Responsible Innovation in Asia: A systematic review and an agenda for future research

Abstract

Based on a comprehensive and structured literature analysis of 48 studies, this study explores and highlights the key research developments in the domain of responsible innovation in Asia. Accordingly, the paper critically analyses, maps, and structures responsible innovation research in Asia, and synthesizes the findings into an integrative conceptual framework that provides the basis for future scholars to further build on and practitioners to be guided by. Moreover, the study identifies several shortcomings in extant literature, proposes several avenues for further research, and provides best practice recommendations for researchers. This study revealed that majority studies were conducted in context of China, India and Korea. Contextually, there is a scope to extend research in other emerging Asian markets which are under-researched such as Pakistan. The key theories applied in the domain of responsible innovation in Asia were the resource-based view and stakeholders' theory and major themes for the outcomes were discussed from *social, environmental, and economic* perspectives. Theoretically, there is a scope to apply and empirically validate other theories such as legitimacy and reputation-building perspectives and resource-dependency. Given the issue of responsible innovation is managerially important, studies should also examine underlying motivations for the responsible innovation, applying behavioral theory of firm.

1. Introduction

Responsibility has always been a significant element for both innovation research and practice (Stilgoe, Owen, and Macnaghten, 2013). However, the human capacity for creativity and innovation exceeds the appropriate level of innovation needed to provide positive and sustainable outcomes to society. Hence, concerns about intended and unintended effects of new technologies explain growing calls for responsible innovation (Pandza and Ellwood, 2013). Referred to as "taking care of the future through collective stewardship of science and innovation in the present" (Stilgoe, Owen, and Macnaghten, 2013: p. 1570), the origins of the concept come from science and technology literature and the concept was only recently introduced in the management field (Ambos and Tatarinov, 2021). Moreover, even though the concept is both old and new, responsible innovation is framed differently based on time and place, as different contexts could create tensions and contradictions, thus these require a further examination of the actions of various stakeholders in new contexts (Pandza and Ellwood, 2013).

In simple terms, responsible innovation is defined on the basis of three norms i.e., doing good, avoiding harm, and protecting people and planet (Voegtlin and Scherer, 2017). A majority of the scholars in management field have defined responsible innovation outcomes from *social, environmental, and economic perspectives.* The responsible innovation is important to examine in context of Asian region.

This is mainly because the region of Asia Pacific is the most populated region in the world, with 4.2 billion people, India and China being the two countries with the highest population percentage (Budhwar, Pereira, Mellahi, and Singh, 2019). Added to this, during the last two decades, emerging and developed economies in Asia have grown considerably and contributed substantially to global economic growth (Budhwar, Pereira, Mellahi, and Singh, 2019; Budhwar, Varma, and Patel, 2016). This fast-paced economic development, combined with the

various new technologies emerging constantly, as well as the large population of the region, means that Asia represents a significant portion of the global focus and development of responsible innovation. This increasing contribution of Asian economies in innovation and global development, followed by a growing research interest in responsible innovation in the emerging countries during the last decade, and the subsequent increase in the number of studies, require a review (Acs, Audretsch, Lehmann and Licht, 2016; Ahlstrom, 2010). There is a great need to conduct context-specific research to better understand responsible innovation issues in Asia and the contextual factors underlying the concept in the region.

Moreover, despite the recent attention given to cross-national differences in studies on responsible innovation (e.g., Ambos and Tatarinov, 2021; Setiawan, 2020), there is no systematic review that places specific attention on the implementation of responsible innovation in Asia, and how various micro- and/or macro-environmental factors in the Asian context may influence the concept of responsible innovation. In fact, most research finds as a setting context the Western countries in comparison to the Asian ones or neglects a large part of the non-western geographical regions (Ko, Yoon, and Kim, 2020), focusing in only one, two or three most researched Asian countries, such as China, India, and Korea. Furthermore, the most addressed topics consider socially responsible business, ethics, CSR and innovation capacity, leaving no room for a deep comprehensive analysis of the phenomenon (Zhou et al., 2020; Graafland and Zhang, 2013; Jun, 2016). There is clearly a research gap between Western and Asian economies in respect to responsible innovation, a gap that results from theoretical confusion in a different cultural context, high fragmentation (de Hoop et al., 2016) and lack of empirical research to cover a broader geographical area rather than few specific countries (Ko, Yoon, and Kim, 2020). Thus, a systematic review is necessary to provide the idiosyncrasies and unique characteristics of responsible innovation related to the Asian context, as it fits the aim of our study in making sense of fragmented research and study the topic in depth in order

to identify flaws of research, and possible gaps in extant knowledge, addressing future research in a direction that is useful to the entire academic communities and practitioners in the domain of interest (Denyer and Tranfield, 2009).

The purpose of this study is two-fold: first, to assess the current status of responsible innovation research in Asia; second, to provide a critical analysis of how different responsible innovation constructs from other geographical regions have been operationalized in the context of the Asian region, and the theoretical lenses that have been applied. In this sense, our review is the first initiative to systematically examine the existing literature (48 relevant studies published in peer-reviewed publication outlets) on responsible innovation in Asia. We explore the patterns of (1) year, journal, and type of publication; (2) authors' information and other data; (3) content by antecedents, dimensions of the responsible innovation phenomenon, and outcomes; (4) applied theories; (5) methodologies, measures, and research design applied; (6) study findings.

The present study makes three substantial contributions to the domain. First, we contribute to the literature by providing a systematic identification and critical analysis of the antecedents and outcomes of responsible innovation, as well as its various dimensions, when applied in the Asian region. This logic led to the development of a conceptual framework, which synthesizes previous findings and provides the basis for future scholars to further expand the boundaries of the domain in relation to the Asian context. Second, we provide an identification of how various responsible innovation constructs have been conceptualized and measured, as well as a specification of the network of variables to which these constructs are related in the Asian context. Third, another significant contribution is provided by reviewing the theoretical perspectives used in extant research on the responsible innovation concept in Asia, to identify and explain the relevance of these theories to examining responsible innovation issues in Asia, and how this theoretical basis could be further enhanced to consider the various socioeconomic

and institutional factors that characterize the implementation of responsible innovation in Asia. Finally, we contribute to the domain of responsible innovation by highlighting opportunities for further research in terms of theory, methodology, and context, which are likely to differ because of societal, institutional, and economic influences in Asia, thus further advancing the development of the field.

In the next section we describe the methodology applied for conducting the review. Following this, we provide a brief description of the characteristics of the studies included in the final sample, and we continue by analyzing, discussing, and synthesizing our findings in a conceptual framework. Finally, we provide a set of guidelines for future research and best practice approaches in terms of theory, methodology, and context.

2. Methodology

This research draws on the systematic literature review methodology with the aim to map, structure, and synthesize existing research in a robust procedure (Pisani et al., 2017; Gaur and Kumar, 2018; Palmatier, Houston, and Hulland, 2018; Christofi et al., 2019). This process is an effective method to collect evidence on the researched topic by applying a scientifically accepted and reproducible procedure (Christofi, Leonidou, and Vrontis, 2017; Denyer and Tranfield, 2009). The systematic review follows a step-by-step standardized procedure that requires the definition of a search strategy (Christofi et.al., 2021; Tranfield, Denyer, and Smart, 2003). In particular, we select the database from which we will identify the articles published in journals related to the disciplines that are relevant to our research topic (Bhimani, Mention, and Barlatier, 2019; Dike and Rose, 2017; Schmeisser, 2013). The procedure further continues with the definition of the search formula, a set of keywords used in the database, which will search for titles, abstracts, and subject terms of articles, mostly bringing up the desired search results (Christofi et al., 2017; Leonidou, Christofi, Vrontis, and Thrassou, 2018; Schneider and

Spieth, 2013). The publications in the dataset obtained will be screened and selected based on predetermined exclusion and inclusion criteria related to our research purpose (Pisani, 2009; Pisani et al., 2017; Gaur and Kumar, 2018; Christofi, Vrontis, and Cadogan, 2019; Christofi et al., 2019; Tan and Taeihagh, 2020; Thorpe, Holt, Macpherson, and Pittaway, 2005).

2.1. Conceptual boundaries

An important component of the systematic literature review process is to establish conceptual criteria in order to identify the context of analysis (Denyer and Tranfield, 2009). Based on the definition of responsible innovation proposed by Genus and Iskandarova (2018), this study frames RI as "the control of risk and uncertain futures; open science; supporting innovation, ethical research; and struggling to realize inclusive deliberation" and "highlights the role of language and other institutionalizing factors in spreading and embedding the RI research and policy agenda" (Genus and Iskandarova, 2018, p. 4). We can clearly highlight in this first definition the most important elements to be considered, as: control for the future, inclusive practices, ethics, and supportive policies. Considering that responsible innovation is an umbrella term for a broad category of practices, strategies, and/or ideals (Koops, 2015, p. 3) and there is a lack of a unique accepted definition (Foley, Bernstein and Wiek, 2016), due to the high fragmentation and the different stages of evolution of responsible innovation within different countries (de Hoop et al., 2016), these elements bring us to consider the inclusion of broader categories, starting from ethics and responsible behavior, to extended producer responsibility and corporate social responsibility, as well as technological innovation, eco-innovation, and innovation capability.

 Moreover, we referred to the four dimensions identified by Stilgoe, Owen, and Macnaghten (2013), respectively *anticipation, reflexivity, inclusion,* and *responsiveness*, with the consideration that «*a prospective model of responsibility works through four dimensions, couples anticipation, reflection and deliberation to agency and action and makes explicit the*

need to connect with cultures and practices of governance» (Owen et al., 2013, p.1576). We find the four dimensions of Owen *et al.* (2013) to be useful in categorizing the different stages of responsible innovation adopted by organizations performing in the Asian countries. As the understanding of what consists of a responsible innovation practice is shaped by culture (Park, 2009; Ringov and Zollo, 2007), country regulations and market development (Isaksson, Johansson and Fischer, 2010; Boulouta and Pitelis, 2013), we expect that the four dimensions are not always altogether considered when addressing responsible innovation research in the Asian context. However, the categorization developed by Owen *et al.* (2013) is fundamental for our research as it can provide us an understanding of the evolution of the phenomena of responsible innovation strategies in Asia.

Added to this, there is the need to highlight the importance of RI in developed and emerging countries (Ko, Yoon, and Kim, 2020). If the responsible research and innovation (RRI) approach has been emphasized by developed countries, where the intention is to intervene in the early phases of technological progress to develop higher positive levels of innovations, countries with emerging technologies could play a key role in the unpredictable effects of their innovations. Therefore, we decided to consider the context for this systematic to be that of the Asia region.

In order for the selected articles to be representative of the Asian region, we followed the UN classification of 47 developed and developing economies in Asia (Kutaula, Gillani, and Budhwar, 2020). We also included Russia, based on Bai, Du, and Solarino (2018). We highlighted the impact of responsible innovation in the competitive advantage, firm value, and economic growth of Asian companies in the global market, as a response to the increasing demands from customers and governments, as well as an important instrument to take on climate responsibility. All the above-mentioned categories were merged into our search

formula (Genus and Iskandarova, 2018; Pandza and Ellwood, 2013; Stilgoe, Owen, and Macnaghten, 2013).

In this systematic literature review we concentrate on a connection between these concepts or definitions regarding the organizational aspects that foster responsible innovation, its drivers, and possible effects on various levels of analysis. Starting from the previously explained conceptualizations and to reply to our research question, we focused on responsible innovation and the organizational context of Asia, regarding culture, regulations, political climate, technological advancement knowledge, and labor aspects of the Asia region. We also included papers relating to the international contexts (with at least one country coming from the Asian region), including comparative cross-country studies and studies that analyze the phenomenon of responsible innovation from macro and micro perspectives. Thus, our research includes articles that discuss the comparative aspect of responsible innovation between developed and developing economies, organizational practices, and their impact on the adoption of responsible innovation strategies, and the evolving process of the innovation itself, with the aim to gain a comprehensive understanding of the diverse implementations of responsible innovation strategies that work better in the Asian context.

2.2. Search strategy

To gain a more comprehensive understanding of responsible innovation strategies in Asian countries, this study uses quality criteria to let a sample emerge from the application of the inclusion and exclusion criteria.

The EBSCO host's Business Source Premier database was selected as our main search source, as it covers several disciplines of business, also used in other top-literature reviews (Vrontis and Christofi, 2019), due to the presence of peer-reviewed business journals (Kranzbühler, Kleijnen, Morgan, and Teerling, 2018).

We start our systematic review by running a keyword search formula on titles, abstracts, and subject terms (Christofi, Leonidou, and Vrontis, 2017). We conducted an initial scoping study in order to collect keywords used in existing studies that relate to responsible innovation (Genus and Iskandarova, 2018; Owen et al., 2013; Pandza and Ellwood, 2013) in developed, developing, and emerging countries (World Economic Situation and Prospects , 2020), specifically relating to Asia (Yerrabati and Hawkes, 2015). The keyword search formula was made up from two sets of words. The first set relates to responsible innovation – TI ('responsible innovation' OR 'responsible research and innovation') OR TI (innovation AND responsibility)) OR AB (('responsible innovation' OR 'responsible research and innovation') OR (innovation AND responsibility)) OR SU (('responsible innovation' OR 'responsible research and innovation') OR (innovation AND responsibility) - and the second relates to Asia or an Asian country, in its broadest sense as explained above - (Asia OR Japan OR Brunei OR Cambodia OR China OR Korea OR Fiji OR 'Hong Kong' OR Indonesia OR Kiribati OR Lao OR Malaysia OR Mongolia OR Myanmar OR 'Papua New Guinea' OR the Philippines OR the 'Democratic People's Republic of Korea' OR Samoa OR Singapore OR the 'Solomon Islands' OR Taiwan OR Thailand OR 'Timor-Leste' OR Vanuatu OR Vietnam OR Afghanistan OR Bangladesh OR Bhutan OR India OR Iran OR the Maldives OR Nepal OR Pakistan OR 'Sri Lanka' OR Bahrain OR Iraq OR Israel OR Jordan OR Kuwait OR Lebanon OR Oman OR Qatar OR 'Saudi Arabia' OR Palestine OR 'Syrian Arab Republic' OR Turkey OR 'United Arab Emirates' OR Yemen OR Russia).

For our main purpose, we considered the application of some exclusion and inclusion criteria, often used in leading systematic reviews published in top journals (Christofi et al., 2019; Vrontis and Christofi, 2019; Tan and Taeihagh, 2020). This led us to exclude non-academic peer-reviewed articles such as summaries, book reviews, book chapters, editorials, as well as duplications.

Thus, we included only peer-reviewed academic papers, written in English, which were published in peer-reviewed journals ranked in the Association of Business Schools' Academic Journal Guide 2018 (www.charteredabs.org). Following other systematic reviews on this theme (Thapa, Iakovleva, and Foss, 2019), we also included studies published in the *Journal of Responsible Innovation.* As Guston et al. (2014, p. 5) explain, the relevance of the *Journal of Responsible Innovation* refers to the fact that «*it is dedicated to publishing articles that demonstrate excellent scholarship and can also frame discussions and elicit debate among experts in the field; inform the efforts of scientists, engineers, designers, and other innovators to participate in RI, and of policy-makers to make better decisions about technological innovations and innovation policy* […]». The inclusion of studies published in academic journals is a standard practice in existing systematic reviews in order to satisfy the quality criterion of the final sample and to be based on validated knowledge that has been evaluated in terms of academic quality and rigor, theory robustness, implications for practice, methodology, data and supporting argument, and contribution to knowledge (Phillips, Lee, Ghobadian, O'Regan, and James, 2015).

Carefully considering the review protocol, we initially identified 536 academic peer-reviewed articles from the EBSCO database. After excluding the studies that did not fit our inclusion and exclusion criteria, we started reading the titles and abstracts of the remaining 165 papers. When the relevance criterion was difficult to assess, because the abstract and title reading fail to provide important insights to be considered for the overall analysis, we included them in the next step for full-text reading (Christofi, Vrontis, and Cadogan, 2019; Thorpe et al., 2005). This practice is not new, but it is also present in other systematic reviews dealing with topics that are very fragmented or lack a common accepted unique definition of the phenomenon of interest and are surrounded with theoretical confusion (Christofi et al., 2021; Savastano et al., 2019).

Then, we considered only studies related to responsible innovation in the Asian region. This process returned 59 studies. Out of these articles, 11 were then excluded because were found not relevant to our purpose after full text reading, thus leaving 48 relevant articles in our sample. This 5-step process, which led us to a sample of 48 studies, is reported in Figure 1; additionally, the data have been reported to an extraction table.

Coding procedure

Two authors read the 48 papers and retrieved and coded them based on the four dimensions identified by Stilgoe, Owen, and Macnaghten, (2013) -*anticipation, reflexivity, inclusion, and responsiveness* - while accounting for new themes. The articles extracted were analyzed if they fit one or more of the four dimensions respectively: i) *anticipation*, the first dimension, aims to answer the 'what if' question, while trying to increase resilience and reveal new possibilities for innovation for the future. It involves a prediction element and a need to evaluate possible risk; ii) *reflexivity*, is mainly related to the adoption of codes of conducts, standards, and moratorium, and include reflections on socio-ethical practices and a moral responsibility; iii) *inclusion*, where the authors stress the idea of public and stakeholder engagement and the participation in debates and processes as a mean of ensuring inclusion; iv) *responsiveness,* which is mainly related to the response to societal challenges concerning countries and populations. We must highlight that most articles include only one or two of the dimensions of RI developed by Stilgoe, Owen, and Macnaghten, (2013), and this is evidence of the fragmented understanding of the phenomenon, which can probably be due to the influence of micro- and/or macro-environmental factors. The authors also coded the descriptive characteristics and directions for future research. Moreover, the results have been coded based on a framework (e.g., antecedents - including an institutional level of analysis - moderators, outcomes of responsible innovation in Asia). All the information retrieved and coded was included in a data extraction table.

"Insert Figure 1 about here"

3. Brief characteristics of existing studies

Publication details

Carefully analyzing the articles in our sample, we find that a total of 48 papers have been published on responsible innovation (RI) in Asia during a time period of sixteen years (2005-2021); this can be explained through the growing attention on responsible innovation in the Asian context. As we can see from Table 1, the number of papers published has experienced a continuous growth year by year, starting from 2015. This can be attributed to the increased interest of researchers on the impact of responsible innovation strategies on Asian organizations (MNCs, SMEs, etc.): 62.5% of the papers have been published in a time period of six years (2016-2021), finally coming to a head in the number of articles published in the year 2020, with a total of N=10 articles published. The understanding of responsible innovation is broader, as it considers all kinds of public, private, and civil society actors and types of collaborations among these as possible innovators, not just particular types of organizations (Scherer and Voegtlin, 2020). Table 1 shows the distribution of publications featuring the responsible innovation topic over the years. It is obvious that there is an increased interest in publications regarding the topic, considering the high number of publications in 2020 (N=10) and in the first part of 2021 (N=2, until May 7th).

"Insert Table 1 about here"

"Insert Table 2 about here"

The findings confirm that despite it being quite a new field of study, responsible innovation (RI) has promising potential and has been successful in diffusion (de Hoop et al., 2016). In consideration to journals included in the sample (see Table 2), the *Corporate Social Responsibility and Environmental Management* is the main guest journal for articles on responsible innovation in Asia or an Asian country, with a total of 14 articles (29%). It is

followed by the *Journal of Business Ethics* with six articles (13%) and the *Journal of Business Research* with four articles (8%). *Asia Pacific Business Review, Business Ethics: A European Review*, *Industrial Management and Data Systems* and the *Journal of Responsible Innovation* host two articles each on the topic (4%), while the remaining journals host one article publication each (see Table 2 for more details). As is obvious from the above table, the first three journals (*Corporate Social Responsibility and Environmental Management,* the *Journal of Business Ethics* and the *Journal of Business Research*) account for 50% of the research publications. This highlights their relevant attention since 2008 (the first article published by the *Journal of Business Ethics*, cf. Table 2), and their consistent contribution to the evolution of the responsible innovation concept.

Specifically, *Corporate Social Responsibility and Environmental Management* is the host for a large number of articles published within our research topic and is focused on the factors affecting CSR and sustainability-oriented innovation and their effects, innovation performance, as well as cross-country differences: five articles explore the factors and/or effects driving CSR and/or sustainability oriented innovations (Hsu and Cheng, 2012; Tang, Akram, Cioca, Shah, and Qureshi, 2021; G.-C. Wu, 2017; W. Wu, Liang, and Zhang, 2020; Xiang, Liu, Yang, and Zhao, 2020), two articles focus on firms' innovation performance (Anser, Zhang, and Kanwal, 2018; Zhu, Zou, and Zhang, 2019), three articles focus on the environmental perspective of CSR and/or innovation (Jiménez-Parra, Alonso-Martínez, and Godos-Díez, 2018; Pan, Sinha, and Chen, 2021; Shafique, Kalyar, and Mehwish, 2021), one article explores R&D spending (Gao, Wu, and Hafsi, 2017), one article explores the adoption of new standards (Balzarova and Castka, 2018) and one article is a cross-country comparison of corporate innovation (Ullah and Sun, 2021).

Papers published in the *Journal of Business Ethics* include three articles on the impact of innovation on national competitiveness (Boulouta and Pitelis, 2014; Gugler and Shi, 2009;

Jamali et al., 2009), one article on green management influences on product innovation (Shu, Zhou, Xiao, and Gao, 2014), one article on business adaptation and innovation for foreign direct investment (Bardy, Drew, and Kennedy, 2012), and one article on supply chain innovation (Isaksson, Johansson, and Fischer, 2010). The *Journal of Business Research* offers a more extensive identification of responsible innovation, with a focus on firms' process of learning to innovate (Mirvis, Herrera, Googins, and Albareda, 2016), improving innovation capability (Lai, Lin, and Wang, 2015) and exploring the CSR-innovation relationship (Broadstock, Matousek, Meyer, and Tzeremes, 2020; Upadhaya, Munir, Blount, and Su, 2018). Moreover, we considered the classification of studies in different thematic areas. For this, we draw on the Chartered Association of Business School (CABS) fields' classification to better understand the holistic development of the topic. As shown in Table 3, existing research in journals covers a wide range of fields and different disciplines such as regional studies, planning and environment area studies (31%), ethics, CSR, and management area studies (29%), marketing (8%), international business and area studies (6%) and operations and technology (6%). The first two areas cover more than the half of publications (60%), so we can deduce that there is a growing interest in regional development and environmental aspects of the topic about the ethical, sustainable, and managerial areas.

"Insert Table 3 about here"

Authorship characteristics and important publications

We identified a total of 127 authors coming from different universities and institutions in 22 different countries (see Table 4). Considering the origin of the main author, we can see a clear domination of the Chinese origin (19%, n= 16 authors) in our sample. Further, we have contributions from Korea and USA (n= 3 authors each), Australia, India, Pakistan, Spain, Switzerland, the Netherlands and the UK (n= 2 authors each). All the remaining countries number one contribution each.

"Insert Table 4 about here"

In regard to the number of authors involved in research (see Table 5) we find that in 63% of studies there is a collaboration of three or more authors, and in 31% of cases the co-authors work in three or more institutions. In our sample, regardless of the diversity of countries when compared to the number of studies, 56% of them are attributable to a researcher based in a single country (see Table 5). It is unexpected that considering the global quality of the responsible innovation concept and the fact that industries are revolutionizing in a process of globalization and marketization (Anser et al., 2018), research carried out by a global research team still remains diminutive.

"Insert Table 5 about here"

An analysis of the number of citations was conducted to assess the most impactful articles on the topic (see Table 6). This type of analysis, based on the number of citations, is an effective tool to measure the quality of the manuscript, and the times a study is cited are a representation of its contribution in the body of knowledge (Crossan and Apaydin, 2010). The five most impactful studies (as per number of citations) in our sample are as follows: Jamali, Zanhour, and Keshishian (2008; citations, 496), Gugler and Shi (2008; citations, 405), Ringov and Zollo (2007; citations, 371), Boulouta and Pitelis (2013; citations, 302), Isaksson, Johansson, and Fischer (2010; citations, 162).

Specifically, the first article is an examination of the relational attributes of SMEs contributing to continuing improvement and innovation, and how this inclination can be further nurtured and leveraged (Jamali et al., 2009). The concept of improved efficiency and technology and management innovation based on CSR is the main issue in the second paper, which explores the conceptual and practical gap existing between developed and developing countries in relation to innovation adoption strategies (Gugler and Shi, 2009).

The main topic addressed is that innovation demands pose great challenges to the developing-country MNEs' aspiration of entering the global market, while cultural, legal, institutional, technological, and economic differences can contribute to different attitudes and approaches in implementing standards between the North and the South (Gugler and Shi, 2009). Across this array, a common theme arises: companies do not have an established play-book for innovating in this space and they (and their partners) must learn together to produce successful innovations (Mirvis et al., 2016).

"Insert Table 6 about here"

4. The responsible innovation construct: reviewing the empirical research on Asian regions

Responsible innovation is defined as "*taking care of the future through the collective stewardship of science and innovation"* (Stilgoe, Owen, et al., 2020). As previously defined, the RI construct has been discussed in several research. In our review, we follow the definition of RI and the four dimensions identified by Stilgoe, Owen, and Macnaghten (2013) and Owen (2013), such as *anticipation*, *reflexivity*, *inclusion,* and *responsiveness*. Those dimensions are necessary to allow a responsible innovation model to be successful, as it has to be based on the anticipation, the reflection, the proactivity, and the involvement of cultures and governance (Owen et al., 2013). As this construct represents the theoretical framework most usually adopted in the field (Verburg, Rook, and Pesch, 2020), in our systematic review we have looked for the concept of RI, understanding the innovation process in organizations, where people are the proactive actors in developing new products, services, and business models, and in taking care about the environment.

The *anticipation* relates to the ability to foresee the outcomes of innovation (Asante, Owen, and Williamson, 2014; Owen et al., 2013; Stilgoe et al., 2013) and the technical, political, and environmental impacts potentially related to innovation (Guston, 2014; Pesch, 2015). Referring to the business context, anticipation requires a wide understanding of the impact of a firm's innovation, with a careful monitoring of the innovation environment in terms of committing to innovation-related knowledge activities (Chadha, 2011; Gaziulusoy, Boyle, and McDowall, 2013), in particular to the promising technological initiatives that will shape the future (Borup, Brown, Konrad, and Van Lente, 2006; Selin, 2011; van Lente and Rip, 1998), as well as the unanticipated consequences and the reduction of linked risks (Berker, 2010; Biondi, Iraldo, and Meredith, 2002; Chadha, 2011; Rohrbeck, Konnertz, and Knab, 2013). Anticipation refers to the appropriate means needed to manage the impacts of innovation processes with organizational structures and tools (Verburg et al., 2020).

Reflexivity regards the value system and theories that are able to define the innovation and its governance (Schuurbiers, 2011), requiring a closer bond between the application of moral responsibilities in cultures of science and innovation (Stilgoe et al., 2013). The reason for the pursuit of this dimension is to clarify values and beliefs in the innovation processes, thereby engaging the public (Asante et al., 2014; Flipse, Van Dam, Stragier, Oude Vrielink, and Van der Sanden, 2015; Macnaghten and Chilvers, 2014). In this sense, employee empowerment fulfills a relevant role in supporting the creation of innovations (Muduli, Govindan, Barve, Kannan, and Geng, 2013). The second consideration concerns the possible conflicts related to the generation of innovation (Lubberink, Blok, van Ophem, and Omta, 2017), where managers have to prioritize values and motivations instead of the impact of the latter on innovation (Ayuso, Ángel Rodríguez, and Enric Ricart, 2006). The third concern refers to the critical assessment of the relationship between knowledge and the innovation process, and how the former may affect the latter (Lubberink et al., 2017). This means that companies ought to reflect

and reframe the additional perceived realities that come from stakeholders (Verburg et al., 2020). The aim is to improve their reflexive capacities and capabilities in order to sustain growth (Vickers and Lyon, 2014).

Inclusion concerns the interrelation with agents in the governance of science and innovation in order to widen with new voices the wider public who are included in the company's dialogue (Kilby, 2015; Macnaghten and Chilvers, 2014; Stilgoe et al., 2013; Verburg et al., 2020), as well as searching legitimacy (Hajer, 2009; Irwin, 2006).

Through this dimension, the company includes its stakeholders from the start-up stage of the responsible innovation process, creating a bond with outcomes (e.g., the engagement of public values) (Bozeman, Rimes, and Youtie, 2015; Stahl, McBride, Wakunuma, and Flick, 2014; Stilgoe et al., 2013; Taebi, Correljé, Cuppen, Dignum, and Pesch, 2014). If the purpose of inclusion is the raising of the stakeholder's commitment and contribution (Le Ber and Branzei, 2010), and to emphatically pay attention to other parties looking for common goals and providing solutions (Ayuso et al., 2006), this process brings some criticalities for management. The company needs to understand which stakeholders should be included in what activities, as well as the degree of openness and transparency able to improve research and innovation performance (Balka, Raasch, and Herstatt, 2014; Schaper-Rinkel, 2013).

Responsiveness concerns the response to new knowledge as this emerges, and to emerging perspectives, views, and norms (Stilgoe et al., 2013). Responsiveness is declined in its two meanings - reacting and responding - and satisfies the need of RI to change shape or address depending on stakeholders, public values, and circumstances, showing its bond with inclusion (Pellizzoni, 2004). The opportunity for companies is to glean information from the environment that is able to bring incremental improvement of the innovation process and avoid unintentional effects (Berker, 2010) while enhancing responsiveness to societal challenges (von Schomberg, 2013).

All the dimensions above are described with the aim of providing a framework that will be used in the next section, with a particular focus on the institutional context of the Asia region.

5. Empirics and data characteristics

Research design

Regarding our sample, the majority of articles included in this systematic review are of an empirical type, with a total of 39 out of 48 studies included. The remaining part of the studies consist of a conceptual design and are mainly reviews of existing literature within the field of responsible innovation in Asia.

Out of the 39 studies, 29 of them use a quantitative design, mostly relying on a single source of data and implying a questionnaire; only eight studies are of a qualitative design, where three studies use case studies to collect data (Jamali et al., 2009; Mirvis et al., 2016; Park, 2009), three studies use interviews (Blahová, Haghirian, and Pálka, 2015; Jun, 2016; Shu et al., 2014), one study uses observations (Dong and Xu, 2016) and one study uses ethnographic fieldwork (de Hoop et al., 2016). Further, only two studies from our sample use mixed methods; one of them combines personal interviews and surveys to collect data (Graafland and Zhang, 2014), while the other one combines surveys and observations (Balzarova and Castka, 2018).

When considering the sample composition of the research included in this review, we can say that most studies have focused on companies operating in Asia and/or an Asian country (including SMEs, MNCs, etc.). For instance, in their study, Shu et al., (2014) focus on a stratified sample of firms operating in 23 Chinese provinces. The same concept also followed the study of Lai et al. (2015), when they collected survey data on a sample of 500 respondents from firms operating in the central Taichung area in Taiwan. Only a limited number of studies draw on a sample of stakeholders and include experts, investors, and customers, and only one

study includes a sample of diverse participants from government, industry, and academia (Ko et al., 2020).

Measures used in responsible innovation (RI) studies in Asia

As shown in Table 7, researchers have mostly used measures developed in the Western context to explore responsible innovation issues in Asia. The majority of the scales used are multi-item scales, with only two studies adopting single-item scales, respectively the study by Yao et al. (2019), which adopted a single item to measure environmental agency pressure following the previous work of Berrone et al. (2013), and the study by Gao et al., (2017), which used a single-item scale to measure R and D spending in Chinese companies, based on existing measures in literature (Bouquet and Deutsch, 2008; Greve, 2003; McWilliams and Siegel, 2000; O'Brien and David, 2014). As is obvious from Table 7, a large number of studies in our sample focus on existing measures of CSR (Graafland and Zhang, 2014; Hsu and Cheng, 2012; Jamali et al., 2009; Jun, 2016; Shafique et al., 2021; Zhou et al., 2020), including measures of CSR activity (R. Yang, Zhu, Marinova, and Wei, 2019; Zhu et al., 2019), measures of CSR commitment (Tang et al., 2021), measures of CSR disclosure (Dong and Xu, 2016) and environmental CSR (Pan et al., 2021). Other researchers use existing scales to measure innovation performance (W. Wu et al., 2020) and eco-innovation (Pan et al., 2021). While most of the studies use validated existing measures, or just adapt measures to their research, only three studies consider the self-development of measures that better fit the context of Asia. Specifically, Factor, Oliver, and Montgomery (2013) developed an index entitled 'Social Responsibility at Work' to measure social sustainability at work in a study encompassing 11 countries. The index is constructed from two main items: the belief of respondents in the importance of the view that a job allows someone to help other people and the importance that a job has to society. Moreover, in another study, Lee (2016) developed a three-item scale to measure the supplier's social performance, a three-item scale to measure environmental performance, which included

environmental performance improvements in product safety, waste, and emissions; a four-item scale was also developed to measure relationship commitment, based on extant literature, including trust, family-like atmosphere, mutual respect, and long-term partnerships. Further, Jiménez-Parra et al. (2018), in their study, developed a measure based on a country's environmental behavior - that country's willingness to solve environmental problems and its efforts to promote this environmental behavior by its own citizens and firms in order to measure environmental regulation.

Categorization of measures

Below is a list of all the measures used in the sample of articles researched to capture responsible innovation and related issues in the Asian context. As is obvious from the listed measures, they focus on aspects such as organizational culture and structure, corporate social responsibility, stakeholder perceptions, legislative pressure, environmental and social performance, innovation capability, and intention to adopt and R&D spending, as important components of the entire innovation process in the bigger frame of responsibility. Further, these measures were conceptualized as measures related to one of the four dimensions of responsible innovation by Owen et al. (2013), respectively: anticipation, reflexivity, inclusion, and responsiveness.

- Measures of organizational culture

- Measures of national cultural values

- Measures of CSR (ex. measures of CSR disclosure, of CSR commitment, of CSR activity, etc.)

- Measures of ESG performance

- Measures of relationship commitment

- Measures of national competitiveness

- Measures of social performance

- Measures of environmental performance

- Measures of national cultural values

- Measures of stakeholder perception of policies

- Measures of social sustainability at work

- Green product innovation measures

- Green organizational culture measures

- Measures of environmental agency pressure and public pressure

- Strategic management and performance measures

- Measures of personal values and personal norms, of awareness of consequences, ascription of responsibility, and measures of intention to adopt green IS

- Measures of innovation performance (based on R&D spending and R&D intensity)

- Measures of environmental regulation

- Measures of eco-innovation

- Measures of environmental disclosure

- Measures of organizational ambidexterity

- Measures of environmental CSR

- Measures of R&D spending

Adaption of existing measures to the Asian context

From the sample of articles included in this systematic review, we can imply that researchers in Asia are mostly establishing the validity of measures that have been developed in the West for developed economies. Obviously, most studies have adopted the existing and evaluated measures that were enhanced through a careful review of extant literature. Further, some of the studies adopt existing measures, but contribute with the adaption of the measures when required to fit them to their national context. In their study, Ortas et al., (2019) consider an

aggregation of the CEP, CSP, and CGP in a unique measure for a multilevel (country level, firm level) research in sustainability. In another study, Zhou et al. (2020) argue that CSR is a construct that has been measured in many different ways. We used four items to measure CSR, adapted from previous research, including Carroll (1979): senior leaders' attitude, the corporate governance system, the mitigation of negative impacts, and senior leaders' support for and participation in CSR activities. Different emerging economies have a range of criteria to measure the intensity of corporate social responsibility. Arguably, due to different geographical conditions, emerging economies have different priorities, which should be tackled immediately (Zamir and Saeed, 2020). This is why in their study, Tang et al. (2021) adapted the measures used for CSR commitment in existing literature to the Pakistani context.

The efforts still remain limited in the development of new measures, with only a few studies considering and self-developing scales to measure responsible innovation and other related constructs in emerging Asian economies. Consequently, to tailor measures to the national, legislative, social, and cultural factors of the Asian countries, and to serve the main investigation need of the research itself, some studies have developed new measures. This is the case for Factor et al. (2013), Lee (2016), and Jiménez-Parra et al. (2018), that their studies developed new measures, starting from the need for specific research and following the work of other researchers in the West. However, taking into consideration the fact that for the few self-developed scales, the validity of constructs has not been provided, this implies a rising perspective to future developments of specific validated measures to better serve the Asian context.

<div align="center">"Insert Table 7 about here"</div>

6. Key definitions and theories

6.1 Key definitions

Responsible innovation is defined as "*taking care of the future through the collective stewardship of science and innovation*" (Stilgoe, Owen, et al., 2020). This study provides a snapshot of the key definitions of responsible innovation used in the extant literature to present dimensions and operationalization for future studies on this topic. The extant studies on responsible innovation use a variety of terms: 'socially sustainable innovation', 'responsible product and process innovation', 'incremental and radical responsible innovation', 'corporate social innovation', 'ethical and socially responsible innovation', 'socially responsible investing', 'eco-innovation', 'green innovation', 'cooperative-open innovation', 'climate responsible innovation', 'sustainability oriented innovation', 'responsible research and innovation' and 'environment-responsible innovation'. A majority of the scholars have defined responsible innovation from the sustainability perspective, incorporating *social, environmental, and economic dimensional outcomes*.

6.2 Key theories

The majority of the studies that we have included in this review have applied the resource-based view and stakeholders' theoretical perspectives to examine the responsible innovation phenomenon and its outcomes from *social, environmental, and economic* perspectives across a number of Asian markets. For example, in the context of the supply chain, the importance of investment in **social responsibility** practices in supply-chain performance has been emphasized (Mani, Jabbour et al., 2020). Upadhaya, Munir et al. (2018) apply the resource-based view, extending responsible innovation findings in the context of corporate social responsibility (CSR). Their study asserts that responsible innovation requires strong integration of an **economic dimension** of CSR in business strategy for product and process innovations (Upadhaya, Munir et al., 2018), consequently affecting business performance (Ullah and Sun, 2021). Furthermore, it has been examined that when innovation is embedded in organizational culture, the organization is more likely to focus on responsible strategies and innovations such

as eco-innovation (Pan, Sinha et al., 2021). Likewise, Chang (2015) finds that organizational culture affects proactive CSR strategies and responsible green product innovation. Considering the ***environmental dimension,*** CSR practices towards RI should keep a balanced pursuit of economic growth, environmental protection, and social harmony (Wu, Liang et al., 2020) implying the importance of environmental, social and economic outcomes. Some studies taking environmental perspective, particularly in CSR domain have also studied environmental CSR as an antecedent of the responsible eco-innovation (e.g., Jiménez-Parra, Alonso-Martínez et al., 2018, Pan, Sinha et al., 2021), and CSR innovation (Gao, Wu et al., 2017, Zhou, Wang et al., 2020). Particularly, the environmental perspective is considered as both outcome and antecedent in examining the influence of RI.

Resource-based and stakeholders' theories cut across the three-dimensional outcomes of responsible innovation. Stakeholder theory in responsible innovation literature has also been applied, together with agency theory. For example, applying these two theoretical lenses, Gugler and Shi (2009) argue that in China, CSR engagement and development is still a new concept to many business managers. Most companies are engaging in philanthropy as a substitute for CSR, and others adopt a 'wait and see' attitude for government regulatory pressures. They have concluded that for developing nations' governments, CSR poses challenges to national policies. Thus, a government should actively adopt labor standards performance and reporting criteria for the granting of government loans, grants, overseas investment insurance, or other benefits tied to CSR investment. Applying stakeholder theory, reputation building theory, and signaling theory, a recent study linked environmental disclosures to green innovation (Xiang, Liu et al., 2020). Combining stakeholder theory with an organizational theoretical perspective, corporate innovation capability has been linked to corporate sustainability (Lai, Lin et al., 2015). Effective organizational strategy, R&D technology, uncertainty in the environment, and stakeholders in the environment are outlined

as prominent factors to ensure effective responsible innovation capability (Lai, Lin et al., 2015).

Institutional theory is also another prominent theory that has been applied in the context of responsible innovation (Graafland and Zhang, 2014, Yao, Liu et al., 2019). Applying the institution theory, Ortas, Gallego-Álvarez et al. (2019) show that national institutions influence economic, social, and governance (ESG) performance. In this context, they find that regulatory states with high levels of knowledge and social capital are more committed to sustainability issues; consequently, they achieve higher levels of ESG performance. Furthermore, differences in country profiles of capital providers also drive companies' ESG performance. Applying the theory of professionalism with institutional theory and diffusion of innovation, one study examines and compares the CSR beliefs of managers with non-managers. The study further investigates whether these differences intensify over time and across nations (Factor, Oliver et al., 2013). The authors show that both managers and non-managers have more favorable beliefs regarding CSR in low-inequality countries. Moreover, individuals in more favorable work situations (e.g., those holding jobs with high income and advancement opportunities) have less strong beliefs regarding this. Applying new institutionalist theory, another study focused on socially responsible innovation and governance in the context of open and private equity fund investment, where there has been relatively little investment focusing on environmental issues. The study argues that responsible innovation is still in its formative stages, and there are opportunities for the development of rigorous corporate social performance analysis for investment institutions (Jun 2016). Considering the resource-based and institutional theoretical perspectives, responsible innovation's scholarship has been extended by examining how innovation in industries encourages and discourages CSR practices (Anser, Zhang et al., 2018). Similarly, underpinned by the perspectives of legitimacy and institutional theories, the pressure from the state government on CSR adoption and disclosures has also been examined (Dong

and Xu, 2016). Finally, using a stand-alone institutional theory, the role of green management and government support in radical and incremental responsible innovation has been examined (Shu, Zhou et al., 2014). A few studies have also used other macro level theories. For example, applying legitimacy theory, the impact of CSR on state- vs. non-state-owned organizations has been observed (Tang, Akram et al., 2021). Using the theory of deliberative democracy, the role of reflexive governance structures in addressing grand societal challenges in responsible innovation has been examined (Scherer and Voegtlin, 2020). Considering institutional level variables, economic theory has been applied in determining the role of CSR in national competitiveness in countries with relatively low innovative standing. In the context of such countries, the absence of a strong national innovation record can be compensated for through CSR-based differentiation strategies (Boulouta and Pitelis, 2014). Furthermore, in applying this theoretical lens, differences in CSR strategies of emerging vs. developed countries have been studied (Jamali, Zanhour et al., 2009), as they have in policy perspectives, e.g., consensus building in policy (Tasaki, Tojo et al., 2019).

Scholars have also utilized innovation diffusion theory in examining responsible innovation across different contexts. For example, in the context of Taiwanese SMEs, compatibility and complexity are related to the willingness of SMEs to engage in CSR activities. It has been argued that SMEs need to become more compatible with CSR in their companies' culture, strategy, and corporate image in order to reduce the difficulties of implementing CSR (Hsu and Cheng, 2012). Consistent with this, another study has linked responsible behavior to the cultural values of the country and industry behaviors (Biggs and Messerschmidt, 2005). Another study considered various types of barriers in responsible innovation, e.g., economic, implementation, policy-related, societal, and technological (Ko, Yoon et al., 2020). A further study has examined the similarities and differences in the adoption of ISO 26000 in the

developing world and identified challenges pertaining to CSR innovation (Balzarova and Castka, 2018).

Some scholars took the perspective of organization theory in examining the social and environmental dimensions of responsible innovation. For example, the environmental and social dimensions of responsible supply chain management have been related to relationship commitment in Asian markets (e.g., Vietnam and South Korea), bringing opportunities for innovation and cost improvements (Lee, 2016). Similarly, the theoretical applications' extensions into knowledge exchange and knowledge have been gained in the implementation of CSR activities (Mirvis, Herrera et al., 2016).

Applying social capital theory, green entrepreneurial orientation was examined as a key driving factor of environmental performance (Shafique, Kalyar et al., 2021). Another study applied this theory to examine socially responsible supplier development in sustainable innovation and development (Wu, 2017). A few studies have used other theories, including sustainable consumption theory (Park, 2009) and the theory of ethics (Bardy, 2012), actor-network theory (De Hoop, Pols et al., 2016), norm activation theory (Dalvi-Esfahani, Ramayah et al., 2017) and the theory of inventive problem solving (Shrotriya and Dhir, 2018) in examining responsible innovation.

7. Synthesis of the key findings: an integrative conceptual framework

This section focuses on themes-based analysis of the studies that are incorporated into antecedents-phenomenon-consequence categories. Within each of these three categories, themes of the representative articles are reported, including theories and frameworks, and key results. Figure 2 schematically represents the key inter-relationships and synthesized findings.

<center>"Insert Figure 2 about here"</center>

7.1. The antecedents

The antecedents' category entails the driving factors for the unit of analysis, i.e., responsible innovation in the case of this systematic review. The drivers of responsible innovation in the context of Asian markets are grouped into organization vs. institutional levels.

Organizational-level antecedents in Asian markets

The review demonstrates that the majority of the studies at organizational level have been conducted in the context of China, India, and Korea. Below, we discuss the key antecedents that have been studied in these contexts.

China: Stakeholder theory has been widely applied in studies in the context of China. Combining stakeholder with agency theory, existing studies have considered market demands for CSR innovation as a driving factor for social, responsible, productive, and less costly manufacturing processes (Gugler and Shi, 2009). Drawing upon the stakeholder and resource-based theoretical underpinnings, pressure to innovate was identified as a key antecedent for responsible innovation (Zhou, Wang et al., 2020). Applying stakeholder's perspective, the positive influence of environmental disclosure has been determined in regard to green innovation (Xiang, Liu et al., 2020). A resource-based perspective has also been considered in examining the role of environmental CSR in sustainable environmental innovation (Pan, Sinha et al., 2021). Additional studies in China have considered the role of employees (Yang, Zhu et al., 2019), customers' advocacy (Yeh, 2015), norms and standards (Dong and Xu, 2016), technological, marketing, and management innovation (Zhu, Zou et al., 2018).

India: In the context of India, the extant studies have examined the responsible innovation phenomenon by considering the effects of pressure from customers and stakeholders applying the stakeholders' resource based-view (Mani, Jabbour et al., 2020). Using the theory of inventive problem solving, one study points out technological skills as an important antecedent in responsible innovation (Shrotriya and Dhir, 2018).

Korea: Organizational learning and innovation theories have been predominantly applied in studies conducted in the context of Korea. For example, a study conducted in Korea and Vietnam considers the role of environmental and social challenges such as global environmental regulations, global warming, and fair trade in responsible supply chain management (Lee, 2016). Another study has examined economic, implementation, policy, societal, and technological barriers in responsible innovation (Ko, Yoon et al., 2020).

Nepal: External pressure has been studied in the context of Nepal by applying stakeholders' perspective (Upadhaya, Munir et al., 2018).

Lebanon: In the context of Lebanon, SMEs' inclination and relational attributes to CSR have been examined (Jamali, Zanhour et al., 2009).

Malaysia: Norm activation theory was applied in the context of Malaysia to understand pro-social behaviors (awareness of consequences, ascription of responsibility, and personal norms) in the adoption of green information systems (Dalvi-Esfahani, Ramayah et al., 2017).

Pakistan: Entrepreneurial orientation for exploration and exploitation has been considered in the context of Pakistan by applying social capital theory (Shafique, Kalyar et al., 2021).

Studies in multiple countries: While our systematic review revealed that the majority of studies were conducted in the context of China, India, and Korea, a few comparative studies have also been conducted in other Asian and international markets. For example, a study considering international perspectives (of China, India, Brazil, Russia, Mexico, Indonesia, Turkey, Saudi Arabia, Argentina, Poland, Thailand, the Philippines) has examined the role of CSR and the level of R&D investment in responsible innovation by applying the stakeholder theory (Ullah and Sun, 2021). Applying stakeholders' perspective and considering OECD countries (excluding Chile, Israel, Korea, Switzerland, and Turkey) as the context, firms' engagement has been examined in determining the influence on eco-innovation, leading to environmental outcomes (i.e., reduced air pollution). Considering China and Taiwan as the

context, another study has applied stakeholder and organization theory in pointing out horizontal differentiation as a key antecedent for innovation (Lai, Lin et al., 2015). Similarly, stakeholder and resource-based theoretical underpinnings, plus organizational culture, were studied for Chinese and Taiwanese markets in regard to green product innovation performance (Chang 2015). In the same context (China and Taiwan), applying innovation diffusion theory, scholars have also considered difficulties in market competition (Hsu and Cheng, 2012), and by applying social capital theory, pressure from both regulations and market requirements have been considered as key antecedents of responsible innovation (Wu, 2017). In the context of China and Taiwan, scholars also focus upon the role CSR and service innovation in customer loyalty (Yeh, 2015). Applying Beer's theory, a lack of effective sustainability indicators was studied in the context of India, Tanzania, China, and Iran in order to assess sustainability in supply chains (Isaksson, Johansson et al., 2010). A study considers micro (organizational practices) and macro perspectives (the adoption process, e.g., early vs. late adoption processes) in adopting innovation standards to introduce responsible innovation in the context of Asia, America, Australia, and Africa (Balzarova and Castka, 2018).

Institutional-level antecedents in Asian markets

At institutional level, the majority of the studies were conducted in the context of China and India.

China: Considering the context of China, institutional theory has been mainly applied in understanding the antecedents and outcomes of responsible innovation in this market. Drawing upon institutional theory, one study considered key antecedents, including institutional pressure and benefits from government support and social legitimacy, as key moderating variables in responsible green innovation (Shu, Zhou et al., 2014). Other studies applying the same theoretical perspective point out green domestic products (Graafland and Zhang, 2014) and increased market opportunities (Yao, Liu et al., 2019). Combining perspectives from

institutional and legitimacy theories, Chinese economic expansion was outlined as a key driving factor in responsible innovation (Dong and Xu, 2016). Additional studies in China have considered environmental challenges such as resource depletion, environmental degradation (Jin, 2012), and political embeddedness as key drivers in responsible innovation (Cumming, Verdoliva et al., 2021).

India: Using institutional theory, one study considered the role of institutions in responsible innovation (Ortas, Gallego-Álvarez et al., 2019). This study shows that regulatory states with a higher level of social capital and knowledge are more committed to sustainable and responsible innovations. As a result, they achieve a higher level of economic, social, and governance performance. Using actor-network theory, another study considers legitimization of research and innovation as a critical antecedent for responsible innovation (De Hoop, Pols et al., 2016).

While the majority of the studies on responsible innovation have focused on China and India, limited studies were conducted in other Asian contexts.

Korea: Applying institutional theory, increased market investments have been considered for social investment strategies that drive organizational performance in the context of Korea (Jun, 2016).

Pakistan: In the context of Pakistan, underpinned by legitimacy theory, the impact of corporate social responsibility has been examined for state-owned vs. non-state-owned enterprises' performance (Tang, Akram et al., 2021).

Africa: Applying the theory of ethics, the influence of foreign direct investment (FDI) has been examined in promoting social and economic responsible development in the context of Africa (Bardy, 2012).

Studies in multiple countries: There are also a handful of studies that have taken overarching international perspectives of the comparison of Asian vs. non-Asian markets by considering

institutional perspectives. For example, a study comparing European, North American, and Asian countries found that stakeholders from low/middle income countries tend to concentrate more on sustainability issues (Tasaki, Tojo et al., 2019). Specifically, in Asia, stakeholders from Japan put more importance on sustainability issues such as waste management. In another example, Ortas, Gallego-Álvarez et al. (2019) examine how national institutions drive or restrict economic, social, and governance performance in Asia, Latin America, Africa, and Eastern Europe. Their study finds that firms in regulatory and welfare states with higher knowledge and social capital are more inclined towards responsible innovation. Differences in a country's profile of capital providers also drives economic, social, and governance performance. Companies in countries with developed equity obtain better economic, social, and governance outcomes than those in which the state is the primary source of financing. On a similar theme, Ringov and Zollo (2007) explore how national differences in cultural values across North America, Asia, and Europe impact firms' social and environmental performance. Their study finds that responsible innovation practices are driven by low tolerance for power distance. Individualistic societies are more receptive to responsible innovation practices than collective societies.

7.2. The consequences

We also clustered the reviewed articles' consequences of responsible innovation at organizational vs. institutional levels' thematic outcomes. First, we grouped the relevant studies that focused on organizational level outcomes in Asian markets. Second, we grouped studies that focuses on institutional level outcomes.

China: In the context of China, various organizational level outcomes have been determined: for example, improved efficiency (Gugler and Shi, 2009), innovation, product safety, implementation of labor rights, environmental performance (Graafland and Zhang, 2014), long term competitive advantage (Gao, Wu et al., 2017), stakeholders' satisfaction, social image

(Zhu, Zou et al. 2018), innovation performance (Wu, Liang et al., 2020, Xiang, Liu et al., 2020), sustainable environmental innovation (Pan, Sinha et al., 2021), and employee turnover (Yang, Zhu et al., 2019). At institutional level, institutional benefits have been found as a key consequence of responsible innovation (Shu, Zhou et al., 2014). Studies in the context of China and Taiwan have shown that improved innovation performance and successful strategic CSR are outcomes of responsible innovation (Chang, 2015, Lai, Lin et al., 2015).

India: All studies in the context of India explored organizational level outcomes, e.g., reduced lead time, increased quality and reliability of performance, increased competitiveness, economic growth (Shrotriya and Dhir, 2018, Mani, Jabbour et al., 2020).

Korea: Like India, studies in the context of Korea also examined organizational level outcomes, including effective standards for responsible innovation, codes of conduct, and overcoming barriers to successful implementation (Jun, 2016, Lee, 2016, Ko, Yoon et al., 2020)**.**

Pakistan: Focusing on institutional outcomes in Asian markets, a study has also examined environmental performance in Pakistan (Shafique, Kalyar et al., 2021).

Studies in multiple countries: An organizational level study on numerous Asian markets (China, India, Brazil, Russia, Mexico, Turkey, Saudi Arabia, Argentina, Poland, Thailand, and the Philippines) have shown business performance as a consequence of responsible innovation (Ullah and Sun, 2021). A study conducted worldwide shows competitive advantage as a key outcome of responsible innovations (Mirvis, Herrera et al., 2016). Another study taking the international perspective found development of effective policies and waste reduction (Tasaki, Tojo et al., 2019), while research on North American, European and Asian markets (Ringov and Zollo, 2007) found a higher level of social and environmental performance as other consequences. Taking an institutional perspective for OECD countries, reduction in air

pollution has been determined as an important consequence of responsible innovation (Jiménez-Parra, Alonso-Martínez et al., 2018).

7.3. Integrative conceptualization and theoretical perspectives

The theme-based analysis of studies provided valuable insights. As regards antecedents' categories emphasis was paid to both organizational and institutional drivers. However, a very limited number of studies took perspectives of both organizational and institutional drivers simultaneously. The phenomenon category captured the least attention for developed markets, as most research focus in the context of Asia considers China and India. However, a few studies considered other markets such as Korea, Pakistan, and Taiwan. The consequence category has gained attention in organizational level outcomes. A few studies have considered institutional level consequences. Very few studies have been conducted at international level, or comparative studies such as Asian vs. Western markets, on organizational and institutional drivers of responsible innovation. The integrative framework of responsible innovation research in Asia (depicted in Fig. 1) represents an overview of the antecedents, definitional dimensions, themes, levels, theories, and outcomes studied for this phenomenon.

At organizational level, there has been a good balance of organizational level antecedents and outcomes studied. This captures a more concrete theoretical picture in terms of amount, range, and foci of elements researched. However, at institutional level studies, an imbalance between antecedents and outcomes was noted. The majority of scholars' focus was on institutional level antecedents (government economy connections, pressure from regulatory bodies) or moderators (e.g., government support, policies and regulations, and legitimacy). The findings point out that the presence of institutional pressure and benefits, legitimacy, government economy connections, and FDI challenges influence responsible innovation practices. The

more obvious pattern is to consider institutional level outcomes and comparative groups (MNEs vs. locals, Asian vs. Western markets).

Overall, no apparent pattern has emerged for the theories used. However, stakeholder, resource-based, innovation diffusion, institutional, and legitimacy theories have mostly been applied individually or in combination with other theories. It is noteworthy that while institutional theory is commonly applied, only two studies in the review considered institutional level outcomes. A very few scholars have applied other perspectives, such as the theory of innovation considering social responsibility, responsible research innovation, and technological innovation, while others have also applied social capital (Wu, 2017, Shafique, Kalyar et al., 2021), sustainable consumption (Park, 2009), the theory of ethics (Bardy, 2012), the actor-network theory (De Hoop, Pols et al., 2016), and the theory of inventive problem solving (Shrotriya and Dhir, 2018), considering entrepreneurial orientation and social strategies towards RI.

As mentioned earlier, the majority of studies analyzing RI at the organizational level have predominantly applied the resource-based view and stakeholder theoretical perspectives in the context of Asian markets. The stakeholder theory is mainly applied by considering the market pressures and stakeholders' pressures in enacting responsible innovation, while the resource-based view considers resources such as levels of R&D investments and innovation capability. Institutional theory is applied for institutional level and organizational level determinants of responsible innovation. For example, at an institutional level, one study considers a role of institutional benefits and pressures in responsible innovation (Shu, Zhou et al., 2014). Another study considers the green domestic product (Graafland and Zhang, 2014). At organizational level, scholars also consider the challenges and risks pertaining to society and the environment (Ringov and Zollo, 2007). Applying legitimacy theory, scholars have considered the role of economic expansion in responsible innovation (Dong and Xu, 2016). Scholars have also

applied economic theory in understanding the role of policy pressures (Boulouta and Pitelis, 2014). The theory of deliberative democracy has been applied to study grand challenges pertaining to responsible innovation considering the role of government structure (Scherer and Voegtlin, 2020). The theory of ethics has been applied in considering the role of foreign direct investment (FDI) (Bardy, 2012) and the theory of actor-network considers the demand for legitimization of research and innovation (De Hoop, Pols et al., 2016).

Finally, key definitional dimensions show some interesting patterns in accordance with variations to the context (e.g., eco-innovation, green innovation, climate responsible innovation, socially responsible innovation, etc.). From a methodological perspective, two of the reviewed studies adopted mixed methods (survey and interview, n = 1, survey and observations, n = 1). Fourteen studies adopted a qualitative approach (reviewed articles, n = 6; case-studies, n = 3; ethnographic fieldwork, n = 1; interviews, n = 3; observations = 1) and the remaining were quantitative studies.

7.4. Integrative conceptualization and theoretical perspectives

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No apparent pattern has emerged for the theories used. However, stakeholder, resource-based, innovation diffusion, institutional, and legitimacy theories have mostly been applied individually or in combination with other theories. It is noteworthy that while institutional theory is commonly applied, only two studies in the review considered institutional level outcomes. Finally, key definitional dimensions show some interesting patterns in accordance with variations to the context (e.g., eco-innovation, green innovation, climate responsible innovation, socially responsible innovation, etc.). From a methodological perspective, two of the reviewed studies adopted mixed methods (survey and interview, n = 1, survey and observations, n = 1). Fourteen studies adopted a qualitative approach (reviewed articles, n = 6; case-studies, n = 3; ethnographic fieldwork, n = 1; interviews, n = 3; observations = 1) and the remaining were quantitative studies.

8. Discussion and Conclusion

This systematic review presents a snapshot of the current stage of research and limitations in responsible innovation, as well as some fruitful avenues to extend this important topic. The future research directions are extracted from the knowledge gained through a synthesis of the results presented in Section 3. These synthesis-stemming future research directions expand the spectrum of questions to multidisciplinary areas in the context of Asian markets and their comparisons with Western markets. Our synthesized findings suggest several knowledge gaps, theoretical inconsistencies, and contextual gaps. To enhance the impact of research on this topic, we argue that stronger theoretical grounding, methodological diversity, and contextual positioning is required.

8.1. Sourcing future research and general directions

8.1.1. Axis 1: theory

From the theoretical perspective, the research in responsible innovation has primarily relied upon innovation diffusion, stakeholders, resource-based, and institutional theory to understand the antecedents and consequences of responsible innovation. Our systematic review of the literature on responsible innovation suggests that scholars have utilized these theories in a complementary manner, rather than highlighting the current tensions in the underlying assumptions of any given theory. Future works should address the underlying tensions across different theories, such as the stakeholders-based view vs. the resource-based view and examine not only the positive consequences of responsible innovation, but also focus on the negative impact of responsible innovation. For instance, employees might have to work extra hours to come up with creative ideas for responsible innovation, which may impact their wellbeing, or firms might use technology that is not conducive for enacting responsible innovation, thus greater attention should be paid to examining both positive and negative consequences of responsible innovation.

Future research can also consider other important theories, such as the resource dependency and behavioral theory of the firm. Institutional theory has made great strides and provided useful insights in exploring various phenomena, including CSR and responsible innovation, and there is scope for future studies to apply national business systems and comparative institutional perspectives and thereby shed light on the organizational level antecedents and moderators such as competitors' pressure or institutional distance and responsible innovation. As the institutional environment varies across markets and subnational institutional factors might facilitate or hinder responsible innovation, future studies could thus pay more attention to how organizations based in resource-constrained environments handle institutional pressure and establish legitimacy when it comes to enacting responsible innovation. In this context, organizations might imitate their competitors' responsible innovation, therefore future studies could examine how such imitative strategies work, or whether these are useful for developing responsible innovation. Studies examining these issues could leverage legitimacy and reputation-building perspectives, and thus examine responsible innovation across different types of firms, such as SMEs, the public sector, and private companies.

Future studies could also apply organizational learning and agency theories and shed light on the moderators, such as the role of the board of directors and gender diversity, as well as exploratory and exploitative learning, and how these influence the development of responsible innovation. Managers might pursue their personal interests while meeting the expectations of diverse stakeholders through responsible innovation, therefore future studies need to examine how such private benefits are curtailed or enhanced through the prevalent institutional environments of the managers and their firms.

8.1.2. Axis 2: methodology

As responsible innovation is still a very young field of research in Asia, and is clearly in an early stage, there is a relevant methodological gap in existing knowledge. Drawing on this

systematic review, we can clearly identify the need for more qualitative research in the field, as most studies reviewed use a quantitative approach. The lack in qualitative research can possibly be related to the difficulties in analyzing qualitative data. Moreover, most of the studies included in this systematic review focus on a limited sample of stakeholders and include only a few categories of participants. Future research should consider a more holistic approach and draw on broader samples to include diverse perspectives in the process. This will bring research on responsible innovation to another level, providing useful managerial, practical implications, and evidence for policymakers and governments to focus resources on the development of responsible innovation.

Another important consideration, which leaves room for future research, relates to the measures used in the studies reviewed. To measure responsible innovation in Asia, researchers use, adapt, or develop specific measures. We can identify three levels of measure development. In some studies, researchers use only the existing measures as they were developed for Western countries, without any possible modification. At a higher level, they try to adapt the existing measures to the Asian context, modifying actual constructs or adding new features to be considered. Finally, at the highest level, researchers develop new scales for the Asian context of responsible innovation. Considering that out of the total studies in our sample, only a limited number of studies, specifically three studies, self-develop measures that fit mostly to the Asian context of the phenomenon, there is a clear need for future research to focus on developing measures for this context. The major justification underlying such a need is the fact that responsible innovation in Asia may be shaped by cultural, socio-economic, and political factors, thus implying that measures developed for Western countries need to be further evaluated, modified, or reassessed in this specific context.

Lastly, we can recommend the usage of mixed methods research, which in this review was very little explored, as a way of providing a superior outcome to monomethod studies. This will

help researchers overcome the weaknesses of conducting only qualitative or quantitative research and will result in a better understanding of the phenomenon and complementary strengths (Johnson and Onwuegbuzie, 2004).

8.1.3. Axis 3: context

From a geographic reach perspective, there is a clear bias towards China, India, and Korea, while other important Asian markets such as Pakistan, Malaysia, and Indonesia have largely remained ignored. For robustness, we suggest that future studies should pay more attention to these underexplored geographic contexts. This is because overreliance on specific markets may pose generalizability concerns. We urge scholars to partner with academia or industries in other under-represented countries in order to acquire a deeper contextual understanding. This could also help in accessing the data. Moreover, little attention has been given to comparative studies. Future studies can compare different Asian markets, or Asian markets with Western markets. Furthermore, Asian markets may have unique historical, cultural, and institutional attributes that serve as a good ground for theoretical advancements. This points out that comparative studies can also consider economic, geographical, social, and institutional characteristics as independent, mediating, or moderating variables. Within these streams, future studies could focus on industry-related regulations and market dynamism as potential moderators. Another limitation of this study is a lack of focus on different types of firms. For example, the majority proportion of studies in this review of the extant literature focuses on manufacturing industry, followed by a few studies on service industries. Thus, future research could be extended to other important sectors such as energy, steel, aerospace, legal and financial services in the respective markets studied. In terms of firms' characteristics, most studies were randomly sampled, using databases or listed stock exchanges, while others specifically focused on SMEs. Future studies could also examine the topic in the context of large local firms vs. large MNEs, large firms vs. SMEs, new business entities, as well as state-owned enterprises (SOEs). Further

contextual gaps emerged pertaining to institutional level conditions and theory being applied and studied for organizational level outcomes. Thus, a potential avenue to extend research is to consider institutional level outcomes such as institutional stability. Finally, there is scope to study mediating-moderating mechanisms, as this will provide better insights into the conditions under which the effectiveness of responsible innovation can be strengthened.

8.2 Conclusion

To conclude, our analysis has responded to several calls for the development of a structured and systematic overview and critical analysis in an under-researched but highly important region of the world, namely the Asian region. This study has assisted in mapping the developments in responsible innovation along the specific characteristics, both macro and micro, in the Asian region. Added to this, both the critical and comprehensive analysis and synthesis of the results, as well as the development of an integrated conceptual framework, has helped us to confidently propose an agenda for future research, thus contributing to the expansion of the boundaries of the domain into new research paths and establishing the basis for the concept of responsible innovation to develop further in the region. From a managerial perspective, considering the ability of responsible innovation in supporting businesses for implementation of SDGs at the level of the firm required by the UN Agenda 2030 (Imaz and Eizagirre, 2020), and the opportunity to improve socio-ethical practices of doing business, as adopting a moral responsibility to respond to important societal and environmental challenges, this study proves useful to increased stakeholder engagement, improved legitimacy and reputation, as well as improved efficiency along with several institutional benefits and economic growth (Iazzi *et al.*, 2020). More specifically, a common interest to implementation of RI practices has subsequently been seen as a solution to societal and environmental challenges that Asian countries are facing and paying consequences. RI despite being a step towards improved environmental performance, while we must consider that some of the Asian

countries account for the biggest polluters of the environment (Chien et al., 2021), is also contributing to economic growth, improved quality of life and reduced poverty (Tseng et al., 2013; Herrera, 2016). Therefore, we can acknowledge our findings as theoretically and managerially useful to nurture the debate on responsible innovation in the Asian region.

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