

Review

A Comparative Analysis of Co-Production in Public Services

Pwint Kay Khine ^{1,*}, Jianing Mi ² and Raza Shahid ³

¹ Ph.D. scholar, School of Management, Harbin Institute of Technology, Harbin, China; pkaykhine@gmail.com

² Professor, School of Management, Harbin Institute of Technology, Harbin, China; mijianing@126.com

³ Ph.D. scholar, School of Management, Harbin Institute of Technology, Harbin, China; razashahid@hit.edu.cn

* Correspondence: pkaykhine@gmail.com

Abstract: The purpose of this study is to explore conceptual approaches in co-production studies and to examine current research trends of the study. The conceptual paper includes research articles related to co-production in public administration field. By thoroughly scrutinizing 32 research works of co-production, this study highlights major loopholes in the field of the study. The contributions of the study are: (1) identifying two common characteristics of co-production, (2) categorizing three types of co-producing by end-users, and (3) finding that goals and success of co-production are more beneficial for service providers though its initial approach is citizen-centric approach. We suggest that future studies should be (1) to focus on reasons for co-production failures or success, (2) to discover further hindrances for co-production in service production, (3) to examine influencing factors on service providers as well as institutional impacts on co-production process, and (4) to include practical assessment in co-production study.

Keywords: co-production; knowledge production; public services

1. Introduction

Co-production or citizen engagement in public services is not a new concept as people have been experiencing it since long before. The concept of 'co-production' becomes popular when governments as well as citizens are trying to find solutions for challenges and issues in public sectors by increasing collaboration in public services. This is owing to promising outcomes attained through co-production such as increasing efficiency and effectiveness of public services.

The concept of co-production has been recognized its importance since Elinor Ostrom introduced it in 1970s [1]. Multiple progress and changes have been made through the course of studies. Co-production can be found in all public services. Features of co-production are beneficial to civil community and service providers in terms of creating public and private values. Despite the popularity of co-production, there remain key challenges due to repetitive studies.

The foremost challenge for the co-production study is a difficulty to find the most significant research gap. We regard the root cause of this challenge is by a reason of conflicts related to definitions. Common arguments in co-production studies are about defining co-production in which whether to contain active or passive users [2], whether to include direct or indirect contributions [3], whether to include voluntary or involuntary inputs [4], whether in only service delivery or all other public service stages [5]. At some points, co-production researchers have come to consensus. Studies are futile in identifying co-production since overlapping studies are unavoidable. Apart from many definitions of co-production are either too broad or overlapped, being inapplicable in practice is added another weak point to co-production study.

This paper is an attempt to portray all different facets of co-production. As co-production study is notorious for definitions related conflicts, this paper will propose an inclusive definition of co-production. The study is conducted to detect frequently neglected areas and to observe carefully the current trend in the field of study so as to reveal significant components of co-production. The aim is to explore conceptual approaches in co-production studies, to suggest for future studies based on literature findings and lastly, to facilitate contributions in the co-production literatures to narrow the gap between theory and practice.

This study is organized as follows. In Sect. 1, we introduce the aim and the scope of this study. Then, in Sect. 2, we present the methodology of the systematic literatures reviews. In Sect. 3, we classify the characteristics of co-production including determinants of co-production, focus areas of co-production studies and different practices of co-production. In Sect. 4, we discuss the main concepts related to co-production including our findings and suggestions. In Sects 5 and 6, we present limitations of the study and conclude the study.

2. Materials and Methods

In this paper, we ask what are the most significant and yet most ignored research gaps in co-production. To achieve that, we review co-production definitions and studies throughout the years. This study is a content analysis by using qualitative methods of analysing co-production definitions in public administration field. We reveal least focused areas of the field of study. Through our observations, we expose the whole picture of co-production which will facilitate for future studies.

A total of 32 research work is selected and examined to expand our understanding of the field of study as well as to detect the causes of debates which covers from 1971 to date. Selected research works are as follows:

Table 1. List of literatures

No.	Author	Title
1	V. Ostrom and E. Ostrom (1977)	Public Goods and Public Choices
2	R. Parks, P. Baker, L. Kiser, R. Oakerson, E. Ostrom, V. Ostrom, S. Percy, M. Vandivort, G. Whitaker and R. Wilson (1981)	Consumers as Co-Producers of Public Services: Some Economic and Institutional Considerations
3	J. Brudney and R. Eng-land (1983)	Towards a Definition of the Co-production Concept
4	P. Dabholkar (1990)	How to improve perceived service quality by increasing customer participation
5	W. J. Pammer (1992)	Administrative norms and the co-production of municipal services
6	E. Ostrom (1996)	Crossing the great divide: coproduction, synergy, and development
7	N. Bendapudi and R. P. Leone (2003)	Psychological implications of customer participation in co-production
8	A. Joshi and M. Moore (2004)	Institutionalised Co-production: Unorthodox Public Service Delivery in Challenging Environments

9	J. Ackerman (2004)	Co-governance for accountability: Beyond "exit" and "voice"
10	T. Brannan, P. John and G. Stoker (2006)	Active citizenship and effective public services and programmes: How can we know what really works?
11	S. Auh, S. J. Bell, C. S. McLeod and E. Shih (2007)	Co-production and customer loyalty in financial services
12	T. Bovaird (2007)	Beyond engagement and participation: User and community coproduction of public services
13	C. Needham (2008)	Realising the Potential of Co-production: Negotiating Improvements in Public Service
14	D. McKenzie, T. A. Whiu, D. Matahaere-Atariki, K. Goldsmith and T. P. Kokiri (2008)	Co-production in a Māori Context
15	J. Stewart (2009)	The dilemmas of engagement: the role of consultation in governance
16	D. Boyle and M. Harris (2009)	The Challenge of Co-production. How equal partnerships between professionals and the public are crucial to improving public services
17	S. Bailey (2011)	The evolving governance of public services in England: Extending competition, choice, co-design and co-production
18	V. Pestoff (2012)	Co-production and Third Sector Social Services in Europe: Some Concepts and Evidence
19	B. Verschuere, T. Brandsen and V. Pestoff (2012)	Co-production: The state of the art in research and the future agenda
20	B. Ewert and A. Evers (2012)	Co-production: Contested meanings and challenges for user organizations
21	J. Thomas (2013)	Citizen, customer, partner: Rethinking the place of the public in public management
22	V. J. J. M. Bekkers, L. G. Tummers and W. H. Voorberg (2013)	From public innovation to social innovation in the public sector: A literature review of relevant drivers and barriers
23	S. P. Osborne and K. Strokosch (2013)	It takes two to tango? Understanding the co-production of public services by integrating the services management and public administrative perspectives
24	C. Durose, C. Mangan, C. Needham, J. Rees and M. Hilton (2013)	Transforming local services through co-production. A policy review

25	J. Alford and S. Yates (2015)	Co-production of public services in Australia: The Roles of Government Organisations and Co-producers
26	M. Howlett, A. Kekez Kostro and O. Poocharoen (2015)	Merging policy and management thinking to advance policy theory and practice: Understanding co-production as a new public governance tool
27	J. Fledderus and M. Honingh (2016)	Why people co-produce within activation services: The necessity of motivation and trust-an investigation of selection biases in a municipal activation programme in the Netherlands
28	M. Farr (2016)	Co-production and value co-creation in outcome-based contracting in public services
29	T. Nabatchi, A. Sancino and M. Sicilia (2017)	Varieties of participation in public services: The who, when, and what of coproduction
30	C. Durose, C. Needham, C. Mangan and J. Rees (2017)	Generating 'good enough' evidence for co-production
31	K. Allen, C. Needham, K. Hall and D. Tanner (2019)	Participatory research meets validated outcome measures: Tensions in the co-production of social care evaluation
32	K. Oliver, A. Kothari and N. Mays (2019)	The dark side of coproduction: do the costs outweigh the benefits for health research?

3. Characteristics of co-production

Co-production is a process when there is a greater participation of end-users in social policy processes [6]. Participations can be between professionals and end-users in a form of regular and long-term relationships [7]. As collaborations between government and non-governmental organizations can affect quality and quantity of services [8], co-production becomes a center of attention in public administration study. The application of co-production becomes a contemporary practice by including it in designing or planning of public services under New Public Governance (NPG) [9].

Co-production can also be an activity done by any individual outside the government either to collaborate with government or to independently produce with the support of government [10]. Some scholars regard co-production as an internal cooperation process between service providers and users in the process of public service delivery [11] [12] [13].

Co-production has been regarded as the best practice for co-generate actionable knowledge [14]. Collaboration between researchers and users of research will generate more accessible, relevant, and credible knowledge [15]. Interactions and engaging with public is seen as a way to narrow the gap between science and society. Collaborations in co-production process can be with individual or third sectors or organized groups. Some researchers only focus on categorizing stakeholders in co-production of public services [16] [3] [17]. In general, any involvement of citizens in public service delivery and policy making is defined as co-production [18].

Since given the fact that governments alone are unable to provide services, it is natural to receive assistances from public with the aim to improve quality of public services.

Governments around the world are facing challenges and problems in public service delivery, albeit there is an opportunity of civil engagement in public services. A plausible solution for them is to utilize co-production as a policy tool to utilize their opportunities for collaboration with public. The process of co-production is to maximum use of resources and contributions by stakeholders including professionals and non-professionals, individually or collectively [19], with the purpose to achieve greater efficiency [6].

Initially, the focus of co-production study is on citizens' ability to produce services. Co-production occurs when individuals from different organizations contribute inputs in services [20], i.e. joining hands of government agencies and non-governmental organizations in service production.

Some scholars separate co-production from other interconnected terms such as co-management and co-governance [21], whereas some researchers distinguish two perspectives of co-side and production-side [22]. Under the co-side, co-production can be categorized as individual and groups participation in the process of public services [23]. In addition, some scholars distinguish three categories by accumulating collective co-production as the third one [24].

For the production-side, some researchers define co-production limited only on the delivery stage [25] [26] [27]. Some scholars assume that co-production occurs in all service stages of production including planning, design, managing, delivering, monitoring and evaluation [28] [29] [30].

Knowledge translation or knowledge co-production occurs when there is a continuous interaction among various groups of service providers and service users [31]. In knowledge co-production, citizens are active participants to contribute important knowledge and resources to use [32]. All stakeholders in co-production process are responsible in exchanging and creating of knowledge [33]. Stakeholders can be ranging from planning stage to delivering stage: policymakers, decision-makers and managers, relevant service personnel of different levels, partners, community organizations, the media and the wider public. Both researchers and practitioners need to enhance collaboration to produce actionable knowledge through co-production.

Knowledge co-production is the practice of knowledge from different sources to address common problems and to build a mutual understanding of the local problems [34]. Stakeholders in knowledge co-production take part in a role as an active provider rather than being a passive receiver.

Major benefits of co-production which many studies revealed are to prevent public problems [35], to increase efficiency and effectiveness of public services [36] and to provide higher quality of services with the help of public [37]. As benefits of citizens' participation is huge, it is essential to examine the capacity of citizens to co-produce [38]. According to Whitaker (1980), there are three categories of activities occur during co-production which are: (1) citizens request to service providers for services, (2) citizens offer inputs to service providers, and (3) interaction between citizens and service providers [39]. All these types are related to stakeholders of citizens and service providers.

Some scholars point out that willingness of stakeholders is needed to consider as an important element in co-production [7] [40] [25]. Willingness of citizens to co-produce can be effected by factors including socio-economic attributes and attitudes. For instance, people are willing to co-produce only when they regard their contribution is worthwhile.

The scope of co-production can also be affected by the attitudes of public officials and politicians [41] and it can also simultaneously affect organizational structure. We assume that there are impacts from all stakeholders and at the same time, there can expect tensions in every interaction.

3.1. Determinants of co-production

Both human and financial resources of organization are determinants of co-production [42]. Economic resources provided by an organization are vital sources for the process

of co-production. Performance of public organization is another determinant of co-production [43]. Responsibilities and rights of governments may be affected due to citizens' involvement in the public services [44]. New technology or new setting can cause diversities of co-production [45].

Researchers give attentions on values created in co-production process [30] [21]. Values related to co-production are openness, salience, inclusion, credibility, trust, legitimization and usability of knowledge co-production. Studies show that co-production is positively related to flow of information or engagement of consultation [40]. Related to flow of information, democratic values such as accountability and transparency become determinants in co-production.

3.2. Focus areas of co-production studies

It is observed that co-production exists in all sectors of public services such as local governance, police, education, healthcare, social, agriculture, and information technology, etc. We find that the utmost focus of the study is on local governance and the least focus area is information technology.

Local governance studies focus on governments, especially at higher levels, with the purpose to achieve greater inter-organizational networking, self-regulation and self-management in contemporary government. When systems transform politically, socially and economically, a standard tradition of providing public services becomes incompatible with changes. Governments are no longer a sole provider of public services. Individuals or non-governmental agencies are invited to join in decision making and service delivery to bear the shared responsibilities.

Education and healthcare sectors are the second-most research focus areas of co-production as public generally tend to expect higher quality of healthcare and education. In the knowledge co-production context, patients as well as students become active participants beyond traditional role as passive users. However, it is necessary for them to recognize their active role as co-producers and their contributions by means of experiences and perspectives [46].

In the medical context, co-production is known as patients' engagements. The more patients engage with service providers, the more beneficial the outcomes become. Patients' engagement in medical services is a common characteristic of healthcare sector. The governments are trying to reduce healthcare costs which can be done by improving quality of services and patients' quality of life [47]. Interactions between professionals and patients in service co-production could increase not only the involvement of stakeholders but also the quality of healthcare service. When in the time of need, for instance during Covid-19 outbreak, we have witnessed that general public are more willing and more engaged in healthcare services collaboration. Governments are also relying on public including to follow restricted rules to contain virus and produce medical supplies. With voluntary engagement of citizens, we have seen evidences that co-production is an effective and efficient tool for public services.

Disaster management is another area where we can find community's involvement. Studies related to co-production in disaster management are mostly in the disaster-prone location like Japan. Many empirical analysis have been explored based on the Japanese experience of co-production which mainly include the assistance of volunteers from general public. Success in disaster management programs are due to the capacity of Japanese people to co-produce.

Policing is an area where studies of co-production have been emphasized, despite research attention on this area is far behind that of social and healthcare sectors. Since there is always a natural misunderstanding in the relationship between police forces and general public [48], we can assume that citizens' involvement in security could be a solution to resolve pre-existed misperceptions.

Knowledge co-production research in agriculture is at the beginning stage. In the co-production study of agriculture sector, farmers are end-users. Knowledge and experiences of local farmers is considered as significant inputs in decision making process [49].

From the aspect of knowledge co-production, climate change is the rising focus of researchers with the aim to improve climate knowledge exchanging between governments, scientists, and the community. Climate services contribute linkages between decision-makers and the community with the useful information [50]. Integrating of actors outside the government in public services is assuring the success of co-production as well as influence the participation in decision-making processes. It becomes popular to develop knowledge and practices with the aim to support adaptation decisions. Nevertheless, co-production in climate change, especially in developing country is still under study. This is because both government and public unaware the role of co-production in the development process.

The least focus area for co-production study is information technology although information technology facilitates an easy path to deliver public services. Public service delivery should be provided through online platforms in executing e-governance. New media platforms enhance quality of co-production [51] as well as information flow between governments and citizens. Online platforms make convenient for service providers, especially in dealing with new challenges of changing societies and citizens. It also helps to promote improved citizenship through social production of public services.

3.3. Different practices of co-production

Scholars prove that different regimes, environmental attributes, and community characteristics can result different practices of co-production [52]. There are two dimensions in practices: generation of actionable knowledge and transformation of norms and structures within science and society [15]. In the first dimension, outcomes is centered on benefits that emerge from the production and dissemination of decision-relevant knowledge and services. In the second dimension, outcomes may change societal power structures and political systems and may also reorder the relationship between science and society.

Different disciplines practice co-production in a different way. Co-production in disaster and crisis management is approached by top-down control [53] whereas in epidemic, it is more practical to use bottom-up control [54]. Hence, co-production in different disciplines require different controls. For digital co-production, both top-down and bottom-up approaches need to be balanced [55]. Some studies point out that different conditions such as jurisdictions, government levels, and policy domains, could result differences in co-production practice [56]. Co-production in different controls while considering the impact of different conditions is necessary to explore in the field of study.

It is difficult to be programmed into public sector activity [57] since co-production can occur asymmetrically. In the IT age, online co-production and its drivers remain unexplored. Practices of online co-production remain under study. More quantitative works are needed in co-production study, particularly in analyzing relationships between drivers and impacts of co-production.

4. Discussion

When we observe through co-production studies and different definitions, we find that the terms mostly used to define 'co-production' are relationship, process, concept, activity and involvement. There are different definitions of co-production mentioning as a vehicle, a way, an approach, a policy tool, an instrument, a goal, a means, an arrangement, an idea, one way, the degree, joint working or joint production of outcomes as well as public good.

In relationship measure, scholars refer as partnership, potential relationship, equality and changing relationship, interrelationships, equal and reciprocal relationship, regular and long-term relationships, intrinsic and involuntary element.

For process measure, scholars mention as internal cooperation process, intrinsic process of interaction and distinguishing characteristic of service process. In activity measure, they describe as a mix of activities, actions by citizens and fundamental phenomenon of service activities. Some scholars restrict co-production in one or more phases of service production whereas many others regard that co-production occurs in a wide variety of activities in any phase or type of public services.

As a conceptual measure, researchers describe co-production as revolutionary concept, an umbrella concept or a combining concept with specific process like service delivery. Many scholars on co-production have reached consensus on practicing of co-production in public service delivery.

For participation or involvement measure, scholars define co-production as a simple participation or constructive customer participation, a participative element, a form of public involvement, both involvement and investment of individuals.

We observe two characteristics of co-production. Firstly, a condition to be named as co-production is required to be direct and active, sometimes positive contributions in service production. Scholars define qualities of contributions as meaningful and cooperative contributions. In co-producing process, it can be expected that more quality assured and outcomes are more in tune with community needs. The second condition in co-production is that all public services are for the benefit of general public based on the citizen-centered logic.

Citizens or end-users contribute inputs such as resources, skills and capabilities, user empowerment, interactive communication, in some cases just necessary negotiation. Researchers describe qualities for contributors as active, assertive or positive, compliance, voluntary, capable and responsible.

Different researchers describe co-production with different goals to achieve. We find that there are basically eight categories of goals in co-production studies:

1. Democratic values related goals
2. Relationship related goals
3. Outcomes related goals
4. Services related goals
5. Policy goals
6. Identification of solutions and challenges goals
7. Users related goals
8. Institutions related goals, and
9. Market-oriented perspective.

We perceive that all of these goals are from the aspect of State or service providers to use co-production as a tool. We can assume that service providers and service users have different perspectives. So, these goals of studies are different from actual goals of citizens, especially in the case of citizens' initiative public services either with or without the assistance of the State. Once governments notice the potential of citizens' contributions in public services, they try to use co-production as a tool to achieve goals. In many developing countries, the impact of co-production or the role citizens in public service production, especially in decision-making or policy making stage, remain greatly ignored. This is due to professionals' fear of power shifting to people and their rejection to growing of citizens' control [58]. These kind of hindrances for co-production is required to be explored.

When we examine studies related to co-production, we find researches are emphasizing on who are co-producers, how they co-produce, where they co-produce and what they co-produce. However, questions related to when they co-produce is rarely addressed.

Basically, co-producers are providers and contributors. The variety of terms used through co-production literatures, which all can be interchangeable, are shown in the following Table-2:

Table 2. Terms of usage

Category	Different terms used for each category
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Providers	Public service providers, public organizations, professionals of non-profits or private organizations, government agencies, paid employees of an organization, government, public actors, state actors (governmental or non-governmental actors who regularly produce the service), public service agents, public sector professionals, any service organizations, professional providers of public services, suppliers, state agencies, regular producers, policy makers
Contributors	(Local) Citizens, citizens organized into polycentric systems, non-governmental actors, individuals, (organized) groups or crowds, (highly knowledgeable) end-users, consumers, consumer producers (who produce for consumption), (groups of) individual citizens from different organizations, any individual outside the government, service users, their families and their neighbours, civic community, communities, policy target, private actors, public actors, local residents, lay actors, (multiple) stakeholders, NGOs, clients, third sector, voluntary sector, (private) non-profit sector, social economy, civil society, patron, receivers or people at receiving end

We find that actors/stakeholders are co-producing by means of (1) contributing knowledge and experiences, (their own) resources and capacities, time and efforts, (2) (jointly) involving of individual or (organized) groups in producing public goods and services or policy making, and (3) communicating or responding among providers and users for different purposes.

Some co-production researchers assume that co-production occurs either on service delivery and/or few other service stages, whereas many scholars ascertain that co-production occurs in all different stages of public services. The flow chart of service production stages are illustrated as **Figure 1.**:



Figure 1. Flow of services stages

4.1. Factors in co-production

We categorise three influencing factors in co-production studies: (1) influencing factors on actors/stakeholders, (2) influencing factors on co-production process, and (3) influencing factors of co-production.

Influencing factors on actors are mostly favourable conditions for them to co-produce. These factors are compatibility of public organizations with citizen participation,

clear incentives for co-production, open attitude towards citizen participation, willingness of politicians to put trust on citizens' decision making, and lastly, risk aversion by both organizations and citizen side [41]. Citizens will co-produce when there is a favourable condition for co-production. Apart from a risk factor, all other factors are mainly emphasis on citizens. This is due to the whole concept is depending on the citizen-centric approach. As there are less studies on influencing factors on service providers, future research should focus on it.

Influencing factors on co-production process include customer awareness and ownership, social capital, mind-set of public servants and their political masters, public decision-making, people's preferences as well as tension between user and providers. Most of these influencing factors are behavioural influences. However, institutional influences on the co-production process is neglected in the co-production studies.

Influencing factors of co-production itself are on policy landscape, its negative effect on customers' evaluation, and impacts of its success and failure on users' attributes and attitudes. We find that a limited numbers of studies are emphasizing on impacts of co-production. So, future studies should focus on institutional influences on co-production process and impacts of coproduction.

4.2. Benefits of co-production

Benefits of co-production include addressing societal challenges, providing useful alternative way to design and deliver public services, flourishing democratic values and practices, offering more efficient, effective, affordable and sustainable services, improving quantity and quality of services, promoting user empowerment, encourage affective attachment between actors and reducing prevalence of self-serving bias. We notice that many of above mentioned benefits of co-production are more advantageous for policy makers rather than service users. Hence, we suggest that policy makers should aware these massive benefits of co-production for service mechanisms and take measures to include citizens in service processes.

Outcomes of co-production

Majority of co-production studies are generally outcomes based analysis. Many of the outcomes from co-production are typically intangible results and mostly values occurred to stakeholders. In which, we distinguish two types of values: individual values and mutual values. Individual values include increasing self-esteem, enjoyment of participation or group work or gaining social approval and loyalty, etc. Mutual values contain relational values, economic values, normative values such as satisfaction for contribution, promotion of participation and democracy, public values such as responsiveness and innovation.

Although numerous studies prove series of benefits of co-production, co-production can be failed at some points. When co-production fails, the role of social presence becomes important [59]. Social presence means presence of other people in a common environment. Since social presence can influence on people's attributions and behavioral intentions, we can use it in co-production failures. Only very few researchers focus on co-production failures and yet the reasons why co-production fail is challenging to be perceived.

Since it is uncertain that co-production can always bring success, we can expect negative outcomes from co-production process. For instance, service providers may feel discouraged of additional interaction which causes increased workloads for them. Generally, positive outcomes in practices and policy changes cause the success of co-production, whereas negative values may be one of the major causes of co-production failure. This study area remains untouched. Therefore, future research should focus on causes of success and failure of co-production.

4.3. Challenges for co-production

Naturally, there are several challenges for co-production, which we categorize them into six types of group: 1. challenges related to co-production, 2. challenges related to providers, 3. challenges related to citizens, 4. challenges related to problems, 5. challenges related to process, and 6. challenges related to factors.

Details of each challenge category are presented as below:

1. Challenges related to co-production include identifying drivers and impacts of co-production, qualities of co-production, procedure of co-production and performance of co-production, promoting, managing, evaluating and sustaining of co-production initiatives, and application of co-production strategies.
2. Challenges related to providers include impacts of political loyalty or professionalism.
3. Challenges related to citizens are identifying the conditions required for citizens to co-produce.
4. Challenges related to problems are identifying social problems and problem solutions, and preventing self-serving bias.
5. Challenges related to process include implementation and ultimate success of collaborative policy process and managerial challenges related to collaboration (defining form, features and institutional characteristics).
6. Challenges related to factors include identifying key factors for effective co-production and its performance.

4.4. Reasons for co-production

Reducing costs for public service is one of the well-known advantage of co-production. This is the key motive of governments applying co-production in service processes. Sharing responsibility with citizens assure more effective and efficient public services. From citizens' perspective, when people sense that it is necessary to co-produce and recognize their capacity or role as active contributors [46], they are willing to co-produce with the aim to receive expected outputs through their inputs. Despite both sides have different motives to co-produce, all stakeholders expect for positive outcomes and success of co-production.

5. Conclusions

Co-production is a complex concept. It would be impossible to explain co-production within a limited conceptual framework. As co-production exists in every public services, it would locate in all different stages of service production. Scholars on co-production have agreed on some points such as co-production in service delivery, individual or group contribution, active user, voluntary inputs, etc. They reject any passive contribution as co-production. Few researchers counts involuntary inputs in co-production [10] [60] [4]. Based on our findings, we propose the potential definition of co-production as follows:

Knowledge co-production or co-production can be defined as any active and voluntary contributions of individual or collective end-users who are from outside the government/organization in different stages of public services including service delivery.

Through our observation, we detect drivers and impacts of co-production. The basic drivers for co-production are regular or long-term relationships between stakeholders, active users, contribution/input/resources, new setting and new technology as well as knowledge and flow of information in knowledge co-production. These drivers cause particular impacts. For instance, active users and inputs/resources have influenced on qualities and performance of public services. New setting or new technology has impacts on attitudes of end-users as well as on shared responsibilities and rights of stakeholders. Likewise, flow of information and knowledge/inputs/resources have influenced on knowledge generation, individual and mutual values of stakeholders. We also find that regular and long-term relationship between stakeholders have influences on all above mentioned impacts. We can suggest that relationships between stakeholders should be focus of future studies.

We find that the overall research gap in co-production study is a weakness in practical implication. Scholars define varieties, impacts, degrees, levels, values, etc. related to co-production. But there are very weak or lack of testing these in a practical way. Significant research gaps related to co-production are when and why co-production fails or succeeds, features of co-production in different disciplines and relationship between co-production's drivers and impacts. Regarding citizens, we find that capacity of citizen to co-produce has not been explored yet. Similarly, researches related to influencing factors on service providers as well as institutional factor on co-production process remain missing.

Future studies should also focus more on quantitative analysis to narrow science and society gap while considering the importance of time factor, especially in regular and long-term relationship of stakeholders. Future researchers should emphasise on co-production's failure so as to bring success in co-production process. It is essential to reduce the complexity of co-production study and to well-construct co-production for mutual benefit by understanding of what is co-production and what is not, its actors, their impacts and their relationships in the short and long run.

Funding: This research received no external funding.

Acknowledgments: The author would like to express the appreciation to Prof. Mi Jianing, Professor, Harbin Institute of Technology, China for providing his valuable supervision during the course of this research.

Conflicts of Interest: The authors declare no conflict of interest.

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