

Innovation System in Agricultural Downstream Supply Chain: A Systematic Literature Review and Future Challenges

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Abstract—The paper aim to investigate the current state of researches, current development, gaps and provide guidance for future research of innovation system and agricultural downstream supply chain research field. A systematic literature review (SLR) method was implemented to achieve the research objective. After applying some relevant keywords filter and including some relevant papers published in the field, 110 papers addressing the innovation system in agricultural downstream supply chain are identified for review analysis. Afterwards, the selected papers are categorized according to the topic and keyword considered. From this classification, current research and gaps in the existing literature are analysed and derived to make a current research state of innovation system (IS) and its development-relationship with agricultural downstream supply chain (ADSC) research area. Then, Potential areas guidance for future research are suggested for the development of technology diffusion and stakeholder interaction through innovation system, in order to make ADSC facing technology disruption. Our findings in this paper contribute to improving knowledge of IS-ADSC research development through analysis and systematic review of papers published in scientific journals. By doing systematic review, we claim our contribution to expand knowledge on IS, with focus on knowledge sharing/transfer and technology diffusion studies, through selected paper analysis.

Keywords— agricultural downstream supply chain, innovation system, knowledge transfer, systematic literature review, technological diffusion

1. Introduction

In the era of disruption technology and sustainability challenges, innovations play a significant role in any business competitive strategy. Innovation is a diffusion and process new concept, novel ideas, experimentation, improvement practical application and creative thoughts to find a better solution, technology, method, or re-engineering a thing or to

make something in a real-world system in order to make human-life better and easier [1],[2],[3],[4],[5]. The process of making an innovation consists of several steps, from research, commercialization and large-scale deployment [3] or some researcher called it readiness level of innovations. Understanding innovation as a system is necessary, because the innovation complexity process has dynamic aspect in the system environment and need holistic view of innovation to be able understand and develop it [6].

According to [7], innovation system is a complex set of relationship between components in the system. It is a set of networks of stakeholders/actors in the system with initiation activities, modification, improve and new technology diffusions and knowledge through innovation process. The main business sector that pay attention from researcher in the disruption of technology era for development of innovation system research is agricultural downstream supply chain that play a significant impact for human need.

Agricultural downstream supply chain involves processing commodities from agricultural post-harvest into a finished product. It means products in downstream supply chain have more value-added than post-harvest product because of the processing itself. According to [8], in order to accelerate agricultural modernization and facing a technology disruption era, innovation process through the business process should strongly considered. Hence, researches in innovation system in agricultural downstream supply chain are important and pay attention for many researches over the past decade since disruption technology concept appear in 2010 as result behind technology disruption.

Recent researches in innovation system through agricultural supply chain were focused on sustainability, technology development related to the development of technology, economy, social, energy, policy, and method innovation. Researches in the development of innovation system in agricultural downstream supply chain (IS-ADSC) is very high for the past decade. This has led to in an

appearing line of research that pays attention on several aspect (like technology or social innovation) of the development of innovation system and its impact on rapid development of agricultural downstream facing technological disruption. However, the research total in the IS-ADSC research area has growing up substantially currently. Most researches correlate to IS-ADSC theoretical discussion and also there has also been an empirical research increasing that pays attention by practitioners, academics, and researchers. Results to date are diffuse, not fully understood, lack of understanding in managerial implementation, research mechanisms and effects that have only been addressed in particular system complexities. Thus, further research attention is necessary to understand the causes and consequences of IS-ADSC research area. This improved knowledge may affect the way researchers' approach through the IS-ADSC researches and can be very insightful for the design of future research agenda.

The aim of this SLR research scrutinizes previous and current research that proposes the IS-ADSC researches and to suggest lines of study to this research area. We claim our contribution in this systematic review is providing an overview of the past and current research development of innovation process, technology and knowledge diffusion through IS-ADSC and using a multidimensional structure formulated from related keywords to categorize the studies reviewed. Our study enables multiple complexity aspects of IS-ADSC system integration to be addressed, with the main concern on integrating innovation process, technology, knowledge, economy, social, methods and sustainability innovation in IS-ADSC researches. This paper is not limited to any partial aspect of innovation system but as a complex holistic view of the innovation system and its development in IS-ADSC. We also identify from existing and past literatures and suggest directions for IS-ADSC future research. Our findings contribute to improving knowledge of IS-ADSC research development through analysis and systematic review of papers published in scientific journals. By doing systematic review, we intend to contribute to the knowledge body on IS, related to knowledge sharing/transfer and technology diffusion studies, through careful SLR analysis of filtered papers. The SLR offers a clear paper review analysis to the researcher, communities and practitioner, providing research lacking, or where literature review with more exploration is needed to identify current and future issues that have been researched. Improving IS development for knowledge sharing/transfer and technology diffusion within their field can also be used by practitioners (See [9] to learn target reader of a review paper).

The rest of this paper is constructed as follow, after introduction we describe the systematic literature review methodology in detail start from

finding question, defining keywords to analysis and synthesis of related paper from scientific journals related to IS-ADSC research. Then, we present result, present gap, and discussed current research and future research direction in IS-ADSC. The last section we provide conclusion and summarization of this paper.

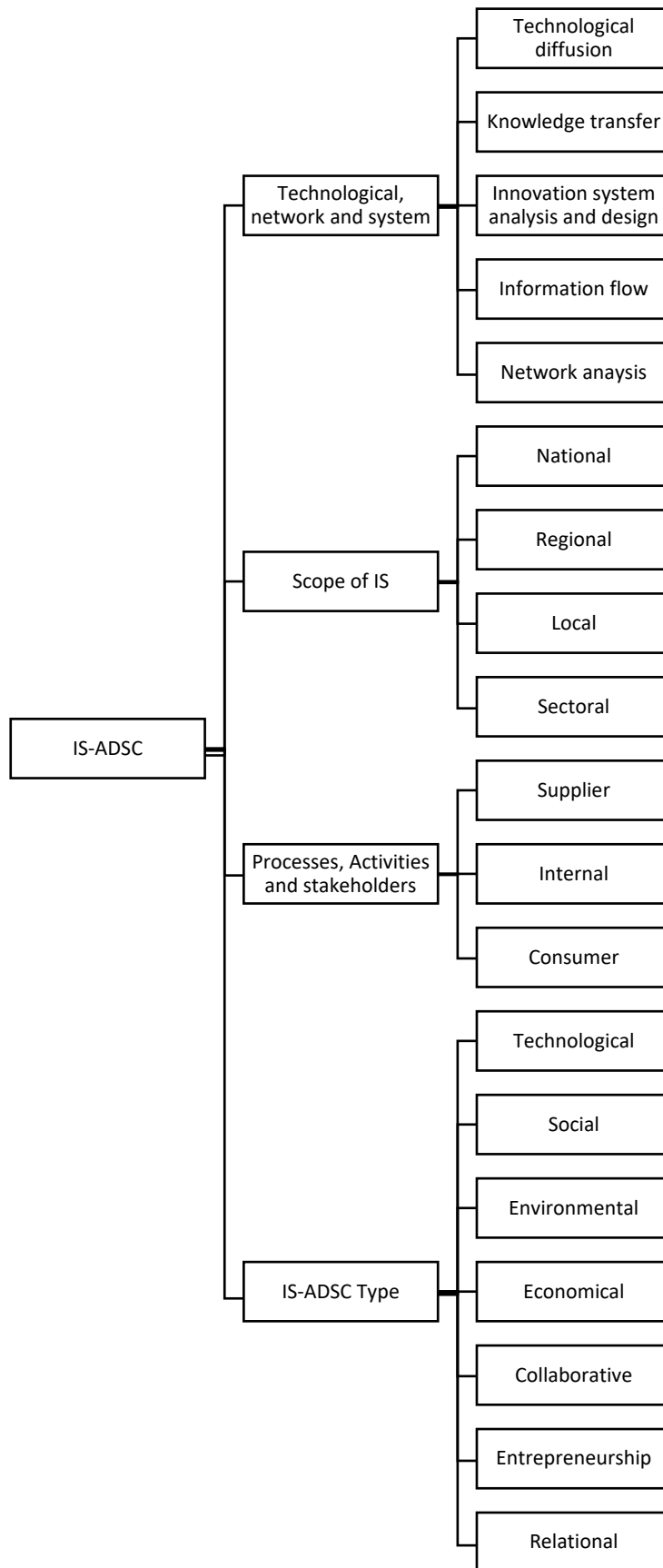
2. Methodology

Systematic Literature Review (SLR) is the most widely methodology used to systematically collect, summarize, analyze and synthesize bibliographic sources for a IS-ADSC topics with the objective of the review is to arrive at a SLR outcome based on current accumulated knowledge of previous research topics under SLR research questions. It is commonly used to find past and current state of a topics/researches studied and find future direction and recommendation from the studied research area. The main advantages of this method are allowing reasonably clear conclusions to be reached about what is already known and not known from the topic studied, consists of a number of steps that are widely accepted, and easily verified or replicated by researchers and other practitioners [10]. Therefore, the SLR's strengths are transparency, structure, steps generally accepted, and replicable compared to a simple literature review.

This step consists of 3 parallel steps named developing a study protocol, developing and evaluating research question(s) and establishing inclusion criteria. The developing a study protocol guides this SLR study and provide clear directions for the development of a study. This is an important step in SLR to design a specific approach to undertake the SLR's objective completion [9], [11].

A comprehensive and systematic literature search and selection was carried out to identify studies related to research questions related to established inclusion criteria [9]. We use a combination of keywords, indexes, and subject terms with IS-ADSC Boolean related strategies such as 'AND' and 'OR' for limiting and broadening search results. To keep focus on the theme and scope of this study, we defined multidimensional keywords related to IS-ADSC used as searching keyword (See Figure 1). In Figure 1, the multidimensional keywords framework has two level: level 1 with four-research main topics and level 2: research lines. These topics are generated into research line:

- The technological, network and system is main variables in studied in the IS-ADSC study, flowing through IS-ADSC network.
- Scope of IS is a main topic in IS-ADSC research to know the scope of IS developed through ADSC system.



Source: Own elaboration

Figure 1. Proposed keywords for the literature classification,

- Process, activities and stakeholders is a main topic in IS-ADSC and any supply chain research to know the ADSC system point of view and understand the complexities and comprehensiveness of IS-ADSC under study.
- IS-ADSC type is the last main topic considered in this study. IS-ADSC type is considered to accommodate special issue in IS-ADSC.

We also consider other layer that stand for supply chain integration flows. It is important since IS-ADSC is a study of a network and it is flows within essentially. These flows are information flow integration, physical flow integration and financial flow integration. The results of this step are shown in the next section.

3. Result and Discussion

In this section we present the previous section result. The descriptive analysis is presented based on graph, chart and statistic descriptive to make reader understand the research trend and potential research guidelines. After presenting descriptive analysis, we present literature/paper classification analysis and provide gap from the analysis. The last sub section presents our recommendation for future research in IS-ADSC research area

3.1. Descriptive analysis of IS-ADSC researches

First, previous papers were analysed chronologically based on the year of publication. Research interests related to IS-ADSC for the past decade focused on technological development, knowledge transfer and diffusion related to global issues mainly in relatively recent issues of sustainability and technological disruption is relatively new in the literature, with the 2010 study being the earliest study identified. Research interest in the IS-ADSC field has grown, especially over the past five years, with a trend continuing to the present. We found publication trend from 110 selected paper proposed in the previous step related to IS-ADSC for the past decade.

The research method used in the paper was comprehensively analysed and then implemented, with the development of a dominating model: 52% (39 papers) of all papers examined. However, an increase occurred in the use of intelligence systems (with total 22% for past 10 years) as the issue of technology disruption developed. In other hand the technology disruption issue/technology/IT issues for IS-ADSC have been analysing with descriptive and mathematical model too. Research with this methods pattern is also carried out on environmental issues. This shows that the topics of interest in this

study have been investigated from a variety of different and related methodological perspectives.

The main research main topics and research lines are identified and used in the categorization in the classification process. In this tabulation, a paper may discuss a specific research line or may discuss two or three integrated research line. Data show that “technological diffusion” and “knowledge transfer” as the most studied research topic to date in “technological, network and system” topic in IS-ADSC research. In “scope of IS” national and regional is the most studied topic proposed by previous researchers. Mostly studied for a specific country IS-ADSC. In “processes, Activities and stakeholders” topic, consumer studies stand the most studied research line. Finally, Technological, social and economic pays the most studied topic to date in IS-ADSC type along with the increasing issues of sustainability and disruption technology in IS-ADSC for the past decade

3.2. Analysis and Literature classification

This section provides a classification of the literature and the results of the analysis of the papers examined. Tables 1 and 2 are presented for each part of the research topic that shows the flow of integrated actors in the agricultural supply chain in the IS-ADSC study [11] detected in the analysed papers. The supply chain flows are (information flow -IF-, physical flow -PF- and financial flow -FF) The analysed-paper research topics and research lines is also shown. Finally, we ma a comprehensive analysis for the analysed papers with those supply chain flows: information, physical, and financial flow combined with research topics and research lines.

3.2.1. Research topic one: technological, network and system

In this research topic the identified research lines are: (1) Technological diffusion; (2) Knowledge transfer; (3) Innovation system analysis and design; (4) Information flow, and (5) Network analysis.

Technological diffusion in IS-ADSC research

In this research line, the results, contributions, highlights from these authors’ show what already known in technological diffusion research lines. Relationship between several aspects in technological diffusion researches have proposed by [85] for technology innovation and technological innovation system, [58] for innovation and market structure, [46] aquaculture development with the different approaches innovation with technology transfer analysis and [54] for adoption of ICTs and business location.

Table 1. Methodologies used in the papers analysed

Methodology	Papers	Total
AHP/ANP	[7] [12][13][14]	4
Intelligent system	[15][16][17][18][19][20][21][22][23][24][25][26][27][28][29][30] [31]	17
MCDA	[32][33][34]	3
Optimization/Modelling	[35][36][37][38][39] [40]	6
Descriptive, case study and statistical method	[41][42][43][44][45][46][47][48] [49][50][51][52][53][54][55][56][57][58][59][60][61][62][63] [64][65][66][2][67][68][69][70][71][72][9][73][74][75][8][76]	39
Hybrid	[77][78][79][80][81]	5
Other	[82][83][84]	3
Total		77

Table 2. Literature classification according to the research topics

Research main topics	Research lines	Authors	Total
Technological, network and system	Technological diffusion	[85][25][58][46][7][84][49][83][74][17][23][54][35]	13
	Knowledge transfer	[24][47][19][48][54][42][16][50][23][69][2][55]	12
	Innovation system analysis and design	[49][43][47][39][19][54][58][29][60][42][15][61]	12
	Information flow	[58][29][75][23][46][52][27][62]	8
	Network analysis	[75][23][20][33][46][80]	6
Scope of IS	National	[64][22][86][35][48][56][43][32][26][87][88][8][55][57] [28][47][38][15][39][16][29][41][46][34][50][70][49][7]	28
	Regional	[22][35][48][89][56][32][87][88][8][55][64][19][42] [47][38][15][39][16][29][69][41][46][34][86][50][54]	26
	Local	[90][91][39][92][93]	5
	Sectoral	[39][55][69][94][4][59][41][20][49][48][44]	11
Processes, Activities and stakeholders	Supplier	[93][67]	2
	Internal	[76][78][88]	3
	Consumer	[78][56][25][17][58][28][73]	7
IS-ADSC Type	Technological	[26][70][25][61][81][7][64][2]	8
	Social	[26][81][35][75][1][7][64][2][43] [93][90][16]	12
	Environmental	[17][45][90][21][54][35][61][93][26][1][29][79][57][24] [92][77][76][68][82]	19
	Economical	[38][51][68][88][93][1][25][29][17][79][19][86][39] [7][4][57][64][47][35]	19
	Collaborative	[12][93][31][8]	4
	Entrepreneurship	[16] [8]	2
	Relational	[93][81][74][71][67]	5

Most of researchers in this research line have proposed implementation of diffusion technology in order to increase IS-ADSC performance, sustain their business and facing technological disruption.

The implementation researches were proposed by, [17], [18], [74], [23], [35], [26], [40], [49], [56] and [69]. A framework for technological diffusion was proposed by [25] for theoretical framework

construction based on a literature review of socio-economic constraints adoption effect and technological diffusion and model by [30]. Other researches in this research line have proposed review for elder's innovative technology adoption, including the impacts and costs for elderly demand in agriculture supply chain [83], Science and technology in economic or sociological perspective, for 'sectoral systems of innovation' (SSI) literature.

Knowledge transfer in IS-ADSC research

The literature findings show that knowledge transfer in IS development has a positive impact on organic farming supply chain [24], knowledge-based economy [47], demand and technology push [42],[50], global value chain [48], sustainability, actor's relationship in ADSC [16],[23],[52],[54], [55] aquaculture and agriculture supply network [69], knowledge sharing and management [55], [69] and infrastructure [2]. In this research line the knowledge transfer mostly is focused in information flow through ADSC because the scope of the study is focused on how the knowledge sharing and transfer make influenced other actors in ADSC via information flow. Thus, the ADSC network can fit their production network through variations in global challenges, technological disruption, and their customers' needs. The papers that address "knowledge transfer" in IS-ADSC determine that IS development with knowledge sharing-focused research via IF in supply chain can support actors to make their business sustain.

Innovation system analysis and design in IS-ADSC research

"innovation system analysis and design research lines" is the research line to which proposed by 22 authors has been specialized in the "Technological, network and system" topic. However, the proposed literature in this research area indicates that IS development can improve IF and FF in ADSC. Authors in this research line have proposed mainly in system approach, analysis and design [27],[49],[47] for an ADSC sector, development model and framework [35],[39],[61] analysis for variables that affect IS-ADSC system [19],[32] and how to implement a system into ADSC that increase sustainability value for a business [42]. IS development in ADSC can therefore improve the management of manufacturing costs, increase IF, make PF in ADSC logistic better, face sustainability and disruption technology challenges.

Information flow in IS-ADSC research

The papers found in this research line suggest that the continuous flow of information through ADSC with IS development support technology diffusion

and knowledge flow research line. IF researches were focused in how information flow [46],[58] through ADSC network in order to support improvement [29], sustainability, technology, actor's interaction [52] and flexibility .

Network analysis in IS-ADSC research

"Network analysis in IS-ADSC research" is another research line topic that has pay attention from researchers, mainly on how build link between actors in IS-ADSC to share the information, knowledge and diffuse new technology. The SLR frameworks, previous proposed models and shows that network analysis and development can support information and physical flows through ADSC. In this research variables flow through a network were analysed: market, legitimacy, and characteristics of the information, enterprises, technology, and network [69]. Social interaction and network give positive impact to technology diffusion and knowledge sharing through ADSC echelon [20], [23], [33], [46]. Risk, Improvement, and mitigation [95][96][97]

3.2.2. Research topic two: Scope of IS

In this research topic we identified these research lines: (1) national, (2) regional, (3) local, and (4) sectoral.

National scope in IS-ADSC research

Our findings show that "national scope in IS-ADSC research" is the most proposed research line in topic two. Mostly was proposed in a development country,[15], [26], [29], [41], [46], [47], [48], [74], [87]. Researchers propose the drivers of agricultural innovation [22], innovation Ecosystems [32], technological [26], commercial and social uncertainties [48], modelling for agricultural value chain [15], sustainable, [70], conceptual framework [15], strategic for aquaculture and agriculture and also link between actors in national innovation system [50]. Research in this line can be concluded about differentiation ADSC and IS development for a development and developed country. Most of development and poor country develop national IS to fulfil society food with mainly focused on social impact. The developed country IS focused develops on technological implementation for efficiency with facing technological disruption and sustainability. The IS-ADSC research are important in the development of national innovation system for a country.

Regional scope in IS-ADSC research

Total researches in this line are 31 with focus on sustainability for a region in a country [22],

modelling for a marketing and economy [35],[64], commercialization for a value chain [48],[87], technologies and knowledge transfer trans-regional/country [19],[32],[42], [56], sustainability [16], technological innovation trans-regional [69], and strategic management [50], implementation and adoption of ICT[54]. Most researches were focused on IF and FF for a strategic level with the development of IS-ADSC for trans-national scope.

Local scope in IS-ADSC research

The “local scope in IS-ADSC” research line has received little attention from previous researches with total 5 researches in it. Local scope in IS-ADSC are currently focused on IF, PF and FF rather than other research lines. Researchers in this research line have proposed several topics in IS-ADSC mainly on link between farming system and agri-food chain [90]; the progression and adoption of IS in ADSC [91]; actor/organization in agriculture operation including production, processing and commercialization of agricultural commodities [39]; sustainability [92]; regional and local market [93]. These researches show the development of local innovation system can increase ADSC business performance, especially for localized market and economy.

Supplier studies in IS-ADSC research

Our SLR findings found that “supplier study in IS-ADSC” has received very small attention from researchers. supplier research line has focused on new product development study [93], value chain, coordination and relationship from supplier to consumer, risk and performance management, and cooperation. IS in ADSC may have a positive impact on coordination between actors with supply chain suppliers and contribute to integration between suppliers because, besides sharing resources in the supply chain, it also enables the exchange of skills, knowledge, technology and production data, in addition IS with technology diffusion and knowledge sharing gives companies and suppliers real-time access to production, warehouse, purchasing and logistics data via technology, so that greater supply chain visibility, increase performance and risk handling management, increase coordination and flexibility in ADSC.

Internal supply chain studies in IS-ADSC research

Internal research line has focused on capabilities for eco-innovation performance enhancement of manufacturing firms [76], actors’ interaction, internal marketing, specific and interdependent capability [78], internal resources to external networks, and internal/external environments [88].

Research on the implementation of IS in ADSC can be a useful tool to improve operating results, the performance of manufacturing companies and their supply chains because it can help internal and external partners achieve higher levels of integration between actors, transfer knowledge and technology diffusion faster in ADSC. IS can increase collaboration and integration between departments (with employees, departments, and internal processes) in an industry. The development of IS in ADSC supports not only the sharing of resources, but also strategies, skills, knowledge, and information about internal processes and activities through the flow of information, knowledge sharing, and diffusion technology.

Consumer studies in IS-ADSC research

Consumer studies in IS-ADSC pay more attention from researcher since most of ADSC are based on market-based driven [78]. Mostly based on IF and FF through market researches. Internal research line has focused on consumer awareness to achieve sustainability and facing technological disruption in the manufacturing supply chain, new products and services [78], information exchange [56], barriers with consumer and market [25], technological innovation and implementation, and how to increase competitive advantage in market competition [58], [73], through the development of IS in ADSC. The development of IS in ADSC could provide better operational results. The integration between IS-ADSC can eliminate and reduce problems in the SC such as the bullwhip effect (mismatch between demand and demand estimates) through knowledge transfer, technology diffusion and better information flow and a positive impact on coordination / partnerships between actors in ADSC

3.2.4. Research topic four: IS-ADSC Type

In this subsection the following research lines have been identified are: (1) technological; sustainability aspects: (2) social, (3) environmental, (4) economic; (5) collaborative; (6) entrepreneurship; and (7) Relational.

Technology studies in IS-ADSC research

Technology pay more attention in IS-ADSC researches since technological disruption become a challenge in ADSC. The implementation of technological in IS-ADSC need analysis on knowledge transfer also. The researches were mainly focused on technology management [26], research and development [70], adoption/diffusion of technology [7], [25], organization [61], green and sustainability [81]. Most researches have focused on technology diffusion and implementation. Technological innovation and diffusion with

information flow have a positive impact on facing sustainability and disruption technology challenges.

Social studies in IS-ADSC research

Social study is the most common research line in IS-ADSC researches with total 38 researches in this line. Most researchers who studied sustainability based on innovation system considered social aspect. Researchers pay more attention in technology, innovation and social uncertainties [26], [81], framework and model for social and economy [7], [35], [38], [75], market research, actor interaction, industrial improvement [2], [64] and mainly in sustainability, [92]. IF pays more attention in social research in IS-ADSC. Research in this line shows social aspect is important in IS-ADSC for actor's technology diffusion and knowledge transfer. Social aspect also improves and increases sustainability and competitive advantages for ADSC.

Environmental studies in IS-ADSC research

Environmental studies in IS-ADSC has received considerable attention from researchers with total 28 researches in this line. Like social studies, most researchers who studied sustainability based on innovation system considered environmental aspect. The researches were mainly focused on environmental influence in ADSC [45], product innovation and its impact to environment [17], business development [54], modelling and framework [77], [90] technology implementation, market and actor interaction, and sustainability (the most studied) [90], The environmental researches in IS-ADSC help industries face sustainability challenge and make the ADSC more environment friendly and green via innovation, knowledge and technology diffusion.

Economic studies in IS-ADSC research

Environmental studies in IS-ADSC has received high attention from researchers with total 38 researches in this line. Like social and environment studies, most researchers who studied sustainability based on innovation system considered economy aspect. The researches were mainly focused on cost and resource-based [29], socio-economic [25], [38] actor interaction, [93], drivers and factors [7], [51], actor interaction, operational for institutional and technology [88], policy, model and framework [39], and mainly in sustainability [1], [17], [39], [57]. The economy researches in IS-ADSC research area is one of performance indicator measurement to ensure IS development sustains ADSC efficiently with FF as the main flow analysed in ADSC network.

Collaborative studies in IS-ADSC research

Collaborative studies in IS-ADSC studies has received little attention from researchers with total 5 researches in this line. The researches were mainly focused on partner combination, interaction, collaboration [12], research and development [93], governance strategy, adopting and implementing innovations [31], and conceptual framework [8]. IF is the main research flow in IS-ADSC to increase collaboration between actors.

Entrepreneurship studies in IS-ADSC research

Entrepreneurship studies in IS-ADSC studies in IS-ADSC has received little attention from researchers with total 6 researches in this line. The researches were mainly focused on research and development in ADSC, interaction between actors to increase productivity and knowledge transfer [16], strategic entrepreneurial interventions, national innovation system with managerial implication that entrepreneurs have to do, service and exploring new market [8] and information and management. IF and FF are main flow studied in this research line to increase entrepreneurship in development country. The entrepreneurship research in IS-ADSC need knowledge flow, policy and technology diffusion with IF and FF to sustain a start-up business. The start-up business in entrepreneurship research area also increase economy growth for a country.

Relational studies in IS-ADSC research

Relational studies in IS-ADSC studies in IS-ADSC has received little attention from researchers with total 10 researches in this line. The researches were mainly focused on relationship between actors [81], product innovation with relationship maintenance between actors [93], innovation pathways, human resource, market relations, social networks [74], eco-innovation [71], and environment [67]. These researches show positive impact and relationship between IS-ADSC and the development of actors' relationship.

3.2. Gaps and paths for further researches

According to our analysis through SLR methodology there are several gaps from previous researches. As seen in the previous discussion section, there are several research topics that have been explored. The research proposal for future research is based on the research gaps that have been detected and considers the main ADSC topic. The gaps are

- There are many previous researches proposed innovation system through IS-

ADSC with knowledge transfer, technological diffusion through ADSC tier and echelon. However, for future research, we consider specific topics about how innovation systems can contribute to solving sustainability, technology disruption problems, and interactions between actors at ADSC. good experimental arrangements will be needed to enable science, business, policy and consumers to answer this question without repeating the pathway of developing both existing innovation systems and implementing them at the managerial level.

- There is no specific analysis for prospective commodities and how the innovation affects an agriculture commodity such as shallot, rice, farming products and dairy products. Specific product analysis would make the research impactful in an IS-ADSC future researches

3.2 Conclusion and Future Research

We investigate the current state of researches, current development, gaps and provide guidance for future research of innovation system and agricultural downstream supply chain research field. Our findings in this paper contribute to improving knowledge of IS-ADSC research development through analysis and systematic review of papers published in scientific journals. By conducting a systematic review, we intend to contribute to the growth and development of knowledge about IS and its implementation in ADSC, about knowledge sharing / transfer and technology diffusion studies, through careful analysis of selected papers. A systematic literature review was conducted to achieve the research goal. After applying some relevant keywords filter and including some relevant papers published in the field, 110 papers addressing the innovation system in agricultural downstream supply chain are identified for review analysis. Afterwards, the selected papers are categorized according to the topic and keyword considered. From this classification, current research and gaps in the existing literature are analysed and derived to make a current research state of innovation system in IS-ADSC. We found that previous researches proposed innovation system through IS-ADSC with knowledge transfer, technological diffusion through ADSC tier and echelon with gaps are sustainability, technological issue and interaction between actors in ADSC. Also, previous researches only focused on how the innovation system affect a supply chain in general without considering a specific product.

We suggest future researches for future research, we consider specific topics about how innovation systems can contribute to solving sustainability, technology disruption problems, and interactions

between actors at ADSC. good experimental arrangements will be needed to enable science, business, policy and consumers to answer this question without repeating the pathway of developing both existing innovation systems and implementing them at the managerial level. Also suggest a study on an IS-ADSC research with focused on downstream products on a specific agricultural commodity through ADSC. i.e. shallot, rice, farming products, and fisheries.

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