, following research questions guided the study: 1) How the value co-creation occurs taking into account its elements (resources, interactions, value) in university-industry collaborations in Pakistan? 2) Are the collaborating partners satisfied with the value propositions received? 3)what factors impede the co-creation process? and 4) how co-creation between public universities and industrial sector can be improved in Pakistan? In order to come up with the understanding of the U-I co-creation, it is important to have an in-depth understanding of the very nature of Co-Creation.

Prior studies offered insights into the dialogic relationship between co-creating partners (Payne et al., 2008; Diaz-Mendez & Gummensson, 2012; Canhoto et al., 2016) however, the detailed case study comprising of university-industry value co-creation in the context of Pakistan was still deficient. Therefore, the aim of this paper was to explore the building blocks of co-creation, highlighting the hurdles in creating value for the public sector university and industry both and the possible solutions recommended by the co-creating partners to improve the prospect of co-creation in Pakistan.

This paper will contribute theoretically and practically to the concept of co-creation. Theoretically it would develop understanding of the concept with service dominant logic perspective involving different sectors within a network acting in an interactive process of exchange. The applied contribution of this paper would be the recommendations made by the study participants about the smooth and efficient management of co-creation at the university-industry interface level

specifically public sector universities. This study extends previous research by providing a case study approach to value co-creation.

Literature Review

Co-Creation

The nature of value co-creation should be broadly understood in a value-creating system where different actors- suppliers, customers, business partners work together to co-create value (Saarijarvi et al., 2013). Originally introduced in the private sector (Torfing et al., 2019; Vargo & Lusch, 2006), the notion of co-creation likewise became relevant to the public sector with an emphasis on maximizing satisfaction with the service (Torfing et al., 2019).

Currently, co-creation is articulated as a term that requires organizations to work across institutional boundaries that separate the public and private sectors to utilize the resources and expertise of users, civil society and private firms (Osborne, 2006). It assumes that it would benefit all the relevant partners if they are engaged in the development stage (Hilton & Hughes, 2013). The co-creation process emphasizes the social interaction and relationship between firms and users and it has been occurring for quite some time to address problems of business and industries (Nonaka & Takeuchi, 1995; Ramaswany & Ozcan, 2014).

The concept of value co-creation emanated from Service Dominant Logic (SDL). Vargo et al. (2008) defined co-creation as an integration of resources of various service systems under certain circumstances that will benefit all parties involved in the process.

The building blocks of the Value Co-Creation

According to the SDL literature, co-creation is based on three building blocks of interactions, integration of resources and exchange or the outcome sought between actors (Okdinawati et al., 2017; Perks, et al., 2012; Prahalad & Ramaswamy, 2004). In co-creation, the resources include physical resources (Dollinger, 2018) as well as intangible resources (i.e. information opinion, ideas, experiences etc.) (Breidbach & Maglio, 2016). However, mere acknowledging resources of consumers is not enough to benefit. For co-creation to happen, resources need to have active and supportive processes and environment for integration because the resources itself have no intrinsic value. (Payne et al., 2016). SDL literature coined the terms such as operant and operand to differentiate between the types of resources and explained that operand resources are those which are static and tangible such as goods and money; operant resources are the "underlying source of value and include those resources that act on other resources to create value" such as knowledge, skills etc (Vargo & Akaka, 2009). In the value co-creation process, all stakeholders i.e., the firm, supplier and customer constitute

operant and operand resources required for integration. These are provided not only by the client but also by the customer (Edvardsson et al., 2011; Agarwal & Rahman, 2015). One of the premises of the service dominant logic suggest that value is co-created by multiple actors but it always includes the customer who is the beneficiary of the value being created. In the context of university-industry value co-creation, the beneficiaries would be the university and industry both; as they are the actors and co-creators of value. Moreover, both the customer and organization are considered to be living in neighboring communities. This proximity between customer and organization results in developing interpersonal relationships and social structure developments. The growth of this relationship is based on sharing resources and their exchange between the resource integrators (Agarwal & Rahman, 2015, p. 153).

Another premise of SDL relates to how different individuals or firms (i.e., service systems) interact (Vargo & Lusch, 2008) to create value. In terms of SDL, the networks of service systems are known as resource integrators. The Service-Dominant Logic literature suggests a series of interactions to create value (Gronroos & Ravald, 2011) between co-creating parties. The provision of a platform for interaction to share experiences, priorities, and problems dramatically increases the stakeholders' engagement. Stakeholders can be engaged with each other via online communities or through physical engagement i.e., joint collaboration spaces (Vernette & Kidar, 2013). Companies can also interact through internet-based information systems, which facilitate the creation of formal, long standing collaborations (Ngugi et al., 2010).

Interactions involve various departments and can take place through direct mailing, invoicing, telephone calls, meeting at a trade fair (Payne et al., 2008) etc., to produce value propositions. The management of interaction leads toward value creation.

Literature of different fields define 'Value' differently. Kortge & Okonkwo (1993) defined value as a subjective concept. Vargo and Lusch (2006) emphasized that "the experiential component of the product is essential for its actual value to be realized" (Vargo and Lusch, 2006). It depicts that for realizing the product's actual value, the customer engagement and customer experience during the consumption process is very necessary. Under SDL, the co-creation of value evaluates the qualitative value outcomes (Vargo & Lusch, 2004). Value or the benefits sought by university and industry may be studied not only at the institutional and individual level but also at the societal level i.e., ecosystem (Canhoto et al., 2016). Thus, Service-Dominant Logic (SDL) suggests that creation and consumption of value are not separate, but one continuous whole. Instead of being the recipient of final output, consumers are involved in the whole of value creation process.

Skute et al., (2017) defined university-industry collaborations as the partnerships between academic or research institutions and industries or firms focused on research and development activities. Intense competition for revenues faced by the Higher Education Commission of Pakistan has shifted the landscape of higher education sector from teaching institutes into 'academic entrepreneurs' (Bozeman et al., 2016). Literature identified following reasons for industrial partners to collaborate with universities: to develop cutting edge capabilities to solve complex industrial problems; to generate ideas and feasibility assessment through exploratory research for new product development, technological options and new market and to access qualified graduates specially engineers (Freitas & Verspagen, 2017; Balconi & Laboranti, 2006; Lam, 2005; Carayol, 2003).

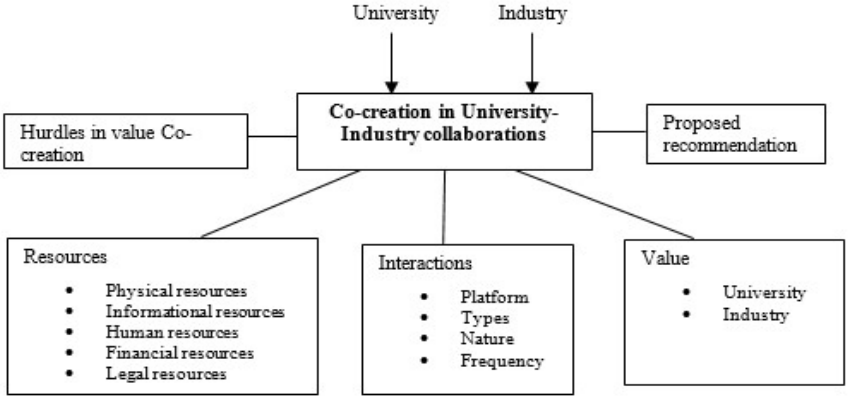
In the light of of highlighted literature, a conceptual framework has been developed by merging various concepts related to co-creation. Objective of the conceptual framework is to explain the process of co-creation in the context of Pakistan. It aims at presenting the elements of co-creation involved in the process and to identify indicators related to benefits and barriers to attain a holistic understanding of the occurrence of this phenomenon in Pakistan. For this study, the inception of the conceptual framework is the emphasis of Service-Dominant Logic on the process (Vargo & Lusch, 2004). This point leads the study to draw attention to the details regarding key resources, their integration through interactions to deliver an outcome or value sought by the co-creating parties (Okdinawati et al., 2017; Vargo & Lusch, 2008). For a successful collaboration, a team of highly committed individuals is required with operant resources like skills, expertise and knowledge (Vargo & Lusch, 2004), which when applied to the operand resources creates value for the co-creating partners. For this study, the university and industry are the main stakeholders co-creating value for each other reciprocally. In the co-creation process, the interaction between stakeholders is an important constituent element. Following Ramaswamy and Gouillart (2010) a successful co-creation process requires all stakeholders must be able to interact directly with one another; provision of platform for interaction to share experiences, priorities. Also problems must be there as it increases the stakeholders' engagement; Online communities or physical engagement i.e., joint collaboration spaces (Vernette & Hamdi-Kidar, 2013) must be used by the co-creating parties. Interactions can also be made through internet-based information systems which facilitate in creation of formal, long standing collaborations (Ngugi et al., 2010). The extensive dialogues and interactions result in improving the value propositions (Gronroos, 2008; Payne et al., 2008).

The overall framework for this paper derived from the review of literature is depicted in Figure 1. As shown in the conceptual model, the benefits in the form of value offerings will indicate how the co-creation activity provided solutions to the problems faced by the co-creating partners. This model also helps to identify

possible barriers encountered by the stakeholders while co-creating. Following this will help study to form policy recommendations for stakeholders and policy makers.

Figure 1

Framework for University-industry Co-creation



Methodology

Taking into account the research question, the current study aims deeper understanding of the nature of co-creation between university and industry, the resources used for creating value and the perceptions of the study participants about the challenges that impedes the co-creation process. The study has adopted Social Constructivism approach that falls under Qualitative mode of inquiry. (Cresswell, 2013). Social constructivist approach lies within the interpretivist paradigm (Mackanzie & Knipe, 2006). Constructivists believe that there are multiple realities that are socially constructed. Social constructivists also seek to understand and address the social and cultural context under which the participants work or live. Co-creation is relatively new phenomenon, therefore rather than beginning with a theory (i.e. Deduction), It was more suitable to build a theory (i.e. induction) through comprehending various aspects of co-creation socially constructed by the participants from the population comprising of public university and industry. This study adopted case study method with the motive 'to arrive at broad generalizations based on case study evidence without presenting individual case studies separately' (Yin, 2009, p. 20). In addition, case study design was appropriate because study answers 'how' and 'why' questions which are preferably exploratory.

For this study single case study design was used. For case selection, in-depth review of literature (both empirical and theoretical) was undertaken to justify the

choice of case. The case study selection was modified due to limited availability of HEIs in the public sector working with the industry. The university of the Punjab was chosen due to its pioneering status in adoption of the modern concept of co-creation with the industrial sector and its great contribution in this regard. The study participants mainly included academicians and administrative staff of the University of the Punjab (PU) who not only had the practical knowledge but also had a major role in co-creating value with the industrial partner. Whereas from the industrial side, the industrial representatives from Four Brothers (Pvt) Ltd working at various managerial and technical positions were included so that the real picture of the phenomenon could be achieved. To achieve data triangulation, data was collected from different departments of the same university and different managerial levels of the industry included in the study. Purposive sampling was used as the study required in-depth insight from the informed participants to address the research question. For data collection, total of 13 participants were selected. Out of this, 10 participants were from the PU, 3 participants were from the partner industry. Few respondents were also selected from those departments of university which were actively working with the industry on various projects. Detail of the interviewees is given in Table 1.

Table 1

List of Interview Respondents

University departments	No of respondents from university	Designation	Name of Industrial partner	Position of Industrial representative	No of respondents from industry
Centre of Excellence of Molecular Biology (CEMB)	8	Director Associate Professor In-charge bio-technology laboratory Field supervisor Principal Investigator Research team.	Four Brothers (Pvt.) Ltd.	Director, External Linkages, General Manager R&D, Chief scientist,	3
Office of Research, Innovation & Commercialization (ORIC)	2	Director Assistant Director			

Following Yin (2009), a case study protocol was developed before starting the data collection. In order to gain deeper understanding of the phenomenon, semi-structured interviews and documentary evidence were used as primary data collection methods. To prepare interview guide, Funnel approach (Roller & Lavrakas, 2015) was adopted. Funnel approach is a four-stage approach beginning with broader questions and progressively narrowing down to probing questions.

Data was collected in two stages. During the first stage, interviews in public sector university were conducted to explore the nature of co-creation with the industrial sector, possible barriers and suggestions for improvement. The second stage comprised of interviews with the industrial representatives to explore their views regarding the nature and dimensions of co-creation, challenges faced by the industrial partner and possible solutions to address these challenges.

Data was analyzed after each stage and relevant documents were also collected for further analysis. These documents were obtained from the organization itself as well as through internet sources. To ensure validity, the documents obtained through internet search were triangulated during interviews with the respondents. Documents from PU included Memorandum of Understanding (MoUs) with the industry, contractual agreement, articles and news clippings related to university-industry collaborative projects, annual progress reports and project reports. Industrial documents included annual reports, brochures, records related to legal agreements with the university, project report etc. Initial interviews with key participants validated the case selection for further interviews in sample university. Tape recorder was used for recording the views of respondents accurately and to increase data reliability. Interviews were about 60-80 minutes long.

Data Analysis

The interviews were transcribed and were saved on a hard drive. To ensure transparency of the analysis process, NVivo 12 plus was used as a suitable computer assisted qualitative data analysis software package (CAQDAS). The interview notes and transcripts were analyzed using Braun and Clarke's (2015) method of thematic analysis.

Following Saldana (2021) and Bazeley (2021), the interview transcript was coded and later recoded after coding the second transcript. The purpose of this comparison of transcripts was to maximize the variety in expression and concept (Bazeley, 2021). During first cycle of coding, In Vivo coding was used.

Within open coding, in vivo coding was used because it emphasizes on respondent's voices, the use of exact words of respondents contribute to richness of data (Saldana, 2021) and portrays imagery and symbols used by the respondents. In vivo coding not only helped in identifying themes but also identified possible categories (Strauss, 1987, p. 160).

Second cycle coding was done to reorganize and reanalyze first cycle codes into meaningful categories and themes (Saldana, 2021). Focused coding method was used to create final set of themes and categories. The categories were grouped to create themes. Focused coding helped in comparing codes developed during second cycle and these newly constructed codes were compared and transferred on all participant's data.

Table 2 highlights an example of coding process adopted in this study. The number of actual codes and categories emerged depict the theme of 'barriers in university-industry co-creation in the Public sector, and were far more but for the sake of example only two categories are exhibited here:

Table 2

Example of coding process

Theme	Categories	Codes
Barriers in University-Industry Co-Creation	Bureaucratic hurdles	Delays in funds
		Administrative delays
		Obsolete policies
		Procedural delays
		Procedural delays
		Lengthy billing system
		Tedious approval process

Context of University of the Punjab (PU)

The University of the Punjab, a public sector research institute was established in 1882 in Lahore. This university holds the honor of having two Nobel laureates. According to QS world rankings by subject, the university ranks 251-300 in agriculture and in Chemistry it ranks 501-550. In Asia, it is ranked at 193. The university comprise of 19 faculties and 137 departments. It has 5 campuses in different cities of Punjab. The University of Punjab has one of the oldest libraries with a collection of around 30000 manuscripts and an e-library with 16 databases.

Table 3 summarizes the research and collaborative efforts undertaken by the university of the Punjab over the years.

Table 3

Research and Collaboration in University of the Punjab

Total number of projects	309
Number of Publications (from 2008 till 2019)	12,657
Number of patents registered	12
University-industry collaborative projects	58

The Co-creation between CEMB-PU and Four Brothers (Pvt) Ltd to develop Transgenic Cotton technology in Pakistan.

For this study, the co-creation project between Centre of Excellence in Molecular Biology (CEMB) at University of Punjab and Four Brothers (Pvt) Ltd was chosen. The project collaboration took place in 2012 worth of 20 million to develop Transgenic Cotton Technology in Pakistan.

After USA, China and India, Pakistan is the fourth largest grower of cotton. Pakistan is also the third largest consumer as well as the exporter of cotton. This contributes about 10% of the Agricultural GDP. Yet variety of factors contribute to the losses in cotton yield such as insects, pesticides, weeds etc. To counter these losses in the yield, scientists at Centre of Excellence in Molecular Biology genetically modified the cotton gene into triple gene cotton which was highly resistant to worms and also cost effective. It is favorable for harsh weather of Pakistan. It was found that it can save 18000 Rs / Acre in cost of cotton production for local farmers.

Four Brothers (Pvt) Ltd is a cotton-based industry. It is one of the pioneers in Pakistan from the private sector to offer genetically modified BT cotton which they developed along with Centre of Excellence in Molecular Biology (CEMB). There are instances where Four Brothers (Pvt) Ltd has also collaborated with CEMB on other projects like investments in research and purchasing the finished products. CEMB being the pioneer in introducing transgenic seeds technology in Pakistan collaborated with Four Brothers (Pvt) Ltd for the multiplication. The commercialization of technology it was patented in 2016 with patent number 142243.

The respondents at CEMB claimed that their institute was self-sufficient in developing transgenic technology by itself after China and USA. The private sector seed industries did not have the expertise and technology especially at the

molecular level to develop the transgenic gene. The labs in the industrial sector were found to be capable of acquiring the prototype or technology from the research university and getting the rights to multiply it for the commercial purposes.

The following excerpt from university respondent corroborated the claim, *"Our technology is far better than others because we claim that we can develop the cotton variety in one year and a half but others can do that in 3-4 years so if we compare ourselves with others, we are competing them"*

The industrial respondent explained the reason behind co-creation with the university in these words, *"We have set up our own lab in collaboration with CEMB to fulfill our basic needs but for new technology development, we have to look at the university. After developing cotton gene prototype with CEMB-PU, we got the rights from its parent institute. After test and trial in our farms, we multiplied the gene in the industry. We are giving royalty to the university for using their product. We also give them non-refundable amount for developing a product for us as it requires constant research and modification".*

Before initiating and signing the contract for co-creation, the university partner had certain criteria which was to be fulfilled by the industry. It included industrial Infrastructure, trained manpower to handle the product, amount of land to be made available with the industry to produce the product, industrial capital etc. After it was verified that the industry fulfilled the above-mentioned criteria of university for collaboration, then an agreement was signed between the two parties.

Resources

The formation of transgenic cotton required lots of costly resources for which contribution of both sides was required. For instance, for this particular case, raw materials like chemicals, cotton seeds, hybrid seeds were provided by CEMB.

Physical Resources

CEMB also provided many types of molecular biological equipment starting from the pipets, PCR machines, gel documentation, gel running apparatus, infrared gas analyzer, sequencer, real-time & digital PCR machines, gloves, consumable plastic etc.

The industrial partner provided CEMB with their resources like land, infrastructure, fertilizers, water, time of taking data, seed harvesting, the verification, the trials, packaging and making the product ready for the end user.

Informational Resources

The data resource in the form of information about variety was also provided by the industrial partner. After getting the feedback from the end users, in this case

the farmers, it was conveyed to the university research team which helped in further enhancing the product functioning.

Human Resources

The industrial partner multiplied the product at its own labs and marketed it to the end user, who in this case was the farmer. The skilled human resource was involved from the beginning to end of the collaboration. For instance, human resources provided by CEMB were principal investigator, chief scientists, assistants, lab technicians etc. The industrial partner provided industrial scientists, farmers, trained manpower to handle the product, sales team as the human resource. The university partner explained the reason behind successful collaboration in the following excerpt: *"Our industrial partner 4 brothers have an innovative approach. They have set up a lab in collaboration with us. They know the technicalities. Therefore, these skills have helped both of us in a successful collaboration".*

Financial Resources

Generally, in Pakistan there are funding agencies like HEC, Punjab Agriculture Research Board (PARB), Pakistan Science Foundation (PSF) etc. for industrial projects. But specifically for this case, the industrial partner provided the capital for research and development. Additionally, funding was also provided by Four Brothers (Pvt) Ltd and Punjab Agriculture Research Board (PARB) for this project.

Legal Resources

Licensing agreement was signed between the collaborating partners for commercialization of the final product which was registered with the Intellectual Property Organization (IPO)of Pakistan.

Interaction

As both sectors had a different work approach therefore, the place of work was different. As the respondents at CEMB were working at the molecular level hence, they were the breeders who generated the idea whereas the industrial partner working in the field were the multipliers of the product.

Mode of Interaction

The co-creating partners employed both physical mode like face-to-face and online mode of interaction like telephonic conversation, WhatsApp, internet etc. to solve problems and queries that arose during the project.

Frequency of Interaction

According to the respondents, initially the interactions took place on weekly basis. The industrial partner helped by providing their feedback regarding problems faced while using the product and suggestions for further improvements.

Nature of Interaction

During initial interactions the industrial partner contacted Head of the institution to get the know-how regarding the technology. Discussions regarding Product development, its characteristics, its quality, its approval process and overall benefit to the society were made. Once the product was developed, discussions were made regarding problems in approval of patents and their possible solutions.

The following excerpt from CEMB respondent explains the nature of Interactions, *"We interact with their scientists involved in research, their industrial heads, breeding expert. Breeding expert discuss characteristics, shape of the plant. Entomologist discusses the killing of insects. Agronomist interact regarding fertilizers, pesticides, land preparation etc. then comes the marketing experts who interact to discuss about season and timing to market the product"*.

Discussing the challenges faced during interaction, initially, the industrial partner relied on its academic partner for technological input and emotional input both. Industrial partner was expert of multiplying the product but little did they know about the technical aspects like how it worked etc. As one of the industrial respondents highlighted "… *sometimes when the temperature is very high and the expression of gene is low also if there is insect infestation and if the product is not working properly…"* In such situations, the industrial partner needed university scientists for solution.

Industrial partner invested in their farms by growing the cotton seeds. The university scientists visited these industrial farms to check the growth progress of its crops, verified its gene, quantified them, and helped them pass through approval of Biosafety Commission of Pakistan. Timelines were strictly followed during the project.

After the product was multiplied at the industrial facility, the industrial partner along with the university experts commercialized the product. For that purpose, industrial partner required university researchers to satisfy their customers. Therefore, co-creation continued from the beginning till the product reached the hands of end users.

Value

For university partner i.e., CEMB the main value received out of this collaboration was the mass production of the product and its commercialization. Although they also anticipated value in terms of financial outcome like royalty received after the product was commercialized by the Industrial partner. The respondent from CEMB pointed out, *"We expect our industrial partner to market our product and to deliver it to the end user. When the government approves our product for commercialization then we can get the royalty. University can earn millions of rupees' revenue if the government let us commercialize it at the national level".*

The value received by the Industrial partner was gaining Intellectual Property (IP) rights of the product and its multiplication. They also expect the university partner to assist them pass through product approval from government departments like Biosafety Commission etc and technical support while selling the product.

The respondents were inquired about value satisfaction which was positively responded by all the stakeholders. It is important to mention here that in the context of value satisfaction, Four Brothers (Pvt) Ltd previously adopted double gene technology from CEMB-PU, after successfully commercializing, they adopted triple gene technology from the same university. The respondent from Four Brothers (Pvt) Ltd remarked, *"Up till now we have collaborated on 3 products from CEMB and both the partners have achieved our goals. Both of us have benefited from this collaboration."*

It was mentioned by the university respondents that the biggest benefit of working with the industry was the training of their students. Four Brothers (Pvt) Ltd have got one of the biggest cotton transformation plants. Production of transgenic cotton seeds had saved foreign exchange due to reduction in cotton import. Therefore, this collaboration has served the community at large.

Factors Impeding the Co-creation

Resource Constraints

It was found that university-industry co-creation in public sector universities suffered mainly because of resource constraints. Poor infrastructure and lack of financial resources were also among the prominent constraints faced during the particular project. As a professor from CEMB commented, *"We had to use land owned by our industrial partner for product testing in areas like Multan, Vehari and Bahawalpur but we are unable to develop a farm due to financial constraints. Once we develop the land then we can ask industries to come and visit our product yield. We cooperate with industry in developing their labs but industry give peanuts in return if we ask for funds to develop our land"*

University respondents mentioned that they were facing the shortage of human resources. An Associate professor from CEMB attributed absence of government interest as the reason behind shortage of skilled manpower needed for these collaborations. It was also highlighted by respondent that due to lack of state-of-the-art infrastructure; the public university was unable to catch the pace of co-creation activities like its private counterparts. He mentioned, *"We need more labs and more manpower for testing. Government should take interest".*

While explaining the reasons for the public sector universities lagging behind academia-industry linkages, the respondent from ORIC at PU argued, *"The universities need to improve its manpower in numbers, universities should provide the faculty with manpower which can help them to develop, and repair and maintenance of the product. Obviously for the bigger tasks we will go to the industry but for menial tasks university must have the resources to deal with."* The university authorities were found dependent upon HEC and the government for funds. The funding received was clearly not fulfilling the needs of such collaborations.

Lack of Government Support & Policy Issues

The instability in the government policies related to university-industry co-creation activities was found to be another hurdle. The new technologies and novel procedures called for new and flexible policies. Previously many collaborative projects had been halted due to absence of rules and regulations. The absence of key departments providing services regarding product testing were also found to hamper the collaborative project. The respondent argued that non-existence of registered labs was a major cause of concern for both partners. For instance, there were no registered labs for testing GMO food etc. Same was the case with absence of policies for locally manufactured major products. For instance, it was found that there were rules for soya beans imported from abroad but no rules existed if the same product was produced locally. These policy issues hampered the co-creation between the two sectors in general. Following excerpt from university respondent highlights this issue, *"We developed transgenic cotton in 2003 because it was done for the very first time in Pakistan, further procedures were difficult, and there were no rules of national board of commercialization (NBC) related to that so it took us 10 to 12 years more in guiding and making ready its first lines. Similarly, an MNC was working with us for 2 to 3 years for GMO testing. It was a project worth 18 lacs we used to meet after 2 to 3 months then the policy was devised which totally banned the GMO testing in Pakistan so we had to end up the project."*

It was stressed that continued negligence of higher authorities in devising policies would severely affect the collaborative activities of the two sectors.

Slow pace of work

The ways industries operate were found different from the universities' way of doing the things. Industry followed purely business oriented approach as its survival was found to be based on its profitability by the end of the financial year. The industry was inclined towards risk aversion and minimizing cost. The fast pace of work was another attribute of industry. The industrial respondent remarked, *"At times we faced delays in a project mainly because researchers are busy in their academic duties but otherwise there is no such problem. In some universities, teachers are not spared for research. They are kept busy in routine teaching, doing additional duties etc. For research you need dedication. Universities must give its faculty the liberty and time to work with the industrial sector".*

The above excerpt reveals that projects were delayed due to other commitments of the university research team like conducting exams, result submissions, assignments submissions, going on semester break etc. The developmental delays can be attributed to misalignment of goals. Explaining the reasons behind slow pace of work by university, one of the faculty members remarked, *"I think hurdles by design do exist everyway e.g., pace of development from university is necessarily slow than a commercial entity. A commercial entity timeline is more rushed because their goals are different. I think to align these goals was the challenge. Mostly university professors have not worked in industry so their understanding of commercial timelines are not accurate"*

Complexity in procedures

Due to longer chain of command, time taken by public universities in paperwork and decision making was highlighted by the industrial respondents as the factor hampering co-creation process. Initiating these projects required a lot of paperwork. Following excerpt from Four Brothers (Pvt) Ltd explains the phenomenon, *"We are facing intense competition specially from MNCs working in Pakistan e.g., Moncento, Sygenta, Pioneer etc. We can't afford delays in our R&D projects. Nowhere in the world an industry can run without university but the universities need to expedite their legal and administrative process for Agreements".*It was remarked by industrial partner that functioning and decision making were usually quick in private firms. In government sector there were found other long and laborious unproductive routines that the industrial partner had to follow instead of spending time on research and innovation. A lot of signatures and paperwork was required to release the funds.

The industrial respondents commented that it was an uphill task to get the project approved from the government departments specially when the product reached commercialization stage. These lengthy legal and administrative processes to approve product in turn, discourage collaborations.

Bureaucratic Hurdles

It was argued that industries collaborating with universities have to be ready for long and tiring approval process. Challenges related to registrations in government departments e.g., FBR, NBC etc. were there. A respondent from Four Brothers commented, *"We faced hurdle particularly dealing with government departments. I don't know these departments come under jurisdiction of HEC or not, dealing with government departments has really been a challenge".*

Bureaucracy in public universities was also found to be another major hurdle for industrial partner as it was following age-old policies instead of adopting innovative and speedy computerized systems and procedures.

Recommendations

Following recommendations were proposed by the respondents.

- The public universities need to expedite purchasing process of raw materials and equipment needed for manufacturing and designing the product. To accomplish this, the university must introduce a computerized system for procurements to save time and energy. The product approval process is also exhausting. Government should introduce one window operation to simplify the product approval process.
- University often relies on industry for provision of chemicals, regents and other necessary items required for research. The raw material required are usually costly as they are imported in Pakistan from other countries. Fewer industrial options are available for the university. Therefore, active involvement of industry along with government support by incentivizing industries working with the universities is needed.
- Due to limited exposure to research and development occurring in the developed countries, the innovativeness in public universities is lagging. To overcome this hurdle, the university must encourage its researchers, faculty and students to attend international forums and meetings to get an idea about innovative trends in their respective fields.
- Currently, ORIC is just doing its job limited to communicating to faculty about research grant openings like Technology Development Fund (TDF) and Grand Challenge Fund (GCF) etc. However, more effective and dynamic role of ORIC is expected in bringing the industry closer to university.
- Government can also enhance the procedures of commercialization for local universities. The universities can earn millions of rupee revenue if the government subsidize the commercialization of innovative product locally.
- HEC must allocate funds for building state-of-the art laboratories and supportive infrastructure in public universities.

- The public universities must cut through the red tapes. University bureaucracy must prioritize its faculty.
- The legal framework for university-industry collaborations must be implemented strongly. Strict accountability must be taken in case of violations.
- University researchers should have the option to work with any industrial partner and to take research grants from anywhere they want. They must be allowed to design and manufacture according to the requirements of their industrial customers.

Discussion

This paper investigates the case of Co-creation of value proposition occurring between the industrial firm and the public sector university in Pakistan. The basic elements of co-creation process like resources, interaction and outcome sought were studied under SDL lens. The findings of this study shed light on the types of resources, interactions and value outcomes that characterize a successful research and development (R&D) collaborations. This study found that for co-creation, both operand and operant resources were used for integration and both partners participated in provision of resources (Agarwal & Rahman, 2015; Edvardsson et al., 2011). Skills and knowledge being the operant resources were found to be the fundamental sources of competitive advantage. This study also found that as the individuals from two different sectors came together to co-create value therefore each actor required strong communication and social skills and capability of exhibiting balanced attitude and behavior. It is important to elaborate here that as the case project required research and innovation therefore the skills, expertise, knowledge and experience of human resource from both parties were found equally important. The researchers from university were expert in lab work and technical aspects such as running PCR machines, gel apparatus, handling Pipets etc whereas the skilled labors and engineers from industry were competent in constructing instrument design on industrial scale . Therefore, activities such as cutting, welding, slitting, winding, coating etc were performed by the industrial workers, technicians and laborers. The field experience of industrial partner was also an important resource.

The phenomenon of 'trust deficit' between co-creating partners was found but surprisingly the intensity of trust deficit was found high between the university and the government departments as compared to the trust deficit between university and the industrial partner.

The university and industrial respondents mentioned that in order to have more exchange, the service systems (in this case, university & Industry) needed to be well connected. In line with the previous literature, to develop such kind of collaborative relationship built on sharing and exchange, it was emphasized by the industrial partner that geographical proximity was necessary (Huikkola et al.,

2013; Bozeman et al., 2016; Siegel et al., 2003). For successfully creating the value, the interactions between the collaborating partners were made by using both online and physical platforms. Initially, the frequency of interaction was found to be high i.e on weekly basis. After the paperwork related to signing Memorandum of Understanding (MoU) and then Memorandum of Agreement (MoA) detailing the course of the project and its timeframe were done, the communication was made effective by quarterly sharing the progress report, feedback report and suggestions for improvement. It was found that university provided customized services to its industrial partner in order to fulfill their requirements and varying needs as well as to maximize the satisfaction with the value received. Both university and industrial partners were readily able to identify and articulate about the value or the outcomes derived from co-creation

Mass manufacturing and students' training in industrial setting were the major benefits sought from these collaborations. Intellectual Property (IP) rights and product multiplications were identified by the industrial partner as the value or the major benefits sought from these collaborations. Certain barriers that were identified by the industrial respondents were found to be related to complexities in procedures and the slow pace of development by the university. Whereas, the university respondents highlighted bureaucratic hurdles and lack of government support along with the financial constraints as the major barriers.

Therefore, this study has verified the characteristics of co-creation in university-industry settings under the light of service dominant logic, along with the possible barriers as perceived by the co-creating partners in order to create a thorough picture of the nature of co-creation in the context of university and industry in Pakistan. Additionally, the study also helped in highlighting the possible solutions to the hurdles encountered by the co-creating partners.

Limitations and future research directions

Various factors have contributed to limit the scope of the study. The limited time for the study (November 2020- February 2021) and also due to pandemic Covid 19, only one university from the public sector could be studied. Additionally, the industrial representatives were reluctant to reveal such details as the financial resources put into the project, the financial benefits derived from the project and the returns from commercialization mainly due to the terms of the agreement.

Future research can be carried out with a quantitative approach to add empirical evidence to the study. Future researchers may want to apply the framework in the context of university-industry collaborations by comparing public and private universities in Pakistan.

Conclusion

This study attempted to validate the concept of co-creation empirically. The thematic analysis provided an understanding of the factors hampering the co-creation between a public university and its industrial partner. The proposed framework provided a detailed account of the resources used by the collaborating partners, interactions made and the value produced during the co-creation project. Furthermore, this case study helped to identify possible solutions to the problems occurring during co-creation.

References

Agrawal A., & Rahman, Z. (2015). Roles and resource contributions of customers in value co-creation. *International Strategic Management Review*, *3*(1-2), 144-160. https://doi.org/10.1016/j.ism.2015.03.001

Balconi, M., & Laboranti, A. (2006). University–Industry interactions in applied research: The case of microelectronics. *Research Policy*, *35*(10), 1616-1630. https://doi.org/10.1016/j.respol.2006.09.018

Bazeley, P. (2021). Qualitative data analysis: Practical strategies (2nd ed.). Sage Publications.

Bozeman, B., Gaughan, M., Youtie, J., Slade, C. P., & Rimes, H. (2016). Research collaboration experiences, good and bad: Dispatches from the front lines. *Science and Public Policy*, *43*(2), 226-244. https://doi. org/10. 1093/scipol/scv035

Breidbach, C. F., & Maglio, P. P. (2016). Technology-Enabled value co-creation: An empirical analysis of actors, resources, and practices. *Industrial Marketing Management*, *56*, 73-85. https://doi.org/10.1016/j.indmarman.2016.03.011

Canhoto, A.I., Quinton S., Jackson P., & Dibb, S. (2016). The co-production of value in digital, university-industry R&D collaborative projects. *Industrial Marketing Management*, 56, 86-96. http://dx.doi. org/ 10.1016/j.indmarman.2016.03.010

Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic Analysis. In J. Smith (Ed.), *Qualitative psychology: a practical guide to research* methods (3rd ed. pp. 222–248). Sage

Carayol, N. (2003). Objectives, agreements and matching in science-industry collaborations: Reassembling the pieces of the puzzle. *Research Policy*, *32*(6), 887-908. https://doi.org/10.1016/S0048-7333(02)00108-7

Creswell, J. W. (2013*). Qualitative inquiry and research design: Choosing among five approaches*. Sage.

Diaz-Mendez, M., & Gummesson, E. (2012). Value co-creation and university teaching quality: Consequences for the European Higher Education Area (EHEA). *Journal of Service Management*, *23*(4), 571–592. https://doi.org/10.1108/09564231211260422

Dollinger, M., Lodge, J., & Coates, H. (2018). Co-creation in higher education: Towards a conceptual model. *Journal of Marketing for Higher Education*, *28*(2), 210-231. https://doi.org/10.1080/08841241.2018.1466756

Edvardsson, B., Tronvoll, B., & Gruber, T. (2011). Expanding understanding of service exchange and value co-creation: A social construction approach. *Journal of the Academy of Marketing Science*, *39*(2), 327–339. https://doi.org/10.1007/s11747-010-0200-y

Freitas, I., & Verspagen, B. (2017). The motivations, institutions and organization of university-industry collaborations in the Netherlands. *Journal of Evolutionary Economics*, *27* (3), 379-412. https://doi.org/10.1007/s00191-017-0495-7

Grönroos, C. (2008). Service logic revisited: Who creates value? and who co-creates? *European Business Review*, *20*(4), 298-314. https://doi.org/10.1108/09555340810886585

Grönroos, C., & Ravald, A. (2011). Service as business logic: Implications for value creation and marketing. *Journal of Service Management*, *22*(1), 5-22. https://doi.org/10.1108/09564231111106893

Hilton, T., & Hughes, T. (2013). Co-production and self-service: The application of Service-Dominant Logic. *Journal of Marketing Management*, *29*(7-8), 861-881. https://doi.org/10.1080/0267257X.2012.729071

Huikkola, T., Ylimäki, J., & Kohtamäki, M. (2013). Joint learning in R&D collaborations and the facilitating relational practices. *Industrial Marketing Management*, *42*(7)-1180. https://doi.org/10.1016/j.indmarman.2013.07.002

Kortge, G. D., & Okonkwo, P. A. (1993). Perceived value approach to pricing. *Industrial Marketing Management*, *22*(2), 133-140. https://doi.org/10.1016/0019-8501(93)90039-A

Kristensson, P., Matthing, J., & Johansson, N. (2008). Key strategies for the successful involvement of customers in the co-creation of new technology-based services. *International Journal of Service Industry Management*, *19*(4), 474-491. https://doi.org/10.1108/09564230810891914

Lam, A. (2005). Organizational innovation. In J. Fagerberg, D. C. Mowery, & R. R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 115-147). Oxford University Press.

Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research*, *16*(2), 193-205.

Marzo-Navarro, M., Pedraja-Iglesias, M., & Rivera-Torres, P. (2008). Determinants of the satisfaction of firms with the competencies of university students: A Spanish case study. *International Journal of Training and Development*, *12*(4), 282-292. https://doi.org/10.1111/j.1468-2419.2008.00306.x

Monreal-Perez, J., Aragon-Sanchez, A., & Sanchez-Marin, G. (2012). A longitudinal study of the relationship between export activity and innovation in the Spanish firms: The moderating role of productivity. *International Business Review*, *21*(3), 862-77. https://doi.org/10.1016/j.ibusrev.2011.09.010

Ngugi, I. K., Johnsen, R. E., & Erdélyi, P. (2010). Relational capabilities for value co-creation and innovation in SMEs. *Journal of Small Business and Enterprise* Development, *17*(2), 260-278. https://doi.org/10.1108/14626001011041256

Nonaka, I., & Takeuchi, H. (1996). The knowledge-creating company: How Japanese companies create the dynamics of innovation. *Long Range Planning*, *4*(29), 592.

Okdinawati, L., Simatupang, T. M., & Sunitiyoso, Y. (2017). Multi-agent reinforcement learning for value co-creation of collaborative transportation management (CTM). *International Journal of Information Systems and Supply Chain Management (IJISSCM)*, *10*(3), 84-95.

Osborne, S. P. (2006). The new public governance?[1]. *Public Management Review*, *8*(3), 377-387. https://doi.org/10.1080/14719030600853022

Payne, A., Frow, P., McColl-Kennedy, J. R., (2016). Co-creation practices: Their role in shaping a health care ecosystem. *Industrial Marketing Management*, *56*, 24-39. https://doi.org/10.1016/j.indmarman.2016.03.007

Payne, A., Storbacka, K., & Frow, P. (2008). Managing the co-creation of value. *Journal of the Academy of Marketing Science*, *36*(1), 83-96. https://doi.org/10.1007/s11747-007-0070-0

Perks, H., Gruber, T., & Edvardsson, B. (2012). Co-creation in radical service innovation: A systematic analysis of microlevel processes. *Journal of Product Innovation Management*, *29*(6), 935-951. https://doi.org/10.1111/j.1540-5885.2012.00971.x

Prahalad, C. K., & Ramaswamy, V. (2004). *The future of competition: Co-creating*

unique value with customers. Harvard Business School Press.

Ramaswamy, V., & Gouillart, F. (2010). *The alchemy of co-creation*. Simon & Schuster's Free Press.

York: Simon & Schuster's Free Press.

Ramaswamy, V., & Ozcan, K. (2014). The co-creation paradigm. In *The Co-Creation Paradigm*. Stanford University Press.

Roller, M. R., & Lavrakas, P. J. (2015). *Applied qualitative research design: A total quality framework approach*. Guilford Publications.

Saarijärvi, H., Kannan, P. K., & Kuusela, H. (2013). Value co-creation: Theoretical approaches and practical implications. *European business review*, *25*(1), 6-19. https://doi.org/10.1108/09555341311287718

Saldaña, J. (2021). *The coding manual for qualitative researchers*. Sage.

Santoro, M. D., & Chakrabarti A. K., (2002), Firm size and technology centrality in industry-university interactions. *Research Policy*, *31*(7),1163–1180. https://doi.org/10.1016/S0048-7333(01)00190-1

Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2003). Commercial knowledge transfers from universities to firms: improving the effectiveness of university–industry collaboration. *The Journal of High Technology Management Research*, *14*(1), 111-133. https://doi.org/10.1016/S1047-8310(03)00007-5

Skute, I., Zalewska-Kurek, K., Hatak, I., & de Weerd-Nederhof, P. (2017). Mapping the field: a bibliometric analysis of the literature on university–industry collaborations. *The Journal of Technology Transfer*. https://doi.org/10.1007/s10961-017-9637-1

Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press.

Torfing, J. (2019). Collaborative innovation in the public sector: The argument. *Public Management Review*, *21*(1), 1-11. https://doi. org/10.1080/14719037.2018.1430248

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. Journal of Marketing, *68*(1), 1–17

Vargo, S.L., & Lusch, R.F. (2006). Service-dominant logic: What it is, what it is not, what it might be. In R. F. Lusch, S.L. Vargo. (Eds.), *The service-dominant logic of marketing: dialog, debate, and directions* (pp. 43–56). Routledge. https://doi.org/10.4324/9781315699035

Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal*, *26*(3), 145-152. https://doi. org/10.1016/j. emj.2008. 04.003

Vargo, S. L., & Akaka, M. A. (2009). Service-Dominant logic as a foundation for service science: clarifications. *Service Science*, *1*(1), 32-41. https://doi. org/ 10.1287/serv.1.1.32

Vernette, E., & Kidar, L. H. (2013). Co-creation with consumers: Who has the competence and wants to cooperate? *International Journal of Market Research*, *55*(4), 539-561. https://doi.org/10.2501/IJMR-2013-047

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Sage.