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Radical Innovation in Family Firms: A Systematic Analysis and Research Agenda

ABSTRACT

Purpose – Investigation of family firm *radical* innovation is burgeoning but far less prevalent than studies of family firm innovation in general. Concurrently, studies repeatedly report that family firms exhibit mostly conservative and incremental innovation rather than more radical ones. This is unfortunate because without radical innovation, family firms risk a competency trap in which long-term competitiveness is lost to more innovative rivals. This situation has led to urgent calls among scholars to explicitly acknowledge the heterogeneity of family firm innovation and to understand the conditions for family firm radical innovation.

Design/methodology/approach – A systematic review of 51 papers categorized into four scholarly conversations build the foundation for a critical discussion of each line of inquiry.

Findings – This study analyzes 51 leading articles and identify four persistent theoretical positions: (1) RBV and capabilities, (2) agency and stewardship, (3) behavioral agency and socioemotional wealth, and (4) the ability and willingness paradox. The authors identify key research problems and research questions needing urgent scholarly and present a framework that captures their complementary and competing assumptions to enable rigorous future research.

Originality/value – To galvanize and spearhead future research efforts, this paper provides a critical analysis of the current understanding of family firm radical innovation with a specific emphasis on the theoretical assumptions at the core of existing investigations and the 8 most important research questions in need of answers.

Keywords – Family firm, radical innovation, family firm innovation, willingness and ability, socioemotional wealth, resources, agency, stewardship, family radical innovation assumptions

Paper type – Literature review

INTRODUCTION

Innovation is vital to the survival of family firms (Chrisman and Patel, 2012; De Massis et al., 2012; Miller et al., 2015; Sciascia et al., 2015). Without innovation, family firms are at risk of losing competitive advantage, witness their products and services become obsolete, and lose market share to new and existing competitors (Konig et al., 2013). Radical innovation to devise truly new products and services has been described as the “lifeblood of firms” (Slater et al., 2014, p.552). However, family firms often innovate less than traditional firms (Llach and Nordqvist, 2010) because of concerns about wealth preservation (Filser et al., 2018), avoid risk-taking as a route to wealth endangerment (De Massis et al., 2014), have poorly developed innovation capabilities (Sciascia et al., 2015), and exhibit family entrenchment (Anderson and Reeb, 2003) and family orientation lock (Herrero and Hughes, 2019) that diminish the incentive to pursue new innovations (Gast et al., 2018; Kraus et al., 2018). These conditions lead family firms to innovate more incrementally rather than radically (Calabrò et al., 2018; Nieto et al., 2015; Roessl et al., 2010; Wright et al., 2016).

Radical innovations carry significant risk and uncertainties with unpredictable rates of success and acknowledged high failure rates (Barczak et al., 2009; Evanschitsky et al., 2012; Rubera and Kirca, 2012), often unpalatable to family firms. An absence of radical innovation, however, is especially dangerous because it renders the long-term viability of the family firm at risk. Despite a sizeable body of research on family firm innovation in general, only a proportion of studies differentiate by type of innovation and urgent calls have emerged for studies into types of innovation, particularly the conditions for truly novel innovations (Calabrò et al., 2018; De Massis et al., 2015a). This gap in research is of paramount importance. The conditions and skills needed for radical innovation are substantially different to incremental innovation (Bouncken et al., 2018; Dewar and Dutton, 1986; Ettlie et al., 1984; Evanschitsky et al., 2012; Salter et al., 2014).

Radical innovation is defined as the commercialization of an entirely novel idea, which is new to the markets (Bouncken et al., 2018; Colombo et al., 2017). This type of innovation is substantially different or new technology that represents a clear, risky departure from existing practice, can be disruptive or discontinuous (Bouncken et al., 2018; Garcia and Calantone, 2002), offering potentially higher customer benefits over previous products and services in the industry (Chandy and Tellis, 1998, 2000; Gatignon et al., 2002; Govindarajan et al., 2011; Kyriakopoulos et al., 2016; O'Connor, 1998). Incremental innovation, however, consisting mainly of improvements and line extensions through fitting, recombining, reusing and adopting the existing knowledge (Bouncken et al., 2019; Colombo et al., 2017).

Incremental innovation has modest novelty to existing products and services in existing markets carry very little risk to the firm and do not require any substantive transformation in business activity (Ettlie et al., 1984; Garcia and Calantone, 2002; Slater et al., 2014).

Radical innovations require a fundamentally different skillset for a firm than do incremental innovations (Slater et al., 2014). Radical innovations also produce large advancements in price/performance frontiers and can offer unprecedented customer benefits, substantial cost reductions, and firm renewal (Kyriakopoulos et al., 2016; Slater et al., 2014). But, it is precisely these properties that cause unpredictable success rates, high failure rates and modest financial returns (Barczak et al., 2009) that are unpalatable to many family firms (Chrisman and Patel., 2012; Konig et al., 2013). From one perspective, family firm size and resource stocks can determine the firm's capabilities for conducting radical innovation (Habbershon and Williams, 1999; Matzler et al., 2015; Roessl et al., 2010). By contrast, intra-family conflicts (Block, 2012; Filser et al., 2018), family firm performance (Chrisman and Patel, 2012), and particular preferences and objectives of family members (Anderson and Reeb, 2003; Roessl et al., 2010) can result in risk-aversion (Gomez-Mejia et al., 2007) and short investment horizons (Chrisman and Patel, 2012; Thomsen and Pedersen, 2000), which

reduce motivation towards radical innovation among family firms (Anderson and Reeb, 2003; Gomez-Mejia et al., 2007). There is heterogeneity in how radical innovation occurs and is implemented among family firms, and family firms themselves are heterogeneous in how they prioritize or create the circumstances for radical innovation. Consequently, the present study examines: (1) what is the current state of understanding of family firm radical innovation; (2) what theoretical lenses are used to examine family firm radical innovation and what are their implications; and (3) what are the key assumptions and questions requiring urgent attention to advance knowledge?

Answers to these questions are essential because to date, studies of family firm radical innovation are far fewer than general studies of family firm innovation (Calabrò et al., 2018; De Massis et al., 2015a). Of the studies specifically speaking to family firm radical innovation, a series of different theoretical lenses are used to frame this activity, creating an array of findings originating from a different set of theoretical assumptions whose implications for the accumulation of knowledge are unclear (Filser et al., 2016). The field lacks an in-depth overview of the growing research effort made towards understanding family firm radical innovation; a detailed evaluation of current academic investigation into family firm radical innovation that identifies inconsistencies, contradictions, and pockets of consensus; a map of the theoretical assumptions associated with each lens and the implications these assumptions hold for the investigation of family firm radical innovation; and ascertains the areas in which future research endeavor should focus for the greatest contribution (Filser et al., 2016; Kraus et al., 2020). This study seeks to address these problems by: (1) assesses the state-of-the-art of knowledge about family firm radical innovation (ascertaining theory, absences, and assumptions), and (2) evaluates the most crucial problems that researchers need to address in their future investigations. Doing so will reconcile the rapid development in theory seen to date and highlight where current

understanding is at its thinnest and in need of the most urgent attention, both theoretically and empirically.

The present paper builds on 51 leading articles published between 2003 and 2018 in *Academy of Management Journal*, *Administrative Science Quarterly*, *Entrepreneurship Theory and Practice*, *International Journal of Entrepreneurial Behavior and Research*, *Journal of Small Business Management*, *Family Business Review*, *Journal of Family Business Strategy*, and *Journal of Product Innovation Management* into family firm radical innovation. Of these 51 articles, 18 directly treat radical innovation in family firms (e.g., Block, 2012; Cassia et al., 2011; Chrisman et al., 2015; De Massis et al., 2012, 2016; Singh and Gaur, 2013; Zahra, 2005) and 33 contribute vital knowledge to the current understanding of the functioning of family firms' radical innovation (e.g., Carney, 2005; Chirico and Salvato, 2014; Gomez-Mejia et al., 2007; Sirmon and Hitt, 2003).

This paper offers two important and timely contributions to the family firm management literature. First, it provides an in-depth overview and point of reference for the burgeoning research effort made towards understanding family firm radical innovation. It crystallizes why family firms have difficulties innovating radically and clarifies the origin of those reasons, critically analyzes the state of current knowledge on those reasons, and identifies high-priority research gaps exist in this debate. Second, it evaluates the current academic investigation of family firm radical innovation, locating and assessing the research advances, contradictions, problems yet to be solved, and promising areas on which to focus future research endeavor for the greatest contribution and impact. In doing so, the authors map the theoretical assumptions associated with each lens and the implications these assumptions have for the investigation of family firm radical innovation. The two contributions of this present study directly respond to very recent petitions by scholars to

acknowledge and urgently study the heterogeneity of innovation (De Massis et al., 2015a) and with a specific focus on radical innovation (Calabrò et al., 2018).

STRUCTURED LITERATURE REVIEW METHOD

A structured literature review process and article filtering can be performed through five steps (Mertens, 2005): (1) read articles and define key terms; (2) type the 'keywords' into databases to search and select articles essential to the current research theme; (3) determine the connections among the key terms and discover the similarities and conflicts among them; (4) draw a literature map to link the terms that are relevant to each other; and (5) update the literature map and list of articles, and elaborate the overall review.

The databases identified for this study are ScienceDirect, EBSCO, Springer Link, Wiley, and Sage. The search engines within these databases use Boolean operators to examine their literature portfolio and report their results according to the presence of keywords (Hart, 2004). The results include journal articles, essays, magazines, books and newspapers if there are no criteria to constrain the auto selection. Thus, the universal search criteria applied to these databases to seek articles directly about or providing supporting information about family firm radical innovation were limited to 'English version', 'peer-review', and 'full text' articles. The publication timeframe of the chosen articles was restricted to between 2003 and 2018 in order to show recent advances and establish the crucial assumptions for the future investigation of family firm radical innovation.

To generate a list of articles relevant to the current topic, a priority search process was carried out to cover keywords and related terms found within established definitions of radical innovation (e.g., Chrisman et al., 2015; Ettlie et al., 1984; Garcia and Calantone, 2002; Konig et al., 2013; Kyriakopoulos et al., 2016; Slater et al., 2014). For instance, 'radical innovation', 'disruptive innovation', 'disruptive technological innovation', 'radical innovativeness' and

‘discontinuous technological innovation’ are relevant terms observed as properties of radical innovation (see Garcia and Calantone, 2002)¹. Extensive keyword searching also prevents important journal articles and scholarly papers from being lost, overlooked or omitted (see Kraus et al., 2020, for an illustration of good practice in the conduct of systematic literature reviews). For example, while searching ‘family firms’, ‘governance’, and ‘radical innovation’, supporting articles such as Carney (2005) will not be revealed among the search results. While inputting ‘family governance’ and ‘competitive advantage’ into the search, the seminal paper by Carney (2005) reveals itself in the EBSCO database. Through the initial reading of the articles of Cheng and Van de Ven (1996), Chrisman et al. (2015), Chrisman and Patel (2012), De Massis et al. (2016) and Konig et al. (2013), and a list of search terms and vocabulary was created: ‘innovation’, ‘radical innovation’, ‘technological innovation’, ‘family governance structures’, ‘research and development (R&D)’, ‘exploration’, ‘motivation and ability’, ‘new product development’, ‘family influence and firm performance’, and ‘ownership and control’.

The filtering criteria restricted the search results towards: (1) key academic contributions that have significantly developed the topic and (2) highly relevant articles in line with the current research theme or providing support for radical innovation (e.g., revealing the radical innovation decision process; connecting family governance and radical innovation) (Kraus et al., 2020). These criteria were met in two ways. First, key articles were identified by reviewing the title of the article, the research concept from the abstract, the

¹ Radical innovations can possess disruptive properties (Garcia and Calantone, 2002; Slater et al., 2014) but not all disruptive innovations are strictly radical (Smith, 2005; Yu and Hang, 2010). Similarly, Garcia and Calantone (2002) in their review of innovation terminology characterize radical innovation as bearing discontinuous properties, including both market and technology discontinuities. They acknowledge discontinuous innovation as a form of innovation, but in its definition expressly stated that discontinuous innovation, “may be either a *radical innovation* or really new innovation dependent upon at which level (macro/micro) and which S-curve(s) (marketing/technology/both) is affected by the introduction of the invention to the marketplace” (p.123, emphasis added). Therefore, to ensure that this present study did not omit relevant studies, the authors retained “disruptive” and “discontinuous” as additional of search terms. Thereafter, each paper was screened for its fit to radical innovation.

contents, introduction and conclusion, the key author or authors, the principal argument(s), (un)stated assumptions, research background, and key examples. Second, to support the literature search endeavor, a further selection condition was set by focusing the choice of journals solely on those publication outlets rated highly for journal quality as indicated, for example, by the Association of Business Schools (ABS) (ABS Journal Ranking Guide, 2015) in the UK and relevant, equivalent international systems (e.g., ABCD ratings) (Kraus et al., 2020). While carrying a degree of subjectivity and imprecision attributable to any such ranking of journal quality, this measure helps provide an additional mechanism to reduce the plethora of initial search results into a more manageable quantity based on a generally-accepted list of journals defined as being of international or world-leading standard (Kraus et al., 2020). Articles were sourced from *Academy of Management Journal*, *Administrative Science Quarterly*, *Entrepreneurship Theory and Practice*, *International Journal of Entrepreneurial Behavior and Research*, *Journal of Small Business Management*, *Family Business Review*, *Journal of Family Business Strategy*, and *Journal of Product Innovation Management*.

The initial search for radical innovation and family firms meeting these criteria led to 74 papers being retrieved from the aforementioned databases. After a round of screening, 31 papers not explicitly concentrating on radical innovation and family firms were deleted. This screening was completed by examining the title and abstract of each paper. Since few studies discussed family firm radical innovation activities between 1999 and 2003, ultimately, 51 papers published between the start of 2003 and the end of 2018 were selected for final discussion, with 18 articles purely discussing family firm radical innovation and 33 supporting articles relevant to family firm radical innovation.

To analyze these papers, the first step was to categorize them based on the instances of theory used to study the phenomenon of family firm radical innovation. This approach was

consistent with addressing the research question of the present study. Each paper was screened to ascertain which theoretical perspective was applied. Among the 51 studies that examine radical innovation and family firms, 25 are quantitative, 23 are qualitative, 2 use fuzzy-set qualitative comparative analysis and 1 study employed grounded theory. Two studies used several theories at the same time (Le Breton-Miller et al., 2015, used three theories) and another six used two theories at the same time (Chrisman et al., 2005; Kammerlander and Ganter, 2015; Kellermanns et al., 2012; Konig et al. 2013; Miller et al., 2015; Zahra, 2005). In total, 18 different instances of theory occurred among the 51 studies (see Appendix).

As a second step, the selected scholarly papers about family firm radical innovation grouped naturally into four areas of discussion based on their theoretical perspective: (1) the resource-based view (RBV) and capabilities, (2) agency theory and stewardship theory, (3) behavioral agency theory and SEW, and (4) ability and willingness. In Tables 1 through 4, all the articles are listed together with details of their respective lenses. Some papers are repeated across Tables 1 through 4 because those papers contained more than one theoretical perspective, as described in Step 1. Tables 1 through 4 detail key information about each article under the 4 groups of studies centered on a theoretical perspective. To illustrate this coding procedure, Chrisman et al. (2015) and Veider and Matzler (2016) discuss how conditions pertaining to the ability and willingness of family firms to act influence their innovation activities. Accordingly, these two papers were grouped under ‘ability, willingness, and innovation’ perspective. Since both papers explained that family involvement in ownership and management will result in different goal selection and idiosyncratic family decision behavior associated with innovation, ability and willingness in this situation belongs to the broader theme of governance as well. As the third step, to identify the factors pertaining to family firm radical innovation in each article, items contained in conceptual models,

hypotheses or propositions as well as quantitative and qualitative findings were extracted to form the basis for discussion. The synthesis achieved through steps 1 to 3 provided a complete picture of the status of the family firm radical innovation literature, with 4 clusters of studies centered around four theoretical perspectives emerging. As the fourth and final step, these clusters were reviewed and evaluated for their underpinning theoretical assumptions, key findings, and areas of weakness to suggest coherent avenues for future research.

ANALYSIS AND DISCUSSION

The analysis reveals four dominant theoretical lenses in the study of family firm radical innovation between 2003 and 2018: the RBV and its capabilities extension ($n = 19$), agency theory and stewardship theory ($n = 16$), behavioral agency theory and SEW ($n = 9$), and the ability and willingness paradox ($n = 7$).

The analysis is structured as follows: Working through each theoretical lens, this study (1) critically analyzes the state of current understanding, and (2) identifies and extract the essential research problems to set an agenda for future research efforts into family firm radical innovation.

RBV, Capabilities and Family Firm Radical Innovation

The RBV holds that the stock of valuable, rare, inimitable, and non-substitutable resources that a firm owns can provide it with a sustainable competitive advantage in its competitive market (Barney, 1991). The family firm's resources, namely, internal financing activities, internal and external social capital, and unified ownership and control generate uniqueness that serves as a basis for competitive advantage (Sirmon and Hitt, 2003; Uhlaner et al., 2013).

Financial Resources

Different from non-family firms, financial resources within family firms come mostly from family members (Covin et al., 2016; Sirmon and Hitt, 2003). This type of financial resource has unspecified date of return to the lenders (among the family members) that allows family firms to have longer investment horizon (Sirmon and Hitt, 2003); but it is also limited in its contribution to radical innovation activities which require abundant initial financial resources (Chrisman et al., 2016; Kammerlander and Ganter, 2015). At the same time, the high degree of altruism characterizing family firms' behavior is associated with strategic decisions that generate benefits and interests primarily aligned with the preservation of family members' financial wealth (Miller and Le Breton-Miller, 2005). Although such altruistic behavior can strengthen family bonds and foster loyalty (Miller and Le Breton-Miller, 2005; Nordstorm and Steier, 2015), it also constrains innovation activity because giving out financial benefits to family members reduces the financial resources available for internal investment. This problem is especially acute in family firms at an early stage of the organizational life-cycle (Block, 2012; Cassia et al., 2012; Sharma and Salvato, 2011). When financial resources are lacking, family firms will put greater concern on short-term growth strategies instead of a focus on longer-term innovation or innovation activities (e.g., radical ones) requiring a long-term return horizon (Sharma and Salvato, 2011; Singh and Gaur, 2013).

Social Capital

Social capital includes internal social capital (relationships among employees within the firm) and external capital (relationships between the firm and external entities) (Chirico and Salvato, 2014; Herrero and Hughes, 2019; Hoffman et al., 2006). Family firms normally have a strong bond among employees (both family and non-family employees) (Nordstorm and Steier, 2015). Internally, since family members have shared values and goals, highly-cohesive daily operations bearing intense and effective communication are typical (Cassia et

al., 2011; Hoffman et al., 2006; Nordstorm and Steier, 2015). The communication among family members encourages mutual information sharing, increase the flow of information (Craig and Dibrell, 2006), enhance trust among employees (both family and non-family employees) (Chirico and Salvato, 2014; Nordstorm and Steier, 2015), and facilitate the flow of resources pertinent to family firm performance (Herrero and Hughes, 2019; Mani and Lakhal, 2015). Compared to non-family firms, family firm employees (both family and non-family employees) more deeply understand the mission and strategy of the firm (Kor, 2006; Nordstorm and Steier, 2015) and make better use of acquired information in that respect (Patel and Fiet, 2011). Hence, the family firm has the potential to react quickly to opportunities with innovative actions (e.g., increasing investment in R&D) and tolerate a degree of risk in doing so; this may create advantages for radical innovation activities (Mani and Lakhal, 2015; Zahra, 2003). However, recent studies find that family social capital can be ‘too much of a good thing’ causing a lock-in that prevents new resources and novel information from entering the family firm (Herrero and Hughes, 2019). Radical innovation activities can prosper within the family firm has a mix of internal and external social capital (Covin et al., 2016).

Externally, family firms search for cooperation with stakeholders, develop long-term attachments with critical stakeholders, and reinforce such partnerships and alliances through generations (Sirmon and Hitt, 2003). Carney (2005) and Dunn (1996) argue that establishing contacts with stakeholders is less of a challenge for family firms as initially speculated because stakeholders are often willing to connect to a family member who owns and manages a business and has a certain social reputation. Connected external stakeholders often prefer to invest in innovation projects that contain benefits from a long-term perspective (Chrisman and Patel, 2012; De Massis et al., 2015b). These external stakeholders contribute an information sharing network that family firms can rely on to acquire new knowledge and business

opportunities (Mani and Lakhal, 2015; Nordstorm and Steier, 2015). For example, external stakeholders provide wider access to resources such as ‘know-how’, customer information and market knowledge (Herrero and Hughes, 2019; Kyriakopoulos et al., 2016). New knowledge flows into a firm can stimulate new venture activities (Colombo et al., 2017).

Knowledge Resources

Knowledge resources are an essential aspect of conducting radical innovation (De Massis et al., 2012; Kotlar et al., 2013; Mani and Lakhal, 2015; Sirmon and Hitt, 2003), and can help family firms maintain their market position and prevent competitors fully imitating a radical innovation (Chirico and Salvato, 2014). A question lies in how family firms acquire and utilize knowledge resources for radical innovation.

The separation of the ‘outsider’ (non-family employee) and ‘insider’ (family member) mindset is rooted in many family firms (especially during first and second generations) (Zahra, 2012). Normally, founders favor the development of their children, take extra care with other family members, and eventually undermine non-family employees (Cassia et al., 2011; Zahra et al., 2004). In this case of unequal treatment, family firms can rarely retain non-family talent (especially those who hold contradictory opinions to family owners) (Zahra et al., 2004), and, over time, family firms lack a diversification of professional knowledge, generating ‘strategic simplicity’ (highly routinized operational process knowledge) (Cassia et al., 2012; Miller, 1993). Although family firms are able to generate effective socialization and shape employees towards a common goal, the firms also narrow the innovation paradigm of employees and routinize their operations (De Massis et al., 2015b; Zahra et al., 2004, 2016). Under these circumstances, family firms are expected to increasingly prefer the status quo rather than pursuing radical innovation, learning from experience and utilizing ‘ready-made’ planning in dealing with problems in the ongoing business environment (Gomez-Mejia et al., 2007; Sharma and Salvato, 2011; Zahra, 2016). As non-family employees’ knowledge is less

efficiently utilized, the knowledge resource for innovation activities depends on the knowledge of founders and other family members (Block, 2012; Miller, 1993).

Family firm founders, who act as CEOs, have the power to integrate various resources and align these resources with family interests to determine strategic actions (Cassia et al., 2011). During the development of the family firm, founders become equipped with vast business experience both in business operation and innovative venturing (Li and Daspit, 2016; McConaughy et al., 1998). Yet, Kraizcy et al. (2015) contended that founders are more innovative than managers within a family organization, especially at the early stage of a firm's' life cycle. However, the investment behavior of the founders will not remain constant over the long-term, typically becoming less incentivized to radically innovate at later stages (Craig and Moores, 2006; Hannan and Freeman, 1984; Miller, 1993; Zahra, 2005). Founders concerns to protect family legacy and reputation and preserving family wealth for next generations (Chrisman and Patel, 2012; Schulze et al., 2001) render knowledge resources inert. The narrowing of information search over time exacerbated by low motivation for innovation can impede the inflow of new knowledge (De Massis et al., 2016; Patel and Fiet, 2011). Over time, the ability to conduct innovation further diminishes and is eventually undermined (Zahra, 2005) while commitment to family tradition rises (De Massis et al., 2016).

Learning can reverse this decline, however. The purpose of providing learning for founder-CEOs is to broaden their minds against the narrowing of information search (Hannan and Freeman, 1984; Sorensen and Stuart, 2000; Zahra, 2012), to increase the founder-CEOs' sensitivity to seeking opportunities, and to lengthen founders' investment horizons (Kotlar et al., 2013; Lumpkin et al., 2010). By learning and over time, family founder-CEOs should act less conservatively and develop strategies to access a broader set of resources (Cucculelli et al., 2016; Zahra, 2012). This should result in a higher chance of radical innovation.

Resource-based Questions for Future Research

Existing studies have emphasized the relationship between family firm resources and radical innovation activities but overlooked the heterogeneity of family firms. Family firms are different from holding different resources, firm sizes and family members' knowledge. These differences may steer family owners' attention towards different innovation activities (Kotlar et al., 2013). For example, the attention or emphasis attributed to risk-aversion in the family firm's decision-making will also reduce when the family firm's financial resources are strong; specifically, an abundance of financial resources can increase the probability of radical innovation activity within family firms (Covin et al., 2016). Considering the size of the family firm, larger firms can have more family social, human, and financial resources than small- or medium-sized firms (Danes et al., 2009), are better placed to internally leverage knowledge and abilities held by family employees, and externally have a better chance to sense opportunities from a relatively strong social capital pool (Chirico and Salvato, 2014). These resources can increase family firms' probability in conducting radical innovation activities; and any negative impact from radical innovation failure can be eased when family firms have slack resources (Gibbert et al., 2007; Xiang et al., 2018). The latter is commensurate with size.

Compared to large family firms, small family firms have less freedom to pursue radical innovation activities. Radical innovation activities require a high degree of sunk costs (once invested, such costs cannot be moved or recovered), and include injections into R&D (Singh and Gaur, 2013). After new products are launched, the knowledge generated by R&D might be copied or 'invented around' by rival firms (Harabi, 1995). Consequently, the R&D investment may not yield or receive the full return initially expected of it (Block, 2012). If family firms consume a lot of resources through innovation activities containing a high risk of failure or long-term payoff, those family firms will likely encounter resource scarcity that makes it hard to maintain daily operations (Singh and Gaur, 2013; Sorensen and Stuart, 2000;

Xiang et al., 2018). Therefore, family firms may drop into a fluctuated market position judged by the degree of success of innovation activities and exposure to risk (Chrisman et al., 2015).

Radical innovation activities cannot entirely depend on the size of the firm either. Although the larger family firm has typically stronger social capital, in which it has a better chance to recognize the opportunities from social networks (Kraiczy et al., 2014), strong social capital can constrain radical innovation because family members will favor dense ties on which they are likely to rely heavily instead of searching for new ties with more novel knowledge (Chirico and Salvato, 2014). In such circumstances, large family firms do not have an absolute higher chance of radical innovation over family firms of small or medium size (Craig et al., 2014). Family firms that are small or medium in size can react to opportunities faster than large firms, because large firms have more formalized bureaucratic systems in which decision-making is systematic in order to meet internal policies and attract legitimacy (Gudmundson et al., 2003; Patel and Fiet, 2011). Concurrently, radical innovation activity forces some parts of the firm to experience intensive change, which can raise family members' fears of losing job control latitudes (Craig and Moores, 2006; De Massis et al., 2016).

Considering the heterogeneity of different family firms, radical innovation is associated with how many degrees of risk, and what types of risk, can trigger family firms to conduct radical innovation (Sciascia et al., 2015; Singh and Gaur, 2013). Ideally, family firms like to engage in innovation activities (e.g. incremental innovation) that generate reliable performance as opposed to simply high performance (Patel and Chrisman, 2014). It seems increasingly necessary to look at the totality of a family firm's resource bundle rather than individual resources. Covin et al. (2016) found that innovation activities are highly related to the 'resource bundle', including a certain market demand from customers, financial resources which can support an overall innovation project, a strong social capital, and firms' knowledge

which can help exploit innovation and later gain competitive advantage. Also, Mallon et al. (2018) found that the combination of human and financial capital and of human and social capital are crucial for family firms to pursue radical innovation. However, there is no causal relationship between each resource within a resource bundle and radical innovation (Covin et al., 2016; Mallon et al., 2018). That is, family firms appear to rely on unique resource *bundles* as the underlying condition for radical innovation; but the composition and confirmation of these bundles remains unknown.

[INSERT TABLE 1 ABOUT HERE]

The analysis of family firm radical innovation studies through the lens of the RBV and capabilities (Table 1) reveals that current investigations are limited in their treatment and assessment of the bundling together of possible resources held by a family firm to cause and commercialize radical innovation activities. That is, family firms having abundant resources should experience fewer uncertainties in pursuing radical innovation than rival firms lacking in well-developed resources; but ownership alone does not explain the extent to which innovation activity occurs (e.g., Kyriakopoulos et al., 2016). Instead, understanding the conditions that steer resource allocation is necessary to understand rent generation. Correcting this error is beneficial to make a contribution to understanding family heterogeneity and radical innovation from a resource perspective. A further unresolved problem, however, is about what resource stocks and bundles should consist of and whether specific resource histories and trajectories create lock-ins that further hinder family firm radical innovation. This requires a shift in theoretical assumptions set around the ownership of resources and towards the composition of the resources held or accessible by the family firm.

Research question 1: What resource bundles should family firms possess or develop to facilitate radical innovation? Are there specific resource histories and trajectories that create facilitate or hinder the family firm in terms of radical innovation activities?

As reported in Table 1, the learning process of founders and next-generation leaders can fail to achieve radical innovation activity if they have low individual absorptive capacity if the process from receiving new knowledge to utilizing it in a radical innovation is slow (Huang et al., 2015). Meanwhile, knowledge accumulation is a slow and costly process in which firms will continuously inject time and money before witnessing a radical innovation (Patel and Fiet, 2011). While studies converge on the need for absorptive capacity to support family firm radical innovation, an understanding of what kind and degree of knowledge family founders, owner-managers or second-generation leaders should possess to help their firms conduct radical innovation is missing. This requires a shift from theoretical assumptions to do with learning as a process towards granular analysis of knowledge content which focuses on the boundary conditions of the knowledge held, owned or accessed by family managers and how these restrict or increase the aggregate flow of knowledge to radical innovation.

Research question 2: What kind and degree of knowledge should the family founder(s), owner-manager(s), or next-generation leader(s) possess, acquire or seek to build within the family firm to change the system of constraints in favor of radical innovation?

Agency Theory, Stewardship Theory and Radical Innovation

The unification of management and control in the family firm can set much closer alignment between the agent manager and owner, reducing traditional agency costs and conflicts between owners and managers (Block, 2012; Filser et al., 2018; Le Breton-Miller et al., 2015). Unlike non-family firms, the family owner normally has great power to control the firm and take decisions, and high family involvement in management can generate effective monitoring to minimize agency cost (Chen and Hsu, 2009; Zahra, 2005). Some scholars reason that there is a positive relationship between family involvement in ownership and propensity to pursue radical innovation activities (Block, 2012; Zahra, 2005; Kellermanns et

al., 2012; Le Breton-Miller et al., 2015; Singh and Gaur, 2013). However, a negative relationship between family involvement in ownership and degree of innovation is also believed to exist (Chen and Hsu, 2009; Matzler et al., 2015). The two different positions depend on specific theoretical assumptions that cause one set of predictions to take precedence over the other. But, this difference might also be due to overlooking how a variety of actors configure innovation in family firms (Hughes et al., 2018).

Carney (2005) proposes that family involvement generates three main governance propensities: parsimony, personalism, and particularism. Under parsimony, family managers preserve resources and allocate them carefully. Firms reduce their risk-taking activities and pool their resources for current survival and future development. Personalism refers to the family firm having concentrated management and ownership, granting great power for family members. Strategic decision-making and problem solving can then circumvent bureaucratic control within these firms. Based on personalism, particularism represents strategic decisions being influenced by non-economic family goals. For instance, family owner-managers consider non-financial benefits (e.g. ownership) of others while making a strategic decision (altruism) (Chrisman et al., 2005; Chrisman et al., 2012).

In terms of firm survival, Carney (2005) found that the three governance propensities can generate distinctive activities for gaining competitive advantage. Parsimony propensity can help pool financial and human resources to outcompete other rivals in environments in which resources are scarce (Sirmon and Hitt, 2003); while the combination of personalism and particularism can accumulate social capital (e.g. kinship, ethnicity group, community and political affiliation) for long-term development (Miller and Le Breton-Miller, 2003), and can imbue family members with the power to make quick decisions in reacting to opportunities.

However, the propensity of parsimony, personalism, and particularism can also influence radical innovation in different ways. Under parsimony, family firms will primarily

concentrate on wealth preservation and cost-saving instead of innovative venturing while dealing with the risk of market resource scarcity (De Massis et al., 2015b; Sirmon and Hitt, 2003). Since radical innovation requires various resources, the large sunk costs demotivate family owners from making investments if the next innovation activities also include high uncertainties (Singh and Gaur, 2013). In order to shift the owner's willingness towards innovation projects, agent managers, in the case of the parsimonious propensity, make investments in innovation activities exhibiting low levels of uncertainty; that is, those investments that can increase sales quickly with a short return period, instead of conducting a project which contains short-term losses but long-time horizon for returns even if such projects seem promising (Sharma and Salvato, 2011; Singh and Gaur, 2013).

Under personalism and particularism, although the high involvement of family members can provide owner-managers with high power, the decision-making is likely to be highly limited to altruistic behaviors in which only innovation activity that can demonstrably benefit most family members (both current generation and next generation) will most likely be chosen (Berrone et al., 2012; Chrisman et al., 2012; De Massis et al., 2015b). Family involvement can reduce agency cost by reducing the need for monitoring, but the tendency towards high altruism behavior (e.g. nepotistic appointments) and managerial entrenchment can attract family free-riders (who have high dividends but are not engaging in the business) and provide power for family members to pursue self-interests (Block, 2012; Chrisman et al., 2005), which can cause misuse of funds in radical innovation projects, and eventually cause agency problems again (Chen and Hsu, 2009). High family involvement can also render severe conflicts that adversely impact firm performance (Faccio et al., 2001; Filser et al., 2018).

[INSERT TABLE 2 ABOUT HERE]

Analyzing the arguments through the lens of agency theory (Table 2), the degree of risk-aversion is highly related to the different degrees of family involvement in ownership and management, and styles of governance (Chrisman et al., 2012; Fernandez and Nieto, 2006; Le Breton-Miller et al., 2015). With a high degree of family ownership and the parsimonious propensity, firms are less likely to innovate radically because high ownership creates a tight organizational control focused on the goal of wealth preservation. These conditions can further shape employees' ideas and behaviors towards a conservative trajectory and impede innovative thinking over time (Cheng and Van de Ven, 1996; Munari et al., 2010).

Nevertheless, a counter set of theoretical assumptions exists. Under personalism, particularism and a high family ownership context, although altruism limits the behavior of family firms, opportunistic investment decisions are encouraged if the proposed investment aligns with the interests of family members (e.g. long-term profitability and survival) (Block, 2012; De Massis et al., 2012; Zahra, 2005). A family firm would likely engage with radical innovation because of the potential for great long-term benefits in line with such goals, even though radical innovation may put short-term wealth at risk (Chrisman et al., 2012). In this case, the risk-aversion behavior normally expected of family firms can be reduced when family firms focus on long-term potential. This theoretical assumption is consistent with ideas of patient capital. However, there is little research classifying levels of family involvement in ownership and management that would generate different levels of risk-taking behavior under personalism and particularism, nor is there sufficient research that identifies why one family firm would adopt the long view over and above the short view despite both reflecting some combination of parsimony, personalism and particularism tendencies.

Research question 3: Under what conditions does a family unit treat a radical innovation project as being in line with the interests of family members? What family properties encourage radical innovation as opposed to more conservative courses of actions?

Stewardship theory provides an alternative viewpoint to the agent–principal relationship and instead sees family members as custodians of the business and stewards of its long-term health: rather than concerns over self-interest, family members will act altruistically as stewards of the business and act in the collective interests of the family and the family business (Davis et al., 1997; Miller and Le Breton-Miller, 2006). Family members, with stewardship thinking, are highly committed to the firm’s mission (Zhang et al., 2018) and have a high level of mutual trust among themselves (Eddleston and Kellermanns, 2007). Thus, stewardship thinking has the potential to shift family members’ attention away from nepotism, personal gain, and the expropriation of firm resources, and towards a collective benefit to the firm and the family (Eddleston et al., 2008; Kellermanns et al., 2012). Consequently, family members as stewards may prioritize the long-term wealth and survival of the business, for which radical innovation activities are vital.

Stewardship behavior is motivated by reciprocity induced by the strength of altruism and the existence of robust family bonds (Eddleston and Kellermanns, 2007; Kellermanns et al., 2012). A greater degree of stewardship is expected when more family members are involved in the family firm (Corbetta and Salvato, 2004; Miller et al., 2007). Ashwin et al. (2015) found that family involvement is positively related to R&D expenditure (as an important antecedent of radical innovation) when stewardship behavior is high within a family firm. However, family involvement has the potential to increase the degree of ownership dispersion, through which ownership control is taken by greater numbers of family members, thereby diluting the control of any one family member or group (Kellermanns et al., 2008; Kellermanns et al., 2012). When ownership dispersion is high, conflicts among family members in relation to money, managerial roles, decision rights and control latitudes will return to the family firm (Kellermanns et al., 2012). Under such circumstances, the benefits of stewardship give way to the return of agency problems. Increases in agency issues (e.g. self-

serving individuals acting in pursuit of personal goals) and a commensurate reduction in stewardship behaviors impede family firm radical innovation. Identifying ways to maintain a consistent level of stewardship thinking is potentially crucial for family firm radical innovation. One solution may lie in the composition of family goals, clarity over goal setting, and goal congruence among individual family members. Goal incongruence has the potential to increase destructive conflict that reduces stewardship and increases an agency mindset.

Further competing findings are also found among previous studies using stewardship theory. From one perspective, studies believe that stewards are intrinsically motivated to maintain business control for next-generation leaders (Miller and Le Breton-Miller, 2005). Maintaining business control indicates the firm's intention to extend business continuity to appropriate longer-term benefits (Ashwin et al., 2015). As stewardship behavior increases during such a period, family members prefer to work closely together and the subsequent collaboration, trust, constructive conflict, and knowledge sharing can *facilitate* radical innovation behavior (Eddleston and Kellermanns, 2007; Miller et al., 2008). However, studies also report that family firms are *less* involved in radical innovation activities (e.g., R&D expenditure) when family owners are concerned with maintaining control for next-generation leaders (Chen and Hsu, 2009; Huybrechts et al., 2013). Family owners' intention to safeguard the business for future generations decreases owners' disposition to take risks in favor of reinforcing the status quo and maintaining business stability (Huybrechts et al., 2013). These competing findings question the feasibility of the relationship between stewardship behavior and family firm radical innovation. Although stewardship behavior has potential to facilitate radical innovation behavior, pursuing radical innovation is dependent on the decisions of family owners. Therefore, the promise of stewardship for family firm radical innovation is undecided and remains an enduring conundrum. The solution to this conundrum appears to lie in understanding the differences between constructive and destructive conflict among the

goals of family members, understanding the circumstances for productive versus unproductive stewardship, and what governance conditions may propagate productive stewardship over individual agency.

Research question 4: How do family firms foster and maintain stewardship thinking among family members to support family firm radical innovation activities? In what ways do family firms foster stewardship behavior to support family firm radical innovation while preserving control for next-generation leaders?

Behavioral Agency, SEW and Radical Innovation

Behavioral agency theory entails that risk-bearing decision attitudes are context dependent (Kahneman and Tversky, 1979). For instance, by combining resources, agency theory and radical innovation, family owners would pay considerable attention to avoid risk-taking, or at the very least calculating the risks of an innovation project in order to prevent the loss of wealth (Sciascia et al., 2015; Miller et al., 2015). This loss of wealth includes financial wealth and socioemotional wealth (SEW) (Gomez-Mejia et al., 2007). To this end, the decision-making of family firms is typically more about loss-aversion than risk-aversion in terms of avoiding losses (particularly to SEW) than with obtaining gains. For example, Gomez-Mejia et al. (2007) argued that when faced with a risk to financial and non-financial wealth (SEW), the family firm is willing to tolerate an economic loss (or hazard) to protect its SEW.

SEW endowment represents the non-financial wealth of the family and includes the preservation of family reputation and social identity, social capital, the degree of family influence (control), and the longevity of the business through generations (Gomez-Mejia et al., 2007). Family firms protect their family legacy and avoid pursuing the type of innovation that has a strong tendency to harm such a legacy (De Massis et al., 2016); but, family firms can sometimes engage in innovation for the sake of gaining long-term benefits without losing family control (Miller and Le Breton-Miller, 2005). Compared to financial wealth, family

firms typically give stronger attention to SEW endowment and attach greater importance to it. Doing so results in three decision behaviors with regard to risk-taking.

First, according to Berrone et al. (2010), family firms have the intention to preserve SEW endowment, even if such conservation intention will miss financial opportunities. In this regard, family firms seldom conduct radical innovation because it might create changes that endanger the SEW endowment (e.g. social identity, ownership and control, and continuity of business) (Berrone et al., 2012; Morck and Yeung, 2003; Le Breton-Miller et al., 2015).

Second, the preference family firms attach to risk-taking may increase when firm performance is in decline and likely to harm SEW if left to continue (Berrone et al., 2012; Gomez-Mejia et al., 2007). In order to rescue losses in SEW endowment caused by poor firm performance, family firms can act more innovatively than before. In this case, innovation activities would be considered as a strategy for the purpose of saving SEW. However, theoretically, it implies that such a risk-tolerant strategy will not be pursued until firm performance has reached a point where SEW itself is also decreasing (Sciascia et al., 2015). Third, although Chrisman and Patel (2012) argued that family firms could emphasize entrepreneurial behavior, particularly when concerned about passing the business on to next-generation family members (because renewal of the family business can provide career opportunities for next generations) (Chrisman and Patel, 2012; Kammerlander and Ganter, 2015), considering that such renewal process would be conducted under the premise of identity and reputation protection (Berrone et al., 2010), incremental innovation is more likely to be adopted as a renewal strategy than radical innovation (Chrisman and Patel, 2012).

Kraiczy et al. (2014) and Sciascia et al. (2015) argued that risk-taking and risk-averse behavior within family firms should be dependent on the weighting placed on pursuing either short-term or long-term goals. Short-term goals are specific, precise and practical and deal with improving the current business (Chrisman and Patel, 2012). When family firms put a

heavier weight on pursuing short-term goals than long-term goals, family members prioritize short-term investment to maintain/enhance current SEW endowment and receive a quick return such as short-term sales growth (Kammerlander and Ganter, 2015; Miller et al., 2015). In this case, incremental innovation is prioritized in daily operations (Kraiczy et al., 2014; Sharma and Salvato, 2011). By contrast, long-term goals are generated from the combination of the firm's current performance, capability, business environment and its future business aims (Cucculelli et al., 2016). Long-term goals are fuzzy and uncertain, containing not only risks but the potential for the firm's long-term development and survival (Le Mens et al., 2015). Since long-term goals are distant from the current business aim, if family members have the intention to pursue long-term goals instead of short-term goals, family firms are likely to act radically in strategic decision-making and choose radical innovation as an option to assist in achieving long-term goals (Cucculelli et al., 2016; Miller et al., 2015). Thus, family firms have shown willingness to take short-term losses of both economic wealth and SEW, with less emphasis on altruistic behavior, and hire non-family talent (Chrisman and Patel., 2012; Sciascia et al., 2015), in contrast to what the authors might expect from a pure SEW perspective (e.g., Berrone et al., 2010; Kammerlander and Ganter, 2015).

In an investigation of family manufacturing firms, Chrisman and Patel (2012) suggest that the investment horizon can be shifted from short-term to long-term within family firms. Family CEOs like to calculate the potential losses and gains of wealth before investing in R&D and to assess R&D performance frequently after the investment. For example, when uncertainties of conducting innovation have exceeded family CEOs' perception of acceptable risk, family CEOs hesitate to make a risky decision in responding to the innovation (Cucculelli et al., 2016; Kammerlander and Ganter, 2015; Kraziczy et al., 2014). However, if the R&D performance has met the perception of family owners in terms of increasing economic performance, at the same time maintaining or enhancing the SEW endowment,

family owners become more risk-willing to make fuzzier and longer-term investment which contains more uncertainties (Chrisman et al., 2012; Li and Daspit, 2016). In this case, innovation activities start from incremental ones including a low degree of risk and uncertainty and move towards radical innovation (Kraiczy et al., 2014; Li and Daspit, 2016). In turn, the investment horizon becomes increasingly concentrated on the long term.

When family firms have engaged in long-term investment, and the actual R&D performance at the current stage is lower than the performance aspirations in economic and non-economic wealth terms, family firms suspect the current R&D might cause further losses of financial and SEW wealth, and invest more in R&D in order to receive better R&D performance in the future (Chrisman and Patel, 2012). Through such a mechanism of investing in R&D in the long-term, family firms have a better chance to conduct radical innovation through the accumulation of learning and experiencing R&D.

[INSERT TABLE 3 ABOUT HERE]

Through the lens of behavioral agency theory and SEW (see Table 3) then, a question can be asked, ‘does maintaining SEW always conflict with the decision to take risks?’ The majority of theoretical assumptions suggest so: family firms gradually take hold of SEW endowment while family involvement is increasing (Berrone et al., 2012) and family firms act in progressively more risk-averse ways. However, studies have found a positive relationship between family involvement and entrepreneurial behavior (De Massis et al., 2014; Konig et al., 2012). Family involvement can enhance family members’ power in allocating human capital, social capital and financial capital towards R&D investment (De Massis et al., 2012). At the same time, increasing numbers of family members, involving a larger number of generations, can broaden the firm’s knowledge in sensing business opportunities (Kraiczy et al., 2014). In this case of family involvement, family firms increasingly take hold of SEW endowment but at the same time enhance risk-taking behavior.

Gomez-Mejia et al. (2007) suggested that risk-taking or risk-willing decision behavior should depend on the maintenance of SEW endowment and rescuing the loss of SEW endowment, respectively. SEW entails five dimensions, namely: family control and influence, identification of family members with the firm, binding social ties, emotional attachment of family members, and the renewal of family bonds to the firm through dynamic succession (Berrone et al., 2012). The contradictory findings and associated theoretical positions revealed above can potentially be explained by discovering which dimension of SEW is the current priority for the current strategies of family firms. For example, Brinkerink and Bammens (2018), and Kammerlander and Ganter (2015) both found that there are different aspects of noneconomic goals which can lead to different decision behaviors within family firms. This may explain how, from a relatively stable set of theoretical assumptions within behavioral agency theory and SEW theory, very different behaviors are observed empirically by family firms. These theories may be advanced through a more granular analysis of SEW to understand how specific aspects of SEW might lead to alternative predictions about family firm radical innovation. SEW has been used to make general predictions about family firm radical innovation; but this aggregate and rather blunt use of the theoretical instrument is not consistent with observations from practice and findings from empirical studies.

Decision behavior might further differ based on dimensions of family identity, family control and transgenerational value (Brinkerink and Bammens, 2018; Chrisman and Patel, 2012). According to Brinkerink and Bammens (2018) and, Chrisman et al. (2015), family firms shift from risk-averse towards risk-willing behavior when the family is currently concentrating on maintaining transgenerational value in the future. Family firms that strive for intrafamily succession conduct radical innovation in order to increase transgenerational control (Berrone et al., 2012; Chrisman et al., 2015). Thus, contingent factors may drive family firms to either place more weight on maintaining transgenerational control than

maintaining the identity of family firms or vice versa. Thus, family firms are risk-averse or risk-willing even when they share the same purpose of maintaining SEW endowment.

Research question 5: Can a multi-dimensional conceptualization of SEW both support and dilute radical innovation? Does a dimensional conceptualization of SEW carry greater predictive accuracy than a unidimensional conceptualization?

Ability and Willingness Paradox, and Radical Innovation

The ability and willingness view of family firm innovation grew out of the behavioral agency and SEW theories, however, it has since developed to exhibit its own specific properties and set of assumptions about the occurrence (or not) of family firm innovation activity. Existing studies on this subject are reported in Table 4. Ability is the discretion of family members to manage family firms' resources in a strategic direction, and the capability (combination of financial resources, human resources, social capital, and firms' knowledge and experience) of family firms allows them to pursue the strategic direction in question (De Massis et al., 2014; Cucculelli et al., 2016). Willingness relates to family owners' goals, intentions and motivation, which can drive them to behave in a particular way (Chrisman et al., 2015).

Miller et al. (2015) contended that SEW dimensions could impact on innovative goal construction and identified two extremes of SEW objectives in line with the decision behavior of family firms. The first extreme is 'feeding parochial family desires (FPFD)'. Under this specific SEW objective, family firms act conservatively focusing on parochial family interests and in turn create a risk-averse organizational decision-making culture. Such risk-averse behavior can decrease the investment in radical innovation activities and in turn block family firms' ability to innovate through generations. Second, the other extreme of SEW is 'creating an evergreen organization (CAEO)' in which family firms act proactively in innovation by

continuously investing in stakeholders, human capital, and social capital. The vision of this evergreen family firm type is to establish a robust business.

[INSERT TABLE 4 ABOUT HERE]

SEW dimensions may shift across conservative behavior and innovative behavior. If SEW dimensions can drive family firms' willingness to start acquiring resources to innovate (Brinkerink and Bammens, 2018; Cucculelli et al., 2016; Veider and Matzler, 2016), they may pursue radical innovation more when SEW has reached the CAEO extreme. The research problem here is what factors drive SEW to shift towards a CAEO extreme and in turn increase the willingness to pursue radical innovation and construct relevant, innovative goals (Cucculelli et al., 2016; Veider and Matzler, 2016).

Research question 6: What factors drive family SEW towards the CAEO dimension, increase willingness to pursue radical innovation and construct relevant, innovative goals?

The business environment plays a pivotal role in strategic decision-making. Strategic goals are set after analyzing the environment for demand, market competition and consumer tastes (Le Mens et al., 2015). A volatile environment with unstable demand, strong market competition and frequent change in consumer tastes pressurizes family CEOs to rethink current and long-term strategic goals (Ingram et al., 2014; Prajogo, 2016; Venkatraman and Camillus, 1984). Both family firms and non-family firms share two aspects of adaptive behavior: firms create strategy to fit the current business environment *and* diversify their capabilities to fit environmental changes (Venkatraman and Camillus, 1984).

In a low dynamic business environment, the future will be similar to the present (Hamel, 1996; Hannan and Freeman, 1978). Changes are slow and predictable. In such a context, competitive advantage is acquired by diversifying products and services and differentiating from rivals (Sharma and Salvato, 2011; Zahra, 2018). Family firms can

implement incremental innovation to maintain fitness with the environment. Theoretically, as long as family firms are constantly creating strategic fitness, they can prevent obsolescence (where new products will supersede and replace existing ones in the business market in time) (Hannan and Freeman, 1977; Venkatraman and Camillus, 1984; Zahra, 2018). In a low dynamic environmental context, radical innovation is not urgent for business development. When radical product innovation delivered to the market, consumers will have little knowledge and experience when facing these new products (Le Mens et al., 2015). It will take a longer period for consumers to understand new products under these conditions (Prajogo, 2016). Since radical product innovation could ruin the identity of the firm (a dimension of SEW) within consumers' minds, they will question the reliability and capability of family firms to provide products that compete with the top performers at a similar price level (Sorenson and Stuart, 2000). Consumers will hesitate to choose the new products and sales will almost certainly fall (Le Mens et al., 2015). Although radical innovation might be promising in the future, family firms need to withstand an extended period of low or no sales profits until such time that consumers have realized the new products are better than the current ones and switch to those new products (Prajogo, 2016). Therefore, low environmental dynamism would decrease CAEO intensity and increase FPPD intensity that decreases the willingness to allocate resources towards radical innovation.

When family firms operate in a highly dynamic environment with high turbulence and uncertainty, the tastes of consumers change quickly such that mere continuous improvements are unlikely to be enough to track environmental changes. But, because the taste of consumers is frequently changing, this situation can create a number of niches within the market (Prajogo, 2016). These niches can provide family firms with opportunities to implement radical innovation, which can motivate family firms to act radically and keep generating new products to attract consumers' attention (Craig and Moore, 2006; Venkatraman and Camillus,

1984). CAEO can increasingly take hold and drive family firms to invest more intensively in R&D. Because the tastes of consumers are frequently changing and old-fashioned products become outdated quickly, it is difficult for family firms to survive if they have little intention to pursue radical innovation. In order to increase survivability and create strategic fit, family firms would be expected to decrease FPDF intensity and engage in more radical innovation.

Research question 7: How does environmental dynamism alter the relationship between (a) CAEO intensity and degree of pursuit of radical innovation and (b) the relationship between FPDF intensity and degree of pursuit of radical innovation within family firms?

Innovation beyond the Boundaries of the Family Firm

The ability and willingness of family owners and managers to direct organizational resources towards radical innovation activity is traditionally assumed to be driven by the interests and unique power afforded by the familial character. However, alternative forms of governance that involve outsiders (e.g., trusts) can destabilize the freedom of the family to act opportunistically or with impunity (Scholes and Wilson, 2014). Trustees, for example, can alter the control rights of family owners to add, direct, or dispose of the firm's assets, which, in turn, can affect their willingness and ability to engage in entrepreneurship and innovation activity (Wright et al., 2016).

Historically, research on family firm radical innovation has looked inside the family firm for innovation. This is understandable because family firms are control-oriented, prioritize the preservation of SEW, and are reluctant to form new relationships with outsiders or involve them directly in strategic activity (e.g., Cesinger et al., 2016). However, the phenomenon of open innovation suggests there are many opportunities to source radical innovations from outside the firm's boundaries. So far, family firms do not show the same inclination to engage in open innovation compared to non-family firms. Their desire to

preserve control over innovation (Kotlar et al., 2013) is juxtaposed against emerging findings that they are well-placed to appropriate external knowledge (Patel and Fiet, 2011).

Collaborative innovation (Feranita et al., 2017) and open innovation (Röd, 2016) holds promise to resolve the innovation dilemma in family firms.

Research question 8: What are the conditions that favor family firm radical innovation through collaborative or open means?

CONCLUSIONS AND FUTURE RESEARCH AGENDA

[INSERT FIGURE 1 ABOUT HERE]

Family firm scholars have made considerable advances in understanding family firm innovation. But, family firm *radical* innovation as a specific type of innovation is very different to other forms of innovation such as incremental innovation. Crucially, studies repeatedly report that the majority of family firm innovation is incremental (Hall et al., 2001; Nieto et al., 2015; Wright et al., 2016). Radical innovations are fundamentally different to incremental innovations, requiring different skillsets, conditions and capabilities.

Consequently, it cannot be assumed that conditions favorable for innovation in general are sufficient to enable this crucial type of innovation. Without radical innovation, family firms are in jeopardy to competitors and failure the long term.

Research into family firm radical innovation is burgeoning, yet, there remains no critical analysis and evaluation of family firm radical innovation, until now. The intention of this paper was to evaluate the current understanding of radical innovation among family firms to determine the theories have been used to predict and explain radical innovation activity in family firms, and distil their underpinning theoretical assumptions to identify research questions in need of urgent enquiry to build the knowledge of family firm radical innovation.

After systematically analyzing and evaluating 51 leading papers published between 2003 and 2018 relevant to family firm radical innovation, these studies consistently fall under four theoretical lenses: RBV and capabilities, agency theory and stewardship theory, behavioral agency theory and SEW, and ability and willingness. RBV and agency theory studies have dominated the last decade, while behavioral agency theory and SEW, and the ability and willingness paradox, have grown substantively in use between 2007 and 2012. The consistent argument about family firm radical innovation among the four lenses lies in the alignment of family involvement in ownership and management, resources, governance and goal setting. That is, if family firms have a long-term investment horizon and the proposed radical innovation is in line with its goals and strategies, they will exhibit higher willingness to devote internal financing resources (e.g. acquiring financial support from family members), R&D investment, and knowledge acquisition and renewal efforts towards radical innovation. But this motivation relies on the ability to innovate while being largely dictated by the accumulation of resources over time so long as the agency and behavioral conditions in the firm support resource allocation towards radical innovation activities.

At this point, it is apparent that the theoretical lenses are not distinct in their observations about family firm radical innovation and their point of convergence is largely to do with ideas of willingness and ability to innovate. However, this is an oversimplification and such a synthesis masks that each theory approaches the problem of family firm radical innovation with a *different* set of theoretical assumptions, some of which compete across each other and within each other. These theoretical assumptions and their differences are exposed in Figure 1. For example, under the RBV and capabilities, it is expected that high family firm idiosyncratic resources may support the propensity for pursuing radical innovation, not least because increased resource stocks support the ability to innovate (assumption A1). However, a competing assumption is that the stronger the tradition of the family firm (itself a resource),

the stronger the propensity for radical innovation because of the inertia brought on by tradition (assumption A2). Moreover, assumptions about resources (A1-3) and agency (A4-A6) rely on the overarching assumption that family owners, managers and employees have near total discretion over resource acquisition, disposal, and allocation, which holds true until external governance mechanisms (such as trusts) are introduced (assumption A12). Also, under behavioral agency and SEW theories, the risk of losing SEW is assumed to cause risk-averse behavior (A7) yet the accuracy of this assumption has boundaries. For example, threats to the longevity of SEW and its stability may also motivate radical innovation (A8). This implies distress as a boundary condition.

Figure 1 presents the eight urgent research questions which need answering in order to move forward knowledge on family firm radical innovation. Allied to this, this study reveals the theoretical lenses and their assumptions attached to these research questions. The present study requests to scholars is to actively consider and question the theoretical assumptions underpinning their future studies and to consider where these assumptions compete or coexist with those of alternative theoretical lenses. In turn, more robust studies of family firm radical innovation can follow and ones that bridge some of the conflict found in predictions and findings about family firm radical innovation. This is directly allied to the research conversation about how, why, and on what basis family firms themselves differ from each other. The examination of the current study provides a research agenda to ensure important and timely contributions that build and scale current understanding of radical innovation as a crucial type of family firm innovation.

While this study generates insights and questions into radical innovation activities in family firms under four theoretical lenses, it is also important the future research does not lose sight of context. In family firm research, the internal context of the family firm is generally treated richly, as epitomized in studies of agency and behavioral agency, family resources,

and family involvement in the willingness–ability paradox. However, the external context of the family firm also matters, but has rarely been given as much consideration. For example, dramatic changes in firms’ external environments are becoming increasingly more frequent and pronounced. Digitalization is one such phenomenon². Digitalization generates many technological impacts on the firm including its markets, business models, products and services. How radical innovation activities may enable the family firm to survive dramatic external environmental changes and in coupling with what other factors represents an interesting avenue for research. Based on the examination presented in this study, it is suggested that the answer lies in a combination or coming together of theoretical perspectives rather than one alone to explain family firm behavior in the face of dramatic technological shifts outside the business. Digitalization is defined as the extent to which a firm implements digital technologies (e.g., information technologies, artificial intelligence, and 3D printing) into its conventional business process (Bouncken et al., 2019). Digital technologies can widen information-sharing between a firm and external business market (from offline to online business) and quicken communication between employees and customers (Kraus et al., 2019a). Because of these, a firm can reach wider geographic markets (Bouncken et al., 2019), broaden the view of the CEO in searching business opportunities (Kraus et al., 2019a), and accelerating transformation processes among competences, activities and outputs (Bohnsack et al., 2018). The future direction can be driven by treating the level of digitalization as a factor within the RBV and capabilities lens or as a moderator when researchers are adopting ability and willingness theory as a lens to predict radical innovation in family firms. The time is ripe for a thorough investigation of radical innovation in family firms and this present study provides a foundation upon which future investigations of radical innovation in family firms can productively build.

² We thank an anonymous reviewer for this suggestion.

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Table 1: Articles Directly Discussing or Supporting the RBV and Capabilities for Family Firm Radical Innovation

Article	Paper type	Theories	Sample	Findings and arguments from the articles
Zahra et al. (2004) (Supporting)	Quantitative	RBV	536 manufacturing companies, U.S.	1. Diversification of employees' ability is positively related to entrepreneurial behavior (finding). 2. Knowledge resources are crucial for family firms' innovation (arguments).
Cassia et al. (2011) (Direct)	Qualitative	RBV	Case study of 4 family firms, Italy.	High 'closure' in the attitudes of family firms is negatively related to NPD process (finding). NPD process needs the high motivation of family firms (finding).
Cassia et al. (2012)	Grounded theory	RBV	Literature review; case study on 5 Italian family firms and 5 Italian non-family firms.	Family firms can reach a NPD long-term thrust if family firms are long-term oriented.
De Massis et al. (2016) (Direct)	Qualitative	Governance structure (Ownership and management)	Structured literature review.	Providing an agenda to demonstrate how family firms innovate through tradition (finding).
Kraiczy et al. (2014) (Direct)	Quantitative	Upper echelon theory	127 TMT members of 63 German firms.	New product development is positively related to multiple generations involved in TMT (finding).
Patel and Fiet (2011) (Supporting)	Qualitative	RBV	Structured literature review.	1. Family firms have advantages in enduring knowledge structures, faster response to opportunities, combining diversified of knowledge sets, and creating economies of scope (finding). 2. When family survivability is threatened, firms will search for alternatives (argument).
Sirmon and Hitt (2003) (Supporting)	Qualitative	RBV	Structured literature review.	1. Family firms have five idiosyncratic resources from which to create competitive advantages (family human capital, family social capital, family patient capital, survivability capital, governance structure, costs) (finding). 2. Compared to non-family firms, family firms have advantages in pursuing innovation activities by relying on these resources (argument).
Xiang et al. (2018) (Supporting)	Quantitative	RBV	958 hi-tech family SMEs in China.	The conversion rate of innovation input into output is significantly related to the degree of financial resources the family firms are willing to support (argument).
Nordstrom and Steier (2015)	Qualitative	Social capital	Conceptual model.	Family social capital has structural dimension, relational dimension and cognitive dimension. Each dimension bears unique effects on innovation behaviors of family firms.
Mani and Lakhal (2015)	Quantitative	Social capital	114 Tunisian family firms.	1. Cognitive dimension is positively related to financial performance in family firms. 2. Both structural and relational dimensions are positively related to financial performance in both family and non-family firms.

Mallon et al. (2017)	Fuzzy-set qualitative comparative analysis	RBV	4928 new ventures founded in 2004 in the USA.	The combination between human capital and social capital, between human capital and financial capital is sufficient for growing family ventures.
Chirico and Salvato (2014) (Supporting)	Quantitative	Knowledge internalization and product development	592 firms, Switzerland.	1. Dense social capital will decrease innovation ability within family firms because family members will over-rely on their social capital (finding). 2. Social capital has an inverted U-shaped relationship with the pursuit of conducting product development processing (argument).
Sharma and Salvato (2011) (Supporting)	Qualitative	Ambidexterity	Structured literature review.	1. Incremental innovation is largely helpful when family firms are at the grown-up stage. Radical innovation is needed when the market is highly saturated (finding). 2. To achieve high firm performance, family firms need to combine incremental and radical innovation together (argument).
Covin et al. (2016) (Direct)	Fuzzy-set qualitative comparative analysis	RBV (resource bundle)	1749 responses across 4 European countries.	The combination of customer responses, social network and innovation motivation is positively related to radical innovativeness in family firms. Adding financial resources will maximize this relationship (finding).
Craig and Moores (2006) (Supporting)	Quantitative	Four-stage life-cycle	67 companies longitudinal studies, Australia.	1. The relationship between techno-economic uncertainty and innovation is weaker in the later stage than that in the early stage of family firms' organizational life-cycle (finding). 2. Innovation activities are less prevalent in established firms than young firms (argument).
Huang et al. (2015) (Supporting)	Quantitative	Absorptive capacity	165 firms, Taiwan.	1. Absorptive capacity moderates the relationship between R&D expenditure and innovation (finding). 2. Absorptive capacity can help facilitate innovation (argument).
Uhlener et al. (2013) (Supporting)	Quantitative	Dynamic capability	229 firms, Netherlands.	1. External resources are positively related to sales growth (finding). 2. Resources are important for family firms to pursue innovation (argument).
Craig et al. (2014) (Supporting)	Quantitative	Entrepreneurial orientation	127 food industry, 246 media, and 159 shipbuilding firms, Finland.	1. Risk-taking does not impact on innovation output (finding). 2. There is no relationship between risk-taking behavior and innovation outputs (argument).
Chrisman et al. (2016) (Supporting)	Qualitative	Execution behavior	Structured literature review.	Although family owners have strong willingness to pursue innovation activities, the adoption of innovation is less likely when firms have fewer supporting resources (argument).

Table 2: Articles Directly Discussing or Supporting Agency Theory and Stewardship Theory in the Context of Family Firm Radical Innovation

Article	Paper type	Theories	Sample	Finding and arguments from the articles
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Chrisman et al. (2012) (Supporting)	Qualitative	Agency theory, ability and willingness	Structured literature review.	1. Different agency types will generate different agency costs, which will influence future firm strategies in non-family management buy-in or buy-out (finding). 2. Unified family governance structure constrains family firms' risk-taking behavior and willingness to innovate (argument).
Chrisman et al. (2005) (Supporting)	Qualitative	RBV and agency theory	Structured literature review.	1. Family involvement will influence family firms' performance (finding). 2. Family involvement can increase altruism and entrenchment, which nullify the value of existing capabilities and slow down the development of new capabilities (argument).
De Massis et al. (2012) (Direct)	Qualitative	Agency theory	Structured literature review.	1. Family involvement has direct influence on R&D expenditure, and number of new products (finding). 2. This study also introduces the gaps within the relationships among innovation input, output, and activities, which provides a basis for future family firms and technology innovation studies (argument).
Singh and Gaur (2013) (Direct)	Quantitative	Agency theory	4946 firms in Bombay Stock Exchange, India.	Family ownership has a positive relationship with R&D intensity in a new market (finding).
Zahra (2005) (Direct)	Quantitative	Agency theory, entrepreneurship	497 responses from 209 manufacturing firms, U.S.	Family ownership and involvement have a positive relationship with technological innovation (finding). Long CEO tenure has a negative relationship with technological innovation (finding).
Chen and Hsu (2009) (Supporting)	Quantitative	Family ownership and R&D investment	124 responses from 76 firms, Taiwan.	1. Family ownership is negatively associated with R&D expenditure (finding). 2. Family firms will spend less on R&D while family owners are maintaining business control for the next-generation leader (argument).
Block (2012) (Direct)	Qualitative	Agency theory	154 firms listed in the S&P 500, U.S.	Founder involvement has a positive relationship with innovation activities at a later stage of family firms' organizational life-cycle (finding).
Kellermanns et al. (2012) (Direct)	Quantitative	Agency and stewardship	126 responses from 70 firms, U.S.	1. Innovativeness in family firms is positively associated with family firm performance (finding). 2. Family involvement will increase the degree of ownership dispersion over family members and, in turn, increase conflicts among family members (argument).
Le Breton-Miller et al. (2015) (Supporting)	Qualitative	Agency theory, Behavioral agency theory, RBV	Structured literature review.	1. Both agency theory and behavioral agency theory can positively and negatively influence entrepreneurship behavior of family firm (finding). 2. High levels of tenure are negatively related to firms' entrepreneurship behavior (argument). 3. The number of the family member present on the board of directors is positively related to entrepreneurship behavior (argument). 4. Family involvement in management is positively related to entrepreneurship behavior (argument).
Matzler et al. (2015) (Direct)	Quantitative	Agency theory	829 firms, Europe.	There is a negative relationship between family ownership and R&D intensity (finding).

Carney (2005) (Supporting)	Qualitative	Agency theory, RBV	Structured literature review.	1. There are three types of family firm governance propensities, parsimonious, particularism and personalism (finding). 2. Innovation activities are more likely when the combination of particularism and personalism governance propensity is present (argument).
Filser et al. (2018) (Supporting)	Quantitative	Agency theory, SEW	161 family firms, Finland.	Family involvement can increase conflicts between family members unless they have a common interest to pursue (argument).
Ashwin et al. (2015) (Direct)	Quantitative	Agency and Stewardship theory	172 firms from India.	Family involvement is positively related to R&D expenditure when stewardship behavior is at a high degree (finding).
Miller et al. (2008) (Supporting)	Qualitative	Stewardship theory	22 interviews, CEOs from family firms in Canada	Extending business continuity is a way to increase stewardship thinking among family members (argument).
Eddleston and Kellermanns (2007) (Supporting)	Quantitative	Stewardship theory	107 family firms from the US.	1. Stewardship behavior is emphasized while family firms are maintaining business control for the next-generation leader (argument). 2. Stewardship behavior is motivated by reciprocity which is induced by altruism and family bonds (argument).
Huybrechts et al. (2012)	Quantitative	Agency theory	740 private firms with 555 family firms within from Belgium.	When succession is approaching, family owners will pay attention to reinforce stability to safeguard business for future generations (argument).

Table 3: Articles Directly Discussing or Supporting Behavioral Agency and SEW Theory in the Context of Family Firm Radical Innovation

Article	Paper type	Theories	Sample	Finding and arguments from the articles
Kammerlander and Ganter (2015) (Direct)	Quantitative	Attention-based view, SEW	Case study of 8 firms, Germany.	1. Economic and noneconomic goals are mutually reinforcing when family firms are experiencing intense firm development (finding). 2. Different noneconomic goals lead to different firm radical innovation behaviors (finding).
Gomez-Mejia et al. (2007) (Supporting)	Quantitative	Behavioral Agent theory, SEW	1237 firms, Spain.	1. Family firms will largely avoid risk-taking for the sake of preserving SEW endowment. However, family firms can be highly innovative when SEW endowment suffers a significant loss (finding). 2. The behavior of preserving SEW will gradually block innovation activities during firm development (argument).
Chrisman and Patel (2012) (Supporting)	Quantitative	Behavioral Agency theory, SEW	964 firms, U.S.	1. When results are below aspirations, family firms will move into loss mode and then increase R&D expenditure (finding). 2. Increases in investment-time horizon can reduce risk-averse behavior and increase R&D expenditure (finding).

				3. SEW dimensions can direct family firms' attention towards either conservative or highly innovative behavior (argument).
Berrone et al. (2012) (Supporting)	Quantitative	Behavioral Agency theory, SEW	43 family and 43 non-family firms, U.S.	1. SEW consists of FIBER dimensions (finding). 2. SEW can change state at any point in time and generate different innovative behavior (argument).
Miller et al. (2015) (Supporting)	Qualitative	SEW and Willingness	A case study of 4 firms, UK.	1. SEW can generate two extreme behaviors and influence the decision to pursue innovation: 'Creating an evergreen organization' (CAEO) directs family firms to make innovation decisions for firms' development; while 'feeding parochial family desires' (FPFD) directs firms to maintain the status quo by acting conservatively and avoid risk (finding). 2. SEW dimensions are the key factors to influence the creation of innovation goals (argument).
Brinkerink and Bammens (2019) (Supporting)	Quantitative	SEW, social identify theory	365 SMEs in Netherlands.	1. family owners concern with preserving family control will reduce family firms 'willingness to invest in R&D (finding). 2. R&D investment would be slightly increased when family owners concern with extending family firm continuity (finding).
Kraiczy et al. (2014) (Direct)	Quantitative	SEW	63 non-family firms and 114 family firms, Germany.	CEO's risk propensity is positively associated with new product portfolio innovativeness. This relationship is stronger in the early stage than in later stage of the organizational life-cycle (finding).
Konig et al. (2013) (Direct)	Qualitative	4C framework	Structured literature review.	Family firms have high speed and stamina for implementing radical innovation strategies when family firms have made the decision to pursue the innovation strategies (finding).
Chrisman et al. (2015) (Direct)	Qualitative	4C framework	Structured literature review.	Ability and willingness paradox plagues family firm innovation. However, family firms will not survive without innovation activities (finding).

Table 4: Articles Directly Discussing or Supporting Ability and Willingness Theory in the Context of Family Firm Radical Innovation

Article	Paper type	Theories	Sample	Findings and arguments from the articles
Chrisman et al. (2015) (Direct)	Qualitative	Ability and willingness	Structured literature review.	Although increasing family involvement is positively associated with family owner-managers' discretion to allocate resources to innovation, family involvement is not necessarily related to the willingness to pursue radical innovation (finding).
Veider and Matzler (2015) (Supporting)	Qualitative	Ability and willingness	Structured literature review.	1. Ability and willingness paradox is not a general rule in every family firm. Innovative behavior depends on the goals of family firms (finding). 2. Family firms' willingness to innovate is based on how family firms face challenges from the external environment (argument).
De Massis et al. (2014) (Supporting)	Qualitative	Ability and willingness	Structured literature review.	1. Family-oriented behavior is generated by combining ability and willingness together (finding). 2. Innovation activities of family firms are influenced by ability and willingness (argument).
Ingram et al. (2014) (Supporting)	Qualitative	Paradox theory	178 executive responses from 125 firms.	1. CEO with paradoxical thinking can increase innovation behavior (finding). 2. Family employees' knowledge and ability matter for pursuing innovation activities (argument).
Miller et al. (2015) (Supporting)	Qualitative	SEW and Willingness	A case study of 4 firms, UK.	1. SEW can generate two extreme behaviors and influence the decision to pursue innovation: 'Creating an evergreen organization' (CAEO) directs family firms to make innovation decisions for firms' development; while 'feeding parochial family desires' (FPFD) directs firms to maintain the status quo by acting conservatively and avoid risk (finding). 2. SEW dimensions are the key factors to influence the creation of innovation goals (argument).
Zahra (2018) (Supporting)	Qualitative	RBV, SEW, Ambidexterity	Structured literature review.	The changing Innovation behavior towards either incremental or radical is to overcome the challenge generated from environmental dynamism (argument).
Cucculelli et al. (2016) (Direct)	Quantitative	RBV, Governance, Willingness	3200 companies, Italy.	Radical innovation activities are highly dependent on founders' risk-taking behavior (finding)

Figure 1: Theoretical Assumptions and Future Research Agenda

APPENDIX

Appendix 1: Breakdown of 18 theories used in the study of family firm radical innovation

Theory	Number of instances
RBV	11
Agency theory	15
Stewardship theory	4
Entrepreneurship	1
Four-stage life-cycle	1
Behavioral agency theory and SEW	10
Family ownership and R&D investment	1
Ambidexterity	2
Ability and willingness	4
Dynamic capability	1
4c model	2
Entrepreneurial orientation	1
Paradox theory	1
Upper echelon theory	1
Absorptive capacity	1
Attention-based view	1
Governance structure	1
Social identity theory	1