Resource Integration process in Complex Service Systems: Examining Value Co-Creation at Higher Education Institutions

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Abstract: This article aims to provide empirical insights on how value co-creation takes place in complex systems; portraying insights from the evolving and complex interaction-based resource integration at HEIs. Tenets of service dominant (S-D) logic (Vargo & Lusch, 2004, 2008) and service science (Maglio & Spohrer, 2008) are used to conceptualize the resource integration process for value co-creation. Multiple Qualitative case studies are used to explore rich experiences of actors during instances of service interactions in higher education institutions (HEIs) and empirical findings are generated from 37 in-depth interviews, observations and web page analysis. The analysis process and findings from the data are systematically displayed using the GIOIA methodology (Gioia, Corley, & Hamilton, 2013). Empirical findings suggested that achievement of sustainable learning outcomes at HEIs requires management of complex interactions that are embedded within diverse yet dependent systems as value is generated through an iterative resource integration process within the overall engagement phase of value co-creation. Furthermore, deliberate replications on key resource integrating practices between human actors and digital systems are discussed to provide clues on interplay of social and technical influences on value co-creation processes. Results could foster expansion of the value co-creation concept and pave way for its operationalization in complex service system settings. Conceptualization of resource integration practices could also guide key stakeholders at HEIs to identify major challenges during value co-creation initiatives. Implications are discussed in the light of roles played by human and digital actors during three critical phases of value co-creation in expedience, engagement and evolution. Acknowledging the fact that opportunities and issues faced by higher education institutions might be like many other industries including tourism, public service, nursing and others; yet aim of using the case studies for in depth insights in this paper limits the statistical generalizability.

Keywords: Resource Integration Practices, Value Co-Creation, Digital Service Systems, Higher Education Institutions

INTRODUCTION

Considering challenges faced by modern firms; the connected aspects of world are proving devastating as imitated in the crisis emerging from COVID-19 outbreak. Overwhelming challenges intervened in complex social and economic forces cannot be addressed in segregation from a solitary disciplinary perspective (Vargo & Lusch, 2017) and cross disciplinary efforts are recommended to locate sustainable solutions (Tejedor, Segalàs, & Rosas-Casals, 2018). Higher education as a field is facing similar demons in lieu of COVID pandemic outbreak; with many underdeveloped countries finding themselves in the worst situation as HEIs are not able to run their regular learning routines physically neither are ideally prepared for alternative technological solutions. Staging a professional academic experience was always a challenge for HEIs, yet contributions from all stakeholders was not deemed essential (Uden, 2011). Value co-creation, especially involving students to co-create value, is now a major challenge for HEIs (Bovill, 2020); especially, when digital and virtual learning is seemingly the only feasible option.

The notion of value co-creation has been deliberated for over a decade, but empirical illustrations on how firms rely on resources to co-create value with stakeholders are still evolving (Hansen, 2020; Ng, Sweeney, & Plewa, 2019; Saha, Mani, & Goyal, 2020). Subsequently, we find very few frameworks and approaches on how economic

actors and digital artifacts get involved in value cocreation (Sklyar, Kowalkowski, Sörhammar, & Tronvoll, 2019), and have little guidelines for managers on how to handle value co-creation in a systematic way (Ramaswamy & Ozcan, 2018; Taylor, Hunter, Zadeh, Delpechitre, & Lim, 2019). Using the tenets of S-D logic (Vargo & Lusch, 2004, 2008), this research aims at reconnoitering the dynamics of service systems within the context of HEIs. With S-D logic aiding in the theoretical foundation of service science, this paper is using the unit of service system for a systematic analysis (Vargo, Akaka, & Vaughan, 2017); where, service systems can consist of objects or fine-tuning of resources (including people, information, and technology) that are attached by value propositions (Vargo, Maglio, & Akaka, 2008). The service system, therefore, offers an idyllic logical framework and an appropriate unit evaluation for value co-creation (Akaka Melissa & Vargo Stephen, 2015; Barile, Lusch, Reynoso, Saviano, & Spohrer, 2016; Ekman, Raggio, & Thompson, 2016).

Higher education institutions are advocated as complex system of systems (Uden, 2011); where, the sophisticated inter-linked nature of service interactions at HEIs (Cavallone, Ciasullo, Douglas, & Palumbo, 2019), styles them as an appropriate context for examination of value co-creation in many-to-many settings (Lusch & Wu, 2012a). Viewing through the corridor of value co-creation and service systems; a service standpoint permits a comprehensive view of HEIs not from the operational or functional outlook but also as a multifaceted network involving numerous actors (Lusch & Wu, 2012b; Lusch, Vargo, & Tanniru, 2010). A broadened service perspective is deemed necessary as conceptualization of value creation still imitates traditional goods dominant logic (Barrett, Davidson, Prabhu, & Vargo, 2015; Lusch & Nambisan, 2015a) that is proven to be incapable of explicating how value is co-created within variant contexts (Chandler & Vargo, 2011). For higher education institutions, any effort that is not aligned purposefully from a holistic viewpoint could result in negative value for its actors and may pose a serious challenge for its management to identify and reeducate its organizational, structural and underlying processes for expected value co-creation outcomes (Oliva & Kallenberg, 2003; Prahalad & Ramaswamy, 2004).

As a multi-disciplinary effort, this paper aims to generate several contributions to areas like management, service science, technology management and education. Firstly, current study contributes to literature within service science by responding to the calls for investigation of service interactions between multiple actors beyond a dyad and within a wider network for value co creation potential. Empirical exploration of higher education institutions as a complex service system could offer understandings on the changing aspects of multifaceted service systems. Secondly it adds to the exploration of service contexts that depicts interplay between social and technological systems. Processes for value co-creation are evaluated within higher education institutions that involved human actors and digital service systems; providing clues on socio-technical perspective and role of technology agency. Thirdly, focusing on co-creation within socio-technical settings, a resource integration patterns was identified to provide explanation on how actors within multiple service systems carry out the combination and recombination of operant resources for sustainable learning outcomes. Finally, the study also adds to the management literature by explaining the potential ways complex service systems and corresponding influences be managed to achieve expected value co-creation objectives for sustainable outcomes. Using the tentacles of complexity and viability approach a three-phase management triad is advocated for successful articulation of complex service systems including expedience, engagement and emergence.

Probable research questions in this background embrace: how do multi actors and digital service systems contribute to value co-creation through resource integration at higher education institutions? Multiple service interaction-based practices are examined within selected cases that involve participation of multi actors and the digital artifacts in a web of complex processes, in order to find answers to our question through empirical evidences. This paper contributes to the theorizing approach recommended (Vargo & Lusch, 2017, 2018) for progressing examination on value co-creation within service ecosystems, resource integration in ICT-mediated settings (Hein et al., 2020; Storbacka, Brodie, Böhmann, Maglio, & Nenonen, 2016), as well as calls on role of technology based learning scenarios ((Akaka & Vargo, 2014; Breidbach, Kolb, & Srinivasan, 2013; Breidbach & Maglio, 2016) in higher education context. The paper is systematized in the ensuing way: extent literature on aspects of value co-creation will provide theoretical background of this research effort followed by elaboration of the choice of methodology and consequent findings from case studies on higher education institutions. Discussion and conclusion will integrate the findings for theoretical and practical implications and agendas for future research avenues.

Literature Review

The Service Dominant (S-D) logic advanced by (Vargo & Lusch, 2008; Vargo & Lusch, 2014) has intensely transformed the overriding views of marketing and is now extensively documented as a substitute architype to perceive numerous phenomena across social sciences including education. Value creation according to the new logic can be best implied as a process of entities serving each other for mutual benefits (Vargo & Lusch, 2014) rather as something associated tangible products and is only reflected in the traditional view of value in exchange. In contrary to traditional view customer or beneficiaries have a key role in the value co-creation narrative and are linked with multiple service interactions within a network of actors. Among the five key propositions of S-D logic

(Vargo & Lusch, 2014), two key propositions i.e. "Value is co-created by multiple actors, always including the beneficiary" and "all social and economic actors are resource integrators", illustrates the central foundations of value co-creation. This implies that customer or beneficiaries are not just destroyers of value rather are active resource integrators during the process of co-creation of value (Ramaswamy & Ozcan, 2018; Sklyar et al., 2019). Value co-creation also implies that during the resource integration process, the focus remains on the primacy of intangible resources labelled as Operant resources as compared to Operand resources which are tangible and the consumer-producer divide is replaced with a unified vision of collaborators termed as actors (Storbacka et al., 2016; Vargo & Lusch, 2012; Wieland, Polese, Vargo, & Lusch, 2012a). When viewed from the S-D logic's accentuated vision of value co-creation, key stakeholders at HEIs including teachers and students are similarly seen as beneficiaries as well as contributors. These major actors are linked through value propositions within service-based interactions (Annamalai, 2017; Auvinen & Smith, 2012) and are utilizing their operant resources for mutual benefits. Actors could be visualized as entities or objects that have a prior understanding on their capabilities and roles in the value co-creation process as Sarasvathy (2008) classified them as "Effectual actors" with a profound sense of their contribution for others. Value co-creation therefore is conceptualized as an interaction of actors which are interacting in an ongoing flexible relationship in contrast to a fixed event based economic exchange (Ramaswamy, 2009; Ramaswamy & Gouillart, 2010; Vargo & Lusch, 2012).

Service has remained of the central themes in value co-creation frameworks that logically is achieved through resource integration involving volunteer actors using the operant resources (Sklyar et al., 2019; Vargo et al., 2008). Value co-creation relies on interactions within service-based encounters, which are simultaneously occurring at multiple levels and volunteer actors are dynamically shifting their roles as providers and beneficiaries (Hein et al., 2020). The lexicon modification in S-D logic to a version of actor to actor (A-A) apprehends this notion of involved entities as both beneficiaries and providers at the same time and also their collective contribution in mutual outcomes (Vargo & Lusch, 2014). While, encounters for resource integration may be happening physically or virtually; these are carried out through engagement platforms which have a pivotal role in value co-creation (Frow et al., 2014; Hein et al., 2020), especially when actors are linking across a wider complex system (Breidbach et al., 2013; Briscoe, Keränen, & Parry, 2012).

S-D logic is now recognized as a theoretical foundation of service science which is a distinct field of studies that relies on study of service systems as a unit of abstraction. S-D logic offers valuable description on several facets of value co-creation conceived within service system and between diversified actors (Maglio, Vargo, Caswell, & Spohrer, 2009). Service systems are recognized as the "configuration of four resources i.e. people, technology, information and organization" (Maglio et al., 2009). When the service system's viewpoint as a cooperative worldview is brought into perspective, as similar to Normann (2001) perception of a "constellation" of value network; it helps in precise explanation of value co-creation phenomenon (Frow, McColl-Kennedy Janet, Payne, & Govind, 2019; Vargo et al., 2017). Investigating creation of value within service systems could help in listing the important resources in the integration process and their contribution in generating unique value (Michel, Brown, & Gallan, 2008). Literature on value co-creation also advocates the examination of the role of the multi actors and digital service artifacts (Lusch & Nambisan, 2015b; Vargo, Wieland, & Akaka, 2015) for value co-creation and evaluation of occurrence and linkage of value propositions within digital ecosystems (Gummesson et al., 2014; Sklyar et al., 2019).

Since, resource integration remains the key to value co-creation in service systems (Akaka & Vargo, 2013; Maglio et al., 2009), the development of resource combination within diversified actors is influenced by synchronizing institutions (Edvardsson et al., 2014; Vargo & Lusch, 2016). In particular, the service-system approach highlights the role of "value in context" i.e. both service context and participating actors are constantly influencing each other through routine and no-routine (Vargo & Lusch, 2016). For instance; staging a memorable academic experience for actors require HEIs not only to customize offerings but also match their expectations (Chandler & Lusch, 2015a; Storbacka et al., 2016; Vargo & Lusch, 2014); while, their interactions is continuously coordinated through social and legal institutions (Alexander Matthew, Jaakkola, & Hollebeek Linda, 2018; Koskela-Huotari & Vargo, 2016; Matthies et al., 2016).

Service systems conceptualization provides an appropriate unit of analysis for investigating service interactions at the micro level of analysis (Maglio & Spohrer, 2008); however, the true essence of value co-creation could be seen in the extended network linking service systems (Akaka Melissa & Vargo Stephen, 2015) i.e. value is embedded in the complex interactions of actors within and across service systems (Meynhardt, Chandler, & Strathoff, 2016). This calls for extending the service lens to a wider scope examining the value co-creation from a network of complex service systems also known as service ecosystem (Barile et al., 2016; Ben Letaifa & Reynoso, 2015; Frow et al., 2019). Where ecosystems are referred as "loosely coupled, self-adjusting systems" involving a range of actors (Vargo & Akaka, 2012; Vargo et al., 2017). However, in many complex service systems the involved actors many not have the level of autonomy advocated in the general conceptualization of service ecosystems than these could be classified as tightly coupled ecosystems and actors in such tightly coupled ecosystems are likely to focus on collaborative efforts to serve the value proposition of the focal entity (Frow et al., 2019; Hein et al., 2020).

Higher education Institutions are already been examined from the ecosystem perspective (Uden, 2011; Uden, Wangsa, & Damiani, 2007) but further exploration is warranted to carefully examine the processes from the service perspective and understand the role of actors, intervening processes, and outcomes of the value co-creation initiatives (Ranjbarfard & Sureshjani, 2018; Soini, Korhonen-Kurki, & Asikainen, 2019; Zhang, Lu, Torres, & Chen, 2018). Ver few studies (Frow et al., 2014; Gummesson et al., 2014; Payne, Storbacka, & Frow, 2007) have inspected digital service-systems that consist of different types of resource-integrating actors; specifically, exploration of value creation within digital platform service systems that constitute relationships between multiple actors presents an interesting research gap in S-D logic as well as service science literature (Breidbach & Maglio, 2016; Hein et al., 2020).

METHODOLOGY
Following guidelines for conducting multiple cases studies (Yin, 1994), couple of higher education institutions with digital learning solutions are selected as case studies. Final selection of case studies was based on the key attributes including the existence of complex networks of actors and also the fact that most of the operation were facilitated through a digital service system in the form of a LMS. The empirical data collected from cases includes evidences obtained through semi-structured interviews of 37 respondents, who are teachers, students, IT staff, LMS coordinators, quality officers, program heads and program coordinators. Qualitative research protocols (Eisenhardt & Graebner, 2007) were rigorously followed during the data collection process as interviews were properly recorded, observations were transferred to field notes. Transcribing process also went through multiple stages with files first created in original native language and then carefully converted in English version for NVivo software.

Interview questions were developed using the literature on similar constructs, but the language of the interview was kept simple to avoid confusion. A brief introduction of the research was communicated to all respondents to develop their prior understanding of the phenomenon of interest. They could use their own native language which helped them to express freely in term of their own language and in their own choice of words. While respondents were interviewed at their own site to provide relative ease and comfort, all interviews were conducted in face-to-face settings, yet two students were contacted via telephonic conversation due to privacy and remoteness concerns. Interview questions followed two separate schemes where first was developed for users while other was slightly different used for IT staff and development teams. A summary of interviews, respondent's role, and interview duration is listed in Table 1.

Table 1:Summary of Interviews Conducted

Higher Education Institutions	Respondents Interviewed	No of Respondents in each category	Length of the interviews (Approximately)	Total Interviews and Length
National University of Science & Technology (NUST)				
	Program Coordinators	2	1 hour each	
	LMS Coordinators	2	1 hour & 15 each	
	Teachers	4	1 hour each	
	Students (Early & Final Semesters)	9	30 minutes each	
	IT/Network Administrator	1	45 minutes	
	Quality Assurance Officer	1	50 minutes	
				19 Interviews, 15 Hours
Virtual University (VU)				
	Regional Campus Head	1	1 hour & 45 minutes	
	Campus Head	1	1 hour & 45 minutes	
	Campus Managers	3	1 hour each	
	Teacher	1	1 hour	
	Tutors	4	1 hour each	
	Students	8	40 minutes each	
	IT/Network	1	1 hour & 15 minutes	
				18 Interviews, 18 Hours

Collected data went through a rigorous process of treatment to ensure research rigorousness starting with transcription of interviews in the native language indicating exact words spoken in the conversation to avoid researcher bias. Then these transcripts were narrated in English to be used in data analysis tool in NVivo 12 pro. Memos were created to mark important observations and insights on settings, comfort levels and deeper emotions. Data transcribed in proper word files after careful translation to ensure originality were imported in NVivo 12 pro software for thematic analysis. Accessible web pages, other important documents and interview recordings were also imported to ensure that data is extracted from all logical resources is adopted to ensure scientific analysis resulting in oscillation between data and literature. Exploration of the data collection process was followed by data findings as guided by GIOIA framework (Gioia et al., 2013) and was based on an iterative process back and forth linking empirical evidences and literature review. Systematic literature guided the whole process for categorization and labelling the themes emerging from the data (Glaser & Holton, 2005).

FINDINGS

National University of Science and Technology is one of the top ranked higher education institutions in Pakistan established in 1991 and offers recognized degrees in multiple disciplines ranging from engineering, business, economic and social sciences. Learning at NUST traditionally started physically in face to face settings but in 2009 management decided to upgrade its learning experience with the launch of its Moodle based LMS. Accessible at the website www.lms.nust.edu.pk, it is now a source of major academic processing and is integrated with other campus management systems to stage a complete solution for students, staff and teachers. Virtual University of Pakistan is also Pakistan's top ranked university that offers virtual learning-based degrees established by Government of Pakistan to promote ICT based remote learning throughout the country. With a slogan of "World Class Education at Your Doorstep", VU expanded its services with the passage of time offering campuses at remote places and greater flexibility for students to access everything from their homes at a lower cost.

In order to understand the importance of resource integration as one of the key aspects of value co-creation, processes linking multi actors and digital service systems at HEIs were evaluated. Throughout the interviews, the interdependencies among actors clearly emerged and their importance to value co-creation for each actor was acknowledged. These results show that value co-creation for one actor depends on the actions of other actors, as well as his or her own actions. Interaction between actors at HEIs is found to link processes within and across service systems and is just not confined to dyadic relationships and static roles played by providers and beneficiaries. Network nature of interactions depicts the dynamic interplay of roles played by actors during the value co-creation process. Exploration of learning at HEIs also reflected upon the importance of dependence of actors through a series of interactions that occur at different time and space contexts but is dependent on the inputs of other actors leading to realization of expected value. Taking the example of a student, who needs to submit assignments; the submission is only possible through dedicated sections at LMS; however, once submitted the assignment it is to be checked for plagiarism and is processed by a dedicated quality officer who will facilitate the outcomes and resubmission.
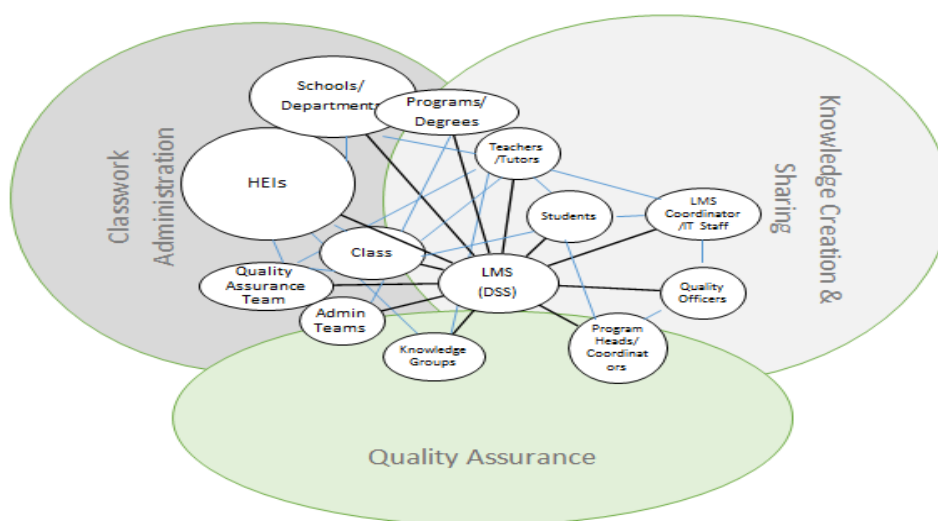

Fig.1: Complex Systemic view of Learning Management at HEIs (Source: Authors)

The final processed file is then reviewed by teachers and tutors who will pass on the feedback to students before final submission of grades. The quality officer and tutors may identify a specific problem that initiates a dialogue supported through messages and alerts routed through LMS. This shows that each actor may be a provider at one instance but may also be a recipient of benefits of his or her actions. Teachers, staff and students and administration at HEIs are found to be acting in the role of both providers and beneficiaries at multiple instances.

Figure 1. clearly depicts that value creation during the learning processes is the result of actions by many actors as either providers or beneficiary, and services should be designed considering how different actors may enthusiastically add to the final value extracted. Co-creation of value is found to require a specific context that reflects attributes of collaboration and communication within an across systems and the exploration of three major modules of LMS has provided the analysis of context for further exploration within HEIs. These LMS specific modules in classwork administration, knowledge creation and sharing, and quality assurance were found to require maximum collaboration and iterative loops of communication. Figure 1 presents the systemic view of HEIs reflecting the multiple instances of interactions within and across service systems.

Case studies in NUST and VU both provided enriched instances of interconnected practices within the three selected LMS based modules. Table 2 provides the details of major service interaction-based practices during the learning management at HEIs and indicating the involved actors, resources utilized and their respective value in context generated.

Table 2. Summary of Service Interaction Practices, Actors, Resources and Value in Context

Service Interaction Based Practices	Involved Actors	Mode of Operation	Operand Resources	Multi Actor's and Institute Level Operant Resources	LMS's Operant Resources	Value in Context
Formal Registration and Enrollments	Students, LMS Coordinators, Staff, LMS	Digitally through dedicated tools	Computers and Networking Facilities, Labs, Devices, LMS as a Platform	Technical Skills, Interpersonal Skills, Attention.	Functional, Informational	Functional Value, Personal Value
Support for Teachers	Faculty, LMS Coordinators, Staff, LMS	Both physically and digitally	Support Offices, Computing Resources, LMS as a Platform, Communication Tools	Interpersonal Skills, Technical Skills, Problem Solving Skills, Actor Response Capability	Functional, Informational	Social Value, Personal Value
Support for Students	LMS Coordinators, Staff, Students, LMS	Both physically and digitally	Support Offices, Computing Resources, LMS as a Platform, Communication Tools	Interpersonal Skills, Technical Skills, Problem Solving Skills, Actor Response Capability	Functional, Informational	Social Value, Comparative Value, Personal Value
Course and Semester Monitoring	Program Heads, LMS Coordinators, Faculty	Both physically and digitally	LMS as a Platform, Printed Reports, Support Offices and Facilities, IT Infrastructure	Monitoring Ability, Team Skills, Analytical Ability, Internal System Intelligence	Interactional, Informational, Functional	Economic Value, Comparative Value, Functional Value
Class Activities	Students, Faculty	Physically	Building and Classrooms Facilities, Multimedia and Computing Resources	Confidence, Subject Knowledge and Expertise, Interpersonal Skills, Administration Abilities, Analytical Abilities, Emotions, Energy, Sensory	Informational	Functional Value, Personal Value, Social Value, Comparative Value
Online Discussion and Activities	Students, Faculty, Tutors, LMS	All processes handled digitally through LMS	LMS as a Platform, IT Infrastructure including on campus and off campus computing resources	Interpersonal Skills, Attention, Knowledge Sharing, Network Capability, Knowledge Management Capability, Learning Platform Capability	Informational, Interactional, Functional	Functional Value, Economic Value, Social Value

Service Interaction Based Practices	Involved Actors	Mode of Operation	Operand Resources	Multi Actor's and Institute Level Operant Resources	LMS's Operant Resources	Value in Context
Semester Planning	Program Heads, Staff, Faculty, LMS	Mostly Physical Face-to-Face with minor communication through emails etc	Discussion Rooms, Printed Documents	Planning Abilities, Coordination, Conceptual Skills, Communication, Teamwork	Informational	Social Value, Comparative Value
Course Allocation	Program Heads, Faculty, LMS	Mostly Physical Face-to-Face with minor communication through emails etc	Staff Rooms, ICT, Printed Material	Teamwork, Analytical Ability, Negotiation Skills	Informational	Social Value, Comparative Value
Course Page Creation	LMS Coordinators, IT Staff, Program Heads, LMS	Mostly Digital with few communication items available in physical formats	ICT Infrastructure including office Computers and Personal devices, Printed documents, Communication tools like Office Telephones	Technical Skills, Interpersonal Skills, Team Ability	Functional, Cultural	Functional Value, Personal Value
Course Contents Creation	Faculty Members, LMS Coordinators, Knowledge Area Groups, LMS	Mostly Digital with few Items made available in printed format	Computers and Devices, LMS based Network, Internet Services and Hardware	Knowledge Creation Ability, Planning Ability, Team Skills, Administration Abilities, Technical Skills	Informational, Functional	Personal Value, Functional Value, Economic Value
Intimation of Links	Faculty, Program Heads, LMS Coordinators, Students	Both Physical and Digital Options are utilized	IT Infrastructure, Conference Rooms, Seminars and Training Facility, Classrooms	Interpersonal Skills, Knowledge Sharing Capability, Motivation Ability, Energy	Informational, Interactional	Personal Value, Social Value
Training	LMS Coordinators, Faculty, Students, LMS	Mostly Physical but Virtual options are utilized	Conference Rooms, ICT Tools	Motivation ability, Interpersonal Skills, Technical Skills	Interactional, Cultural, Informational	Functional Value, Personal Value

Online Assessment	Students, Tutors, Faculty, LMS Coordinators, LMS	Digitally through LMS	LMS as a Platform, IT Infrastructure including on campus and off campus computing resources	Monitoring Skills, Attention, Dedication, Sensory Elements, Problem Solving Skills, Technical Skills, Rules and Regulations	Informational, Interactional, Functional, Cultural	Comparative Value, Functional Value, Personal Value
Plagiarism Check	Students, Staff, LMS	Digitally through LMS support	LMS as a Platform, IT Infrastructure including on campus and off campus computing resources	Monitoring Ability, Analytical Ability, Technical Skills, Internal System Intelligence, Actor Response Capability	Informational, Cultural, Functional	Comparative Value, Social Value, Personal Value
Course Progression	Faculty, Students, LMS Coordinators, Program Heads, LMS	Mostly digitally with few elements in face to face interactions	Conference Rooms, Offices, LMS based printed reports	Planning Abilities, Administration Ability, Dedication, Rules and Regulations, Internal System Intelligence	Interactional, Informational, Functional	Personal Value, Comparative Value
Examination	Students, Faculty, Staff, LMS	Mostly physically with some carried out digitally	Examination Rooms, Printed Material and Accessories	Coordination Skills, Administration Abilities, Sensory Elements, Attention and Dedication	Informational	Comparative Value
Faculty Feedback	Students, Program Heads, Faculty, LMS	Digitally through LMS	LMS as a Platform, IT Infrastructure including on campus and off campus computing resources	Monitoring Ability, Analytical Ability, Technical Skills, Internal System Intelligence, Actor Response Capability	Interactional, Functional, Cultural	Comparative Value, Functional Value
Quality Assurance	Faculty, Program Heads, LMS Coordinators, LMS	Both physically and digitally	Conference rooms, Offices, Computing Resources, Printed Material	Monitoring Ability, Team Skills, Coordination Ability,	Interactional, Informational, Cultural	Comparative Value, Social Value
Accreditation Processes	Faculty, Program Heads, LMS Coordinators, LMS	Mostly physically but major support provided digitally	Conference rooms, Offices, Computing Resources, Printed Material	Monitoring Ability, Team Skills, Coordination Ability,	Interactional, Informational, Cultural	Comparative Value, Economic Value, Social Value

Table 3: Summary of node's sources on Resource Integration Practices from NVivo Software

Themes	Sources Files	Respondents
Resource Availability	19 Files 47 References	13 Students, 4 LMS Coordinators/IT Staff, 4 Program Heads
Resource Access	31 Files 39 References	8 Teachers/Tutors, 13 Students, 3 LMS Coordinators/IT Staff, 3 Program Heads
Resource Internalization	15 Files 28 References	12 Students, 3 Program Head/Coordinators
Resource Adoption	12 Files 15 References	10 Students, 3 LMS Coordinators/IT Staff, 7 Teachers/Tutors, 3 Program Heads/Coordinators

It is evident that reciprocity is at the core of value co-creation, as reflected in the examination of service-based interactions at HEIs. For example, course content creation requires interplay between LMS as a digital service system, teachers, LMS coordinators, program coordinators and knowledge groups. It is a process carried out

mostly digitally using dedicated LMS pages and provided in printed form. This interaction is done through many operand resources like computer devices, LMS as an artifact accessible through a dedicated on campus network infrastructure; however, the resourcing (the becoming of resources) is based on intangible resources including knowledge creation and planning ability of teachers, team skills of knowledge groups and LMS staff and the overall administrative ability of the program heads and their team. Teachers and LMS staff members also need technical skills to operate and manage resources at LMS which utilizes its informational and functional resources to achieve outcomes like personal, functional and economic value for the involved actors.

Resource Integration Process for Value Co-Creation in Service Ecosystems
It is evident from the illustration of HEIs as complex service systems that value co-creation is occurring in a complex web of interactions and in based on interactions within and across multiple system. It is also reflected that value co-creation emerges as a process where actors, when get connected in service-based interaction practices, are involved in the value proposition, value realization and value outcome sequence which involves the resource integration process illustrated in Figure 2.
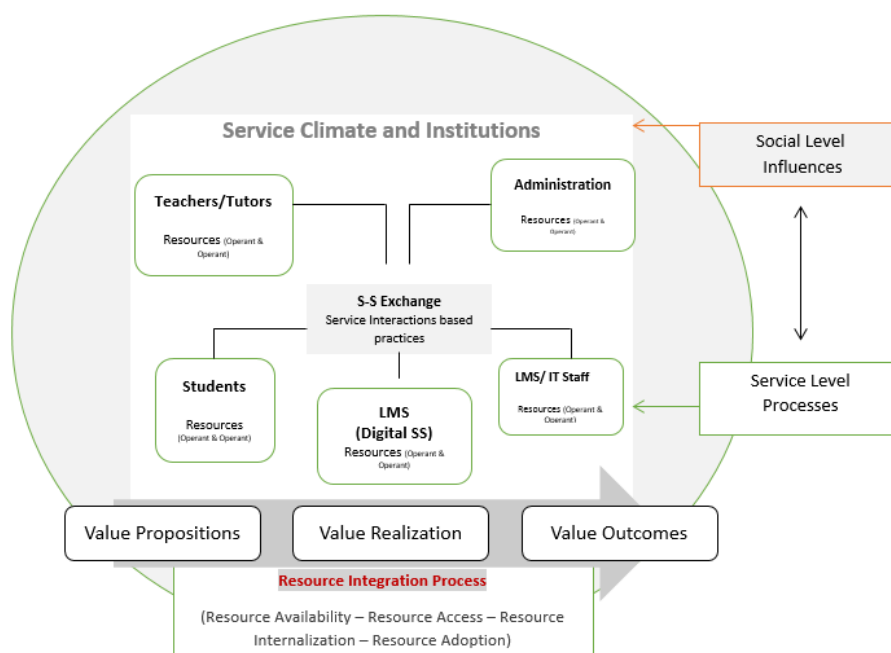

Fig.2:Value Co-Creation Process Model in Complex Service Systems

Four major categories of resource integration practices in resource availability, resource access, resource internalization and resource adoption emerged from the empirical evidences; addressing the need in literature to evaluate the importance of the communal nature of value propositions. Following section highlights the nature of these practices.

Resource Availability – Value Proposition from Teachers, Staff and Institutions
In order to initiate and support the resource integration processes at NUST, the planning routines are initiated well before the start of the semester and support LMS coordinators are actively initiating courses in coordination with the program coordinators and program heads. Teachers when allocated with courses will need to upload course outlines and consequently the course resources at their personal approach with few uploading everything at start of the semester while others systematically doing it within every consequent week. At this phase students are intimated physically in classes as well as virtually at their LMS accounts to access the course pages so that they have the access to the course contents.

Resource Access – Value Propositions by Teachers, Staff, Quality Cell, and Program Coordinators
Evaluation of the resource integration processes revealed that once the resources are made available on course pages the staff and program heads make sure that the intended actors have access to the digital enabled learning mechanism and the offered services. Following section provides insights from NUST cases study through personal experiences, interviews and web page analysis on important stage in the resource integration practices.

Resource Internalization – Value Realization initiated by Teachers, Students and Program Heads
Resources are to be linked with practices to yield expected benefits to the connected actors seeking value outcomes and it is very much evident after exploration at NUST that LMS based resources are utilized not only by major stakeholders but are tightly embedded with key activities both in face-to-face activities in classes as well as with online practices

Resource Adoption – Value realization during use by Students, Teachers, Staff and Quality Officials
Value realization entails activities that require maximum utilization of resources in specific contexts of actors and eventually results in negative and positive value- in- context outcomes. Empirical evidences from the case studies provided substantial clues on value realization as a result of integration of resources.
Following section summarizes the empirical findings related to resource integration practices within multiple service interactions at NUST and VU depicted based on GIOIA framework (Gioia et al., 2013). As we can see from Table 4 that codes from respondent's empirical data are aggregated to 2nd order categories, which are labelled through an iterative connection with the systematic literature review. Aggregate dimensions are logical outcome of the process that constitute the theoretical dimensions of the resource integration practices.

Table 4: Data Structure for Resource Integration Practices based on (Gioia et al., 2013)

1st Order Categories	2nd Order Themes	Aggregate Dimension
Preparation before the semester start with coordination between teachers and program heads	Resources Planning	Resource Availability
Courses are planned and initiated by department heads and teachers take the responsibility to develop course outlines and then consequently what resources to include		
It all starts with creation of course pages and teachers given access to their allocated courses with login and passwords	Course Pages Initiation	
course pages eventually basically become the complete resource center for a given course		
There are general guidelines for everyone how to manage courses online		
Teachers will upload key documents like course outline, assessment details, important deadlines, reading material at LMS	Resource Upload	
At the LMS website we have uploaded guideline documents		
Assessment criteria are available at time prior and at time things are uploaded on weekly basis		
Main pages provide notifications and course related communications	Physical and Virtual indication	
Students get to know what is required in the course in classes through teachers		
Students gets alerts on feedback received and can then share any concern with the relevant teachers		
Students need to register in the semester courses as soon as they get login and passwords	Formal Registration	Resource Access
Teachers also get registered as focal users		
Program heads are also enrolled in each courses of degrees		
LMS provide dedicated section to plagiarism system	Plagiarism System Access	
All assignments to be uploaded for plagiarism check		
Plagiarism reports are available as soon as documents		
All formal users access dedicated course pages	Access to LMS and Course Pages	
NUST provide complete on campus infrastructure for LMS access		
Users are encouraged to access LMS from anywhere		
Course are concluded with access to faculty feedback tools	Faculty Feedback Options	
Students must ensure feedback through LMS portals		
Program heads received reports on faculty feedback		
Course contents at LMS are actively utilized within classes for knowledge sharing	In Class practices linked to Resources	Resource Internalization
Students are required to participate in class discussions		
Assignments and Quizzes guidelines are posted on LMS	Online Practices linked to Resources	
Notification and Deadlines are communicated		
Teacher assistants engage students for online support		
Class participation remains major assessment based on resources	Assessment ensuring utilization of resources	
Online assessment provides feedback and improvement guidelines		
Online exams are also conducted based on course resources		
Users adhere to given guidelines on required practices	Living Embedded academic experiences	Resource Adoption
NUST made this essential for all concerned to be part of their academic experience		
Students regularly access main pages and download resources and submit online		
Resources are used to enhance functional value for teachers and students	Resources matched with Value in Use	

DISCUSSION

This research retorts to calls for empirical efforts that could provide explanation of value co-creation within complex service networks comprising of human and digital actors (Akaka Melissa & Vargo Stephen, 2015; Barile et al., 2016; Frow & Payne, 2011; Meynhardt et al., 2016; Vargo et al., 2017; Vargo et al., 2008). Resource integration is found to be at the core of value co-creation process; where actors through service-based practices contribute to the co-creation of value for themselves and others. Actors are found to be continuously engage in mutual- benefiting resource combination with other actors; while, the process is guided by governing rules and institutions (Alexander Matthew et al., 2018). However the social structures, in return are also shaped by these practices are the dyadic and sub system level of the complex service systems (Edvardsson, Skålén, & Tronvoll, 2012; Edvardsson, Tronvoll, & Gruber, 2011). The theoretical advents of S-D logic and service science were espoused to explore the roles of actors, resources, and practices embedded in technology-intervened value co-creation in complex service systems (Vargo et al., 2008; Wieland, Polese, Vargo, & Lusch, 2012b).

Case Study analysis revealed many insights on how value co-creation takes place in complex service systems; whereas, use of service system lens (Sklyar et al., 2019) provided an approach to examine the dynamic nature of service practices at HEIs. Findings indicated that learning at HEIs could be conceptualized as a value co-creation process and diversified actors play their pivotal role in the process through resource integration practices. Although these actors have variant interests (Gummesson, Mele, & Polese, 2019; Gummesson, Mele, Polese, Barile, & Polese, 2010) yet they seem to be connected through a shared vision to remain in their dyadic act and still be contributing to the overall network goals (Meynhardt et al., 2016). Resource integration emerged as a core aspect of value co-creation (Peters, 2016) and actors were found to engage in these practices in a non-liner and iterative way (Chandler & Lusch, 2015b). Resource combination and recombination takes place as an ongoing phenomena and results in superior value for involved actors when the resource availability and resource access results in resource adoptions and resource internalization. Actors find their bindings with the process through a mechanism of regulatory influence from the social layer imposing the coordination effects of established institutions. Although both HEIs have a different learning model yet can create a delicate balance by managing the service level and social level challenges.

Analysis of the value co-creation process and its centrality in resource integration yielded key insights from the studied educational complex systems. We could confidently suggest that higher education institutions present a genuine example of complex service systems linking human and digital actors. Complexity is a logical outcome of the value co-creation within a network of actors at HEIs and is reflected in the service interactions occurring at individual, group, structure and organizational levels. In order to manage this complexity HEIs need to create a service vision that oscillate between contexts at multiple levels. They need to zoom in at the interaction level to understand the motives, roles and issues faced by actors during the service interaction-based practices. Also, they need to zoom out to understand the interactions occurring at service system and ecosystem levels.

It is also evident from our findings that occurrence of interactions across multiple levels are influences from legal, social and cultural forces which cast and impact and are consequently impacted by resource integration i.e. institutional influences. Service systems analysis perhaps is one of the best approaches practitioners could use to understand the complex web of connections within and across systems and the corresponding institutions and institutional arrangements. Institutional influences that support and guide the co-creation of value have a profound impact not only on the actor's speedy development but also in their successful engagement during the resource integration process. However, combination and recombination of resources between actors especially technology's role as a service system could yield unique value over time and service system goes through a phase of emergence with minor or major change leading to new waves of development and engagement.

Value Co-Creation Management Triad – Expedience, Engagement, and Emergence in Complex Service Systems

Value co-creation process with service for service exchanges depends on many aspects that require proactive management routines to achieve expected outcomes. Higher education institutions and service firms in general, need to manage multiple aspects of service systems to achieve sustainable offerings. Since value co-creation requires reciprocity and volunteer involvement of actors during the resource integration processes (Kelleher, O'Loughlin, Gummerus, & Peñaloza, 2020), it is necessary that actors including the digital artifacts are ready for this interaction with necessary ability and capabilities. Development of actors for technical skills for self-service technologies is not new in the service research yet interaction with digital service systems (Breidbach & Maglio, 2016) require actors to speedily respond to value propositions offered in term of courses and resources and meet certain deadlines.

Value co-creation management cycle begins prior to the resource integration process as a collaborative effort results in agile actor's readiness for value co-creation and requires contribution from a support mechanism and the corresponding coordinating institutions before the engagement phase in which resource integration processes are executed (Albinsson, Perera, & Sautter, 2016). Relative success in the expedience phase i.e. the rapid development of actors within service systems, is concurrent to achieving maximum connectivity and collaboration

for value co-creation (Sebastiani & Montagnini, 2020). Role of actor's motivation, personal interest and competencies requires HEIs to provide a support mechanism for value co-creation (Stoten David, Oliver, O'Brien, & Swain Callum, 2018). This will also lead to role clarity and judgment of consequent actions required from each actor. In tightly coupled service ecosystems HEIs through compliance and social/cultural influences constantly create pressures on actors to accomplish these desired practices.

There are many implications for practitioners in the lieu of technology-intervened value co-creation in all phases of value co-creation management triad. During the expedience and engagement phases administration and support team play their pivotal role by facilitating the transition of actors from passive to active partners in the value co-creation inducing practices. Cases studies on HEIs also reflected on the development of actors through constant support routines with provision of necessary information and guidance on role clarity (Polese, Pels, Tronvoll, Bruni, & Carrubbo, 2017). Managers need to focus on enhancing actor's engagement (Alexander Matthew et al., 2018; Jaakkola & Alexander, 2014); where, diverse actors within service systems and across complex systems need to show greater attachment to the value co-creation process through extent motivation and willingness to take part. Learning and education have been subjected to efforts on engagement (Lusch & Wu, 2012a; Uden et al., 2007), specifically on student engagement for greater knowledge acquisition and cognitive development (Lusch et al., 2010). Resource integration connects multiple actors from diversified contexts, value co-creation within complex service systems may result in emergent and unique occurrence of instances among actors giving way to unique value. However, this ongoing emergence will require practitioners to foresee new cycles of actor's development for successful engagement (Polese et al., 2017).

Limitations and Future Directions

Multiple reflective case studies are recommended by Eisenhardt and Graebner (2007), whenever, data is collected through interviews; however, it was quite evident that respondents were mostly impressionist and reflected on the positive aspects of their experiences. To solve the issue data collected from the cases studies was from actors representing multiple level and aspects of the phenomenon. During the data collection and analysis phases, all qualitative studies are subjected to researchers bias (Creswell, Hanson, Clark Plano, & Morales, 2007) and to minimize this potential risk, this attempt have used multiple systematic protocols qualitative research protocols to ensure emerging theoretical aspects are systematically linked to data. Learning at HEIs was taken as a suitable context based on systematic literature review; yet, opportunities and issues faced by higher education institutions as a complex service system might not be used as a foundation to provide clues on other researchable contexts as using the case studies for in depth insights limit the statistical generalizability.

Exploration of HEIs elaborated on a tightly coupled complex service systems viewpoint as it is quite evident that actors are, at times, forced to live with value propositions which they may not accept. This requires further exploration on the emotional dimensions of actor's response to value propositions which might be leading to negative value outcomes. Respondents indicated that role and goals clarity multiplies their ability to actively engage in resource integration process; especially, the way they maintain their relationship with other actors and during the usage of LMS and actors seem to get settled in what is required out of them. However, with actors are expected to perform multiple roles and at times simultaneously, there is need for empirical based explorations required to obtain further understanding on how variant roles impact the dynamics of value co-creation process.

Authors' contributions
Farhan Mir: design of the work, data collection, analysis, interpretation of data, and draft of the work. Dr. Abdul Rasheed: design of the work, analysis, Discussion and Review of the work. Dr. Naveda Kitchlew: Interpretation of data, language, and drafting of the work. Author 4: Findings and Interpretation of Data, Formatting and References. The author(s) read and approved the final manuscript.

Availability of data and materials
The datasets generated and/or analyzed during the current study are not publicly presented due privacy but could be shared through correspondence with the authors

Competing interests
The authors declare that they have no competing interests.

REFERENCES
1. Akaka, M. A., & Vargo, S. L. (2013). Technology as an operant resource in service (eco)systems. *Information Systems and e-business Management, 12*(3), 367-384. doi:10.1007/s10257-013-0220-5
2. Akaka, M. A., & Vargo, S. L. (2014). Technology as an operant resource in service (eco) systems. *Information Systems and e-business Management, 12*(3), 367-384. doi:https://doi.org/10.1007/s10257-013-0220-5
3. Akaka Melissa, A., & Vargo Stephen, L. (2015). Extending the context of service: from encounters to ecosystems. *Journal of Services Marketing, 29*(6/7), 453-462. doi:10.1108/JSM-03-2015-0126
4. Albinsson, P. A., Perera, B. Y., & Sautter, P. T. (2016). DART Scale Development: Diagnosing a Firm's Readiness for Strategic Value Co-creation. *Journal of Marketing Theory and Practice, 24*(1), 42-58. doi:10.1080/10696679.2016.1089763
5. Alexander Matthew, J., Jaakkola, E., & Hollebeek Linda, D. (2018). Zooming out: actor engagement beyond the dyadic. *Journal of Service Management, 29*(3), 333-351. doi:10.1108/JOSM-08-2016-0237
6. Annamalai, V. (2017). Value Co-Creation in Education: A Case Study on Engineering Education. In *Handbook of Research on Strategic Alliances and Value Co-Creation in the Service Industry* (pp. 305-324): IGI Global.
7. Auvinen, A.-M., & Smith, T. W. (2012). *Value Co-Creation in Online Education.* Paper presented at the 28th annual conference on distance teaching & learning, Madison, WI.
8. Barile, S., Lusch, R., Reynoso, J., Saviano, M., & Spohrer, J. (2016). Systems, networks, and ecosystems in service research. *Journal of Service Management, 27*(4), 652-674. doi:10.1108/JOSM-09-2015-0268
9. Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). Service innovation in the digital age: key contributions and future directions. *Mis Quarterly, 39*(1), 135-154.
10. Ben Letaifa, S., & Reynoso, J. (2015). Toward a service ecosystem perspective at the base of the pyramid. *Journal of Service Management, 26*(5), 684-705. doi:10.1108/JOSM-04-2015-0133
11. Bovill, C. (2020). Co-creation in learning and teaching: the case for a whole-class approach in higher education. *Higher education, 79*(6), 1023-1037.
12. Breidbach, C. F., Kolb, D. G., & Srinivasan, A. (2013). Connectivity in Service Systems:Does Technology-Enablement Impact the Ability of a Service System to Co-Create Value? *Journal of Service Research, 16*(3), 428-441. doi:10.1177/1094670512470869
13. 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. doi:https://doi.org/10.1016/j.indmarman.2016.03.011
14. Briscoe, G., Keränen, K., & Parry, G. (2012). Understanding complex service systems through different lenses: An overview. *European Management Journal, 30*(5), 418-426.
15. Cavallone, M., Ciasullo, M. V., Douglas, J., & Palumbo, R. J. S. i. H. E. (2019). Framing higher education quality from a business perspective: setting the conditions for value co-creation. 1-13.
16. Chandler, J. D., & Lusch, R. F. (2015a). Service systems: a broadened framework and research agenda on value propositions, engagement, and service experience. *Journal of Service Research, 18*(1), 6-22. doi:https://doi.org/10.1177/1094670514537709
17. Chandler, J. D., & Lusch, R. F. (2015b). Service Systems:A Broadened Framework and Research Agenda on Value Propositions, Engagement, and Service Experience. *Journal of Service Research, 18*(1), 6-22. doi:10.1177/1094670514537709
18. Chandler, J. D., & Vargo, S. L. (2011). Contextualization and value-in-context: How context frames exchange. *Marketing Theory, 11*(1), 35-49. doi:10.1177/1470593110393713
19. Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative research designs: Selection and implementation. *The counseling psychologist, 35*(2), 236-264.
20. Edvardsson, B., Professor Anders Gustafsson, P., Pinho, N., Beirão, G., Patrício, L., & P. Fisk, R. (2014). Understanding value co-creation in complex services with many actors. *Journal of Service Management, 25*(4), 470-493.
21. Edvardsson, B., Skålén, P., & Tronvoll, B. (2012). Service Systems as a Foundation for Resource Integration and Value Co-Creation. In L. V. Stephen & F. L. Robert (Eds.), *Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing* (Vol. 9, pp. 79-126): Emerald Group Publishing Limited.
22. 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. doi:10.1007/s11747-010-0200-y
23. Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal, 50*(1), 25-32.
24. Ekman, P., Raggio, R. D., & Thompson, S. M. (2016). Service network value co-creation: Defining the roles of the generic actor. *Industrial Marketing Management, 56*, 51-62. doi:https://doi.org/10.1016/j.indmarman.2016.03.002

25. Frow, P., McColl-Kennedy Janet, R., Payne, A., & Govind, R. (2019). Service ecosystem well-being: conceptualization and implications for theory and practice. *European Journal of Marketing, 53*(12), 2657-2691. doi:10.1108/EJM-07-2018-0465

26. Frow, P., McColl-Kennedy, J. R., Hilton, T., Davidson, A., Payne, A., & Brozovic, D. (2014). Value propositions: A service ecosystems perspective. *Marketing Theory, 14*(3), 327-351.

27. Frow, P., & Payne, A. (2011). A stakeholder perspective of the value proposition concept. *European Journal of Marketing, 45*(1/2), 223-240. doi:10.1108/03090561111095676

28. Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods, 16*(1), 15-31.

29. Glaser, B. G., & Holton, J. (2005). Staying open: The use of theoretical codes in grounded theory. *The Grounded Theory Review, 5*(1), 1-20.

30. Gummesson, E., Mele, C., & Polese, F. (2019). Complexity and viability in service ecosystems. *Marketing Theory, 19*(1), 3-7. doi:10.1177/1470593118774201

31. Gummesson, E., Mele, C., Polese, F., Barile, S., & Polese, F. (2010). Linking the viable system and many-to-many network approaches to service-dominant logic and service science. *International Journal of Quality and Service Sciences*.

32. Gummesson, E., Mele, C., Polese, F., Breidbach, C. F., Brodie, R., & Hollebeek, L. (2014). Beyond virtuality: from engagement platforms to engagement ecosystems. *Managing Service Quality*.

33. Hansen, A. V. (2020). Value co-creation in service marketing: A critical (re) view. *International Journal of Innovation Studies*.

34. Hein, A., Schreieck, M., Riasanow, T., Setzke, D. S., Wiesche, M., Böhm, M., & Krcmar, H. (2020). Digital platform ecosystems. *Electronic Markets, 30*(1), 87-98. doi:10.1007/s12525-019-00377-4

35. Jaakkola, E., & Alexander, M. (2014). The Role of Customer Engagement Behavior in Value Co-Creation:A Service System Perspective. *Journal of Service Research, 17*(3), 247-261. doi:10.1177/1094670514529187

36. Kelleher, C., O'Loughlin, D., Gummerus, J., & Peñaloza, L. (2020). Shifting Arrays of a Kaleidoscope: The Orchestration of Relational Value Cocreation in Service Systems. *Journal of Service Research, 23*(2), 211-228. doi:10.1177/1094670519882495

37. Koskela-Huotari, K., & Vargo, S. L. (2016). Institutions as resource context. *Journal of Service Theory and Practice, 26*(2), 163-178.

38. Lusch, R., & Wu, C. (2012a). A service science perspective on higher education linking service productivity theory and higher education reform.

39. Lusch, R., & Wu, C. (2012b). A service science perspective on higher education: Linking service productivity theory and higher education reform. *Center for American Progress, August*.

40. Lusch, R. F., & Nambisan, S. (2015a). Service Innovation: A Service-Dominant Logic Perspective. *Mis Quarterly, 39*(1), 155-175.

41. Lusch, R. F., & Nambisan, S. (2015b). Service innovation: A service-dominant logic perspective. *MIS Q: Manag Inf Syst, 39*.

42. Lusch, R. F., Vargo, S. L., & Tanniru, M. (2010). Service, Value Networks and Learning. *Journal of the academy of marketing science, 38*(1), 19-31. doi:10.1007/s11747-008-0131-z

43. Maglio, P. P., & Spohrer, J. (2008). Fundamentals of Service Science. *Journal of the academy of marketing science, 36*(1), 18-20.

44. Maglio, P. P., Vargo, S. L., Caswell, N., & Spohrer, J. (2009). The service system is the basic abstraction of service science. *Information Systems and e-business Management, 7*(4), 395-406. doi:10.1007/s10257-008-0105-1

45. Matthies, B. D., D'Amato, D., Berghäll, S., Ekholm, T., Hoen, H. F., Holopainen, J., . . . Toppinen, A. (2016). An ecosystem service-dominant logic?–integrating the ecosystem service approach and the service-dominant logic. *Journal of Cleaner Production, 124*, 51-64.

46. Meynhardt, T., Chandler, J. D., & Strathoff, P. (2016). Systemic principles of value co-creation: Synergetics of value and service ecosystems. *Journal of Business Research, 69*(8), 2981-2989.

47. Michel, S., Brown, S. W., & Gallan, A. S. (2008). An expanded and strategic view of discontinuous innovations: deploying a service-dominant logic. *Journal of the academy of marketing science, 36*(1), 54-66. doi:https://doi.org/10.1007/s11747-007-0066-9

48. Ng, S. C., Sweeney, J. C., & Plewa, C. (2019). Managing Customer Resource Endowments and Deficiencies for Value Cocreation: Complex Relational Services. *Journal of Service Research, 22*(2), 156-172. doi:10.1177/1094670518812195

49. Normann, R. (2001). *Reframing business: When the map changes the landscape*: John Wiley & Sons.

50. Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International journal of service industry management, 14*(2), 160-172.

51. Payne, A. F., Storbacka, K., & Frow, P. (2007). Managing the co-creation of value. *J Acad Mark Sci, 36*. doi:10.1007/s11747-007-0070-0

52. Peters, L. D. (2016). Heteropathic versus homopathic resource integration and value co-creation in service ecosystems. *Journal of Business Research, 69*(8), 2999-3007.

53. Polese, F., Pels, J., Tronvoll, B., Bruni, R., & Carrubbo, L. (2017). A4A relationships. *Journal of Service Theory and Practice, 27*(5), 1040-1056. doi:10.1108/JSTP-05-2017-0085

54. Prahalad, C. K., & Ramaswamy, V. (2004). Co-creating unique value with customers. *Strategy & leadership, 32*(3), 4-9.

55. Ramaswamy, V. (2009). Co-Creation of Value — Towards an Expanded Paradigm of Value Creation. *Marketing Review St. Gallen, 26*(6), 11-17. doi:10.1007/s11621-009-0085-7

56. Ramaswamy, V., & Gouillart, F. (2010). Building the Co-Creative Enterprise. *Harvard business review, 88*(10), 100-109.

57. Ramaswamy, V., & Ozcan, K. (2018). What is co-creation? An interactional creation framework and its implications for value creation. *Journal of Business Research, 84*, 196-205.

58. Ranjbarfard, M., & Sureshjani, M. H. (2018). Offering a framework for value co-creation in virtual academic learning environments. *Interactive Technology and Smart Education.*

59. Saha, V., Mani, V., & Goyal, P. (2020). Emerging trends in the literature of value co-creation: a bibliometric analysis. *Benchmarking: An International Journal, 27*(3), 981-1002. doi:10.1108/BIJ-07-2019-0342

60. Sarasvathy, S. (2008). Effectuation: Elements of entrepreneurial orientation. In: Edward Elgar Publishing, Cheltenham, UK.

61. Sebastiani, R., & Montagnini, F. (2020). Actor Engagement in Service Ecosystems: Innovating Value Co-Creation in Food Retail. In *Handbook of Research on Retailing Techniques for Optimal Consumer Engagement and Experiences* (pp. 400-420): IGI Global.

62. Sklyar, A., Kowalkowski, C., Sörhammar, D., & Tronvoll, B. (2019). Resource integration through digitalisation: a service ecosystem perspective. *Journal of Marketing Management, 35*(11-12), 974-991. doi:10.1080/0267257X.2019.1600572

63. Soini, K., Korhonen-Kurki, K., & Asikainen, H. (2019). Transactional learning and sustainability co-creation in a university – business collaboration. *International Journal of Sustainability in Higher Education, 20*(6), 965-984. doi:10.1108/IJSHE-11-2018-0215

64. Storbacka, K., Brodie, R. J., Böhmann, T., Maglio, P. P., & Nenonen, S. (2016). Actor engagement as a microfoundation for value co-creation. *Journal of Business Research, 69*(8), 3008-3017.

65. Stoten David, W., Oliver, S., O'Brien, J., & Swain Callum, G. (2018). Co-creation and online learning: A case study of online discussion boards at an English business school. *Journal of Applied Research in Higher Education, 10*(1), 44-60. doi:10.1108/JARHE-06-2017-0068

66. Taylor, S. A., Hunter, G. L., Zadeh, A. H., Delpechitre, D., & Lim, J. H. (2019). Value propositions in a digitally transformed world. *Industrial Marketing Management.* doi:https://doi.org/10.1016/j.indmarman.2019.10.004

67. Tejedor, G., Segalàs, J., & Rosas-Casals, M. (2018). Transdisciplinarity in higher education for sustainability: How discourses are approached in engineering education. *Journal of Cleaner Production, 175*, 29-37.

68. Uden, L. (2011). Towards a New Model of Co-Creation of Value in E-Learning Service Systems. *International Journal of Interactive Communication Systems and Technologies (IJICST), 1*(1), 36-49. doi:10.4018/ijicst.2011010103

69. Uden, L., Wangsa, I. T., & Damiani, E. (2007). *The future of E-learning: E-learning ecosystem.* Paper presented at the Digital EcoSystems and technologies conference, 2007. DEST'07. Inaugural IEEE-IES.

70. Vargo, S. L., & Akaka, M. A. (2012). Value Cocreation and Service Systems (Re)Formation: A Service Ecosystems View. *Service Science, 4*(3), 207-217. doi:10.1287/serv.1120.0019

71. Vargo, S. L., Akaka, M. A., & Vaughan, C. M. (2017). Conceptualizing value: a service-ecosystem view. *Journal of Creating Value, 3*(2), 117-124.

72. Vargo, S. L., & Lusch, R. F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of marketing, 68*(1), 1-17. doi:doi:10.1509/jmkg.68.1.1.24036

73. Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: Continuing the evolution. *J Acad Mark Sci, 36*. doi:10.1007/s11747-007-0069-6

74. Vargo, S. L., & Lusch, R. F. (2012). The nature and understanding of value: A service-dominant logic perspective. In *Special Issue–Toward a Better Understanding of the Role of Value in Markets and Marketing* (pp. 1-12): Emerald Group Publishing Limited.

75. Vargo, S. L., & Lusch, R. F. (2014). Inversions of service-dominant logic. *Mark Theory, 14*. doi:10.1177/1470593114534339

76. Vargo, S. L., & Lusch, R. F. (2016). Institutions and axioms: an extension and update of service-dominant logic. *Journal of the academy of marketing science, 44*(1), 5-23. doi:https://doi.org/10.1007/s11747-015-0456-3

77. Vargo, S. L., & Lusch, R. F. (2017). Service-dominant logic 2025. *International Journal of Research in Marketing, 34*(1), 46-67.

78. Vargo, S. L., & Lusch, R. F. (2018). *The SAGE handbook of service-dominant logic*: SAGE Publications Limited.

79. 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. doi:https://doi.org/10.1016/j.emj.2008.04.003

80. Vargo, S. L., Wieland, H., & Akaka, M. A. (2015). Innovation through institutionalization: A service ecosystems perspective. *Industrial Marketing Management, 44*, 63-72.

81. Wieland, H., Polese, F., Vargo, S., & Lusch, R. (2012a). Toward a service (eco) systems perspective on value creation.

82. Wieland, H., Polese, F., Vargo, S. L., & Lusch, R. F. (2012b). Toward a service (eco) systems perspective on value creation. *International Journal of Service Science, Management, Engineering, and Technology (IJSSMET), 3*(3), 12-25.

83. Yin, R. K. (1994). Case study research: design and methods. Applied social research methods series, 5. *Biography, Sage Publications, London*.

84. Zhang, T., Lu, C., Torres, E., & Chen, P.-J. (2018). Engaging customers in value co-creation or co-destruction online. *Journal of Services Marketing*.