

Shedding Light on The Critical Juncture of The Discontinuous Technology Adoption Path Dependence in Family Firms: Case Studies in Southeast-Asia

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Abstract

The adoption of discontinuous technology has been seen as part of the innovation of a company. While there are numerous studies about the adoption of technologies, a lot of them fail to consider the fact that a lot of companies are family firms. Family firms around the world are often large economic contributors, especially in Southeast-Asia. It is believed, however, that when it comes to innovation, family firms have an inertia towards discontinuous technology adoption in the form of technological path dependence. To unravel the beginning of such path dependence, this paper serves to explore the critical juncture of the adoption of discontinuous technology path dependence in family firms. To do that, since there are very few path dependence theories regarding company innovations, this paper adopted the organisational path dependence theory, critical juncture, and issue network theory. Using the adopted theories, a theoretical framework of the critical juncture of the discontinuous technology path dependence in family firms was proposed based on five case studies in Southeast-Asia. The proposed model illustrates how the critical juncture and issue network theory was used to shed light the initial phase of discontinuous technology path dependencies of discontinuous technologies in the sheet metal fabrication industry in Southeast-Asia. While the case studies were based on a specific industry Southeast-Asia, the theoretical framework from this paper may be the starting point of research for discontinuous technology in other regions and industry for family firms.

Introduction

Often, family firms around the world are large economic contributors. For example, the averages of family firms worldwide are 45% and 30% for medium and large companies respectively by 1999 (La Porta, Lopez-De-Silanes, & Shleifer, 1999). As an improvement of the study by La Porta et al. (1999), a company ownership study was conducted specifically in the context of East and Southeast-Asia; the study revealed that for the countries Hong Kong, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand, family firms, with at least 20% voting rights, cover 66.7, 71.5, 48.4, 67.2, 44.6, 55.4, 48.2, and 61.6 percent of the total publicly listed firms respectively (Claessens, Djankov, & Lang, 2000). The high level of ubiquity of family firms induced the grow of attention on family firm studies by scholars (Berrone, Cruz, & Gomez-Mejia, 2012; Chrisman & Patel, 2012; De Massis, Frattini, & Lichtenthaler, 2012). Thus, the study of family firms should not be ignored, and is in fact a growing academic field (Wright & Kellermanns, 2011).

Family firms are defined as businesses that are "governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or a small number of families in a manner that is potentially sustainable across generations of the family or families" (Chua, Chrisman, & Sharma, 1999, p.19). One of the means to which firms gain competitive advantage is through innovation, to adapt to their changing environments, especially for the continuation of competitive advantage across generations (Cooper & Kleinschmidt, 1987; Jaskiewicz, Combs, & Rau, 2015). However, research has shown that family firms have a certain inertia when it comes to innovation. For example, it is shown that family firm invest less on R&D than non-family firms (Chrisman & Patel, 2012). Also, family firms has shown to have phases with low commitments to innovation and R&D investment (De Massis, Chirico, Kotlar, & Naldi, 2014). In addition, it is argued that the inertia within family firms are partly

because of their reliance on the decision making of the founder, and this might make family firms susceptible to losing their competitive advantage in the long run (Jaskiewicz et al., 2015; Kellermanns & Eddleston, 2007; Zahra, 2005; Zahra, Hayton, Neubaum, Dibrell, & Craig, 2008). One of the ways for firms to capture the value from innovation is adopting discontinuous technology (Tushman & Anderson, 1986), in which this paper will focus on.

The inertia of innovation, including the adoption of discontinuous technology, within family firms, is likely to be an effect of path dependency (Fawcett, Ellram, & Ogden, 2013; Garud, Kumaraswamy, & Karnøe, 2010; Stanley, 2010; Sydow, Schreyögg, & Koch, 2009; Wright & Kellermanns, 2011). Researchers suggest that family firms' path dependence are likely due to the founder's imprinting for organizational paths both based on the environment as well as the values, beliefs, and organizational structure at the time of founding (Johnson, 2007; Marquis & Tilcsik, 2013; Stinchcombe, 1965). As previously mentioned, part of the definition of family firms is that they strive to be sustainable across generations and have long term goals (Chua et al., 1999; Miller, Le Breton-Miller, & Scholnick, 2008). However, because of this, the founder's influence usually affects the strategic decision making of family firms (Aldrich & Cliff, 2003; Short, Payne, Bringham, Lumpkin, & Broberg, 2009).

Most of the family firm path dependence theories are through the view of organizational imprinting. The theories of organizational imprinting per se has its own limitations (Schreyögg & Sydow, 2011), one of which is taking the initial path dependence phase for granted (elaborated further in the literature review). This limitation renders the shape of the initial phase of path dependence obscure, resulting an unclear causality mechanism of path divergence or emergence; in our case it is the adoption of the discontinuous technology itself. When discussing about path dependency, one is discussing about the temporal view of a phenomenon of an institution. To date, there is very few research done in the temporal aspect of family firm management process, including innovation decision (Chrisman, Chua, De Massis, Minola, & Vismara, 2016). For example, while a temporal study, like that of De Massis, Chirico, Kotlar, & Naldi (2014), that considers the life cycle view of family firms is useful, it lacks the specificity of the important moments within a family firm to adopt discontinuous technologies. The unclear initial stage of organizational imprinting is insufficient to explain the initial causal factors of technological path dependency phases within family firms (explained further in the conceptual framework). Therefore, there is a **need for study** of the casual mechanisms of the adoption of discontinuous technology path dependence within family firms.

An alternative view to path dependence is Sydow, Schreyögg, & Koch's (2009) framework of organizational path dependence, which addresses the initial phase of path dependence with the concept of critical junctures. Unlike organizational imprinting, the organizational path dependence view focus more in depth into the initial phase of path dependence (Capoccia, 2015; Soifer, 2012; Sydow et al., 2009). In addition, the study of critical junctures shed light towards how an existing path diverge (Sydow et al., 2009). The path divergence within critical junctures might have managerial implications by showing how decisions makers might adopt discontinuous technologies, as opposed to the current technological path. Since most studies about critical junctures had been within the comparative historical analysis in the field of historical institutionalism (Capoccia, 2015), subsequent studies would have to stem from the historical institutionalism literature. In sum, it could be said that the lack of study within the family literature research about path dependence with the historical institutionalism point of view is a **research gap** for the family business literature.

Using the critical juncture theory as an approach to study discontinuous technology adoption is to look in the institutional level. However, we argue that the institutional level view of discontinuous technology is in the macro level of analysis, and that a micro level of analysis is needed to be able to study the phenomena more holistically. In this regard, the micro view level analysis allows us to pin point the exact decisions and show the dynamics among decisions that lead to the adoption of the discontinuous technology. Thus, we propose to use the issue network decision model (Langley, Mintzberg, Pitcher, Posada, & Saintmacary, 1995) as a supplementary approach to study the adoption in the micro level. It is important to notice that there are well established foundations already in the family firm, decision making, and critical juncture literature, however there are no ready to use frameworks to bridge all three academic fields that had been tested empirically; especially within technological adoption. With that the **primary objective** of this study is to explain the critical juncture path dependence of discontinuous technology

adoption within family firms through a novel theoretical framework, including the incorporation of the issue network theory. Therefore, the **general research question** of this study is: *What is the critical juncture pattern of the path dependent adoption of discontinuous technology within family firms.* To answer this research question, several **sub research questions** are asked, based on the abductive view of scientific research (Haig, 2005): **(1)** *What is the path dependent adopted discontinuous technology that will be the focal phenomena* **(2)** *What are the components from both the critical juncture and issue network frameworks within the context of the focal phenomena* **(3)** *What is the integration structure between the components from both the critical juncture, discontinuous technological adoption within family firms and issue network frameworks using the historical institutionalism view; the answer of this sub research question is a proposed theoretical framework based on empirical data collection* **(4)** *What is the difference and similarities among the patterns of critical junctures from the studied cases.* The empirical support for the framework would be from case studies of family firms within the sheet metal fabrication industry's adoption of discontinuous technology in Southeast-Asia (SEA).

This study serves to contribute to all three academic fields, namely the critical juncture, decision making model, and the family firm academic fields. First, the critical juncture academic field (Soifer, 2012; Sydow et al., 2009) would gain from having a holistic framework application of critical juncture in organizational studies. Second, the issue network theory (Langley et al., 1995) would gain from having its framework used in context and empirical evidence. Third, the family firm academic field would gain new insights towards the temporal aspects of the family firm decision making process. Since this study considers specific moments within the firm's life cycle using decisions as the unit of analysis, this study can shed light to new possible factors and their relationships. While this study uses the abductive view of research, the product of this study can be used for subsequent studies deductively.

The first part of this paper is a literature review of the existing concepts and theories of decision making models and critical junctures within the historical institutionalism view. Note that since this paper assumes elemental knowledge on family firm academic discontinuous technology literatures, the literature review would focus more on elaborating decision making and critical juncture theories (the focal foundations on the combined framework); refer to Wright & Kellermanns (2011) for in-depth review in family firm literature, and Tushman & Anderson (1986) for discontinuous technology and Gopalakrishnan & Damanpour (1997) for Innovation. Subsequently, the explanation of why the issue networks was chosen and how it can be integrated and used in the combining theoretical framework is explained in the conceptual framework. The methodology of this paper would explain the research context, the sheet metal fabrication industry in Southeast-Asia, as well as research design and data collection method. Next, the findings are presented and discussed; the discussion will include the revised theoretical framework, as well as how to use it in context. Subsequently, the paper will mention the limitation and managerial implication of this study. The paper would then be ended with a conclusion.

Literature review

The literature review section will elaborate on the theories of organizational path dependence, historical institutionalism, critical juncture, discontinuous technology adoption of family firms, and decision making models.

Historical Institutionalism: Path dependency and Critical Junctures

This section will start with the description of path dependency and followed by the description of historical institutionalism. This section will then be ended with the elaboration of the critical juncture theory and its components.

Path Dependency

To talk about critical junctures is to talk about the theory of path dependency in the view of historical institutionalism, used in comparative history analysis, within the literature of political science (Capoccia, 2015). The concept of path dependency itself was adopted from earlier institutional economics literatures (e.g. Arthur, 1994; North, 1990) to political science literatures (e.g. Collier & Collier, 2002; Lieberman, 2003; Mahoney, 2000). Based on the literatures of institutional economics, political science, institutionalization,

and organizational studies (Boeker, 1989; Johnson, 2007; Lawrence, Winn, & Jennings, 2001; North, 1990; Pierson, 2000, 2004; Powell & DiMaggio, 1991; Thelen, 1999; Tolbert & Zucker, 1999), Sydow et al. (2009) reframed the less structured concept of path dependency into a more structured organizational context. In his work, Sydow et al. (2009) defined institutions as organizations, and that their path dependence characteristic is divided into three different phases of causal regimes, with different environments for organizational action and decision making, as illustrated in Figure 1.

Rather than starting at the initial phase, we will describe the phases starting from the end phase for the sake of clarity. The end phase, within Sydow et al.'s path dependence representation, is phase III or the 'lock in' phase. Here, decisions portray deterministic characteristics, shown by predominant choice of actions or patterns and inflexibility of choice. Even with the availability of more efficient choices, agents (even new comers) would still inevitably favour the predominant choice of action. Thus, within this phase, decision outcomes are predictable and non-contingent, regardless of its efficiency.

The locked path, as described in phase III, was formed during phase II, the formation phase (Sydow et al., 2009). Phase II is described as having self-reinforcing mechanisms (positive feedback loops) for the emerging dominant path. While options narrow, decisions within this path are still contingent, but are progressively getting irreversible. Thus, within this phase, decision outcomes are somewhat predictable, and the directions of the paths are incrementally getting less malleable.

Preceding the formation phase is phase I, the preformation phase. This phase is described as the most ergodic phase, meaning that actors are within a state of high contingency and there is a broad scope of action. This implies that the outcomes of decisions made within phase I are unpredictable. Sydow et al. (2009) then stated that choices made during this phase have may result in outcomes that, accidentally, set forth the self-reinforcing mechanism described in phase II. This period of time, shorter relative to the path it seeded (Capoccia, 2015), is the bridge between phase I and II. And this moment, is called the critical juncture. Thus, it could be said that the critical juncture points the end of phase I and the start of phase II, when a path, with self-reinforcing mechanism, emerges; critical juncture can also be viewed as the point when a path diverges from a previous path (Capoccia, 2015).

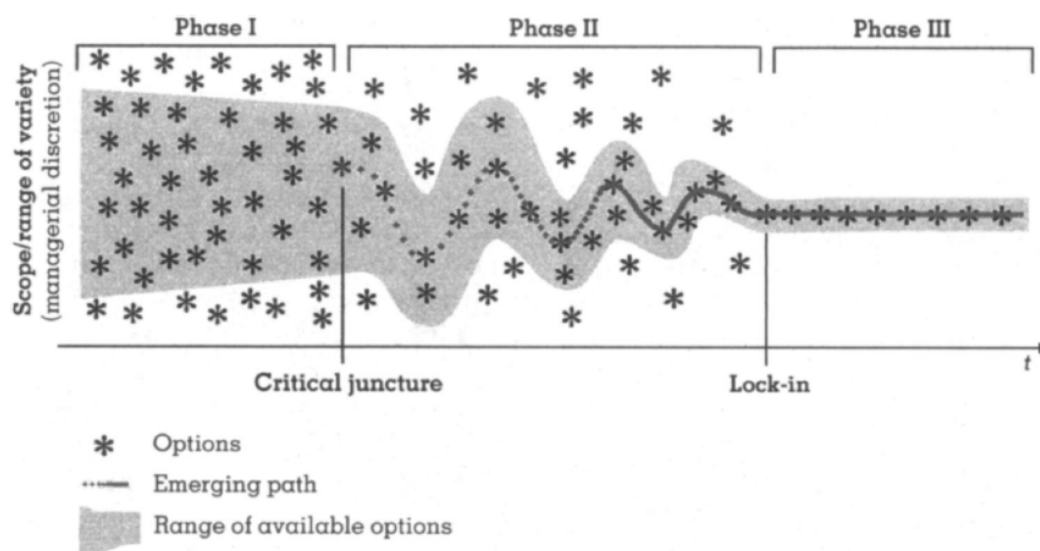


Figure 1. The constitution of an organizational path (Sydow et al., 2009, p.692)

Historical Institutionalism

Since this study uses Sydow et al.'s (2009) organizational path dependence theory, in the historical institutionalism view, the characteristics of historical institutionalism needs to be elaborated. The elaboration of historical institutionalism is easier to be done through its comparison with rational choice

theory (Thelen, 1999). Thelen (1999) provided three main differences within the dichotomy between historical institutionalism and rational choice view: (1) approaches to theory building (2) hypothesis formation (3) inclusion and use of the concepts of norm and culture, as opposed to pure rationality.

According to Thelen (1999), most literature within the historical institutionalism work works at the mid-range level of theory. This means that the works “focus on a limited range of cases that are unified in space and/or time” or, in other words, very contextual (Thelen, 1999, p. 373). The works within historical institutionalism literature focus more into their intrinsic importance rather than generalizability. For example, if the work of Collier & Collier (2002) focus on Latin America in a specific time, then the results and causal factors are relevant only for that specific case and time. Rational choice theorists (e.g. Knight, 1992; Woolley & Levi, 1989), on the other hand, try to produce theories that are generalizable, although also using historical examples, but not so much appeal to their intrinsic importance. But the similarity of both point of views are that they are trying to explain a phenomenon, the adoption of discontinuous technology by family firms in our case, using theoretical propositions.

Thelen (1999) also clarified the difference between historical institutionalism and rational choice view in their hypothesis formation. Thelen (1999), stated that historical institutionalists often start with an observed phenomenon, then use comparisons (comparative historical analysis) to test the hypothesis that account for the observed differences. In contrast, rational choice theorists start with an existing theory, and treat observed phenomenon as deviations from the general theory’s prediction. Rational theorists would then formulate theories to explain the differences and its relation to the general theory. Thelen (1999) also mentioned that while the historical institutionalism view had long considered norm and culture, rational theorists had recently incorporated norm and culture into their theories. The difference is that rational theorists view norm and culture as an instrument to make strategic decisions.

In sum, several characteristics that can be described from the dichotomy between historical institutionalism is that historical institutionalism tries to explain a phenomenon, using a historical view, by using comparative analysis. However, the resulting theories from the analysis are contextually binding and that they should consider using norms and culture in the analysis.

Critical Junctures

Sydow et al.’s (2009) representation of the path dependent phases seems to show clear distinctions between phases. This conception of the initial conditions (phase I) of being free from restrictions seems to follow rational choice traditions (Sydow et al., 2009). A specific path is always described relative to a specific development like, for example, tax policy (Prasad, 2005) or labour movement (Collier & Collier, 2002). When considering the initial conditions in phase I, while the conditions of a specific development seems to be unrestricted, they might still be affected by other developments. Since the initial choices of organizations are embedded within their routines and practices, the analysis of institutions should consider their history (David, 1994). The historical view of institutions could be the lens through which the interactions between the developments are evaluated.

It was mentioned before that critical junctures serve to be the bridge between phase I and phase II (Sydow et al., 2009). However, it was argued that the initial choices that shape the critical junctures takes form not just with a single choice, but a cumulative of choices that makes “small events” (Arthur, 1994; Capoccia, 2015; Sydow et al., 2009). The description of critical junctures as “small events” (Arthur, 1994) is put in very general terms that makes it difficult to discern one event with another. A framework by Soifer (2012), as a complement to work of Slater & Simmons (2010) and previous views of critical juncture (Capoccia, 2015; Collier & Collier, 2002), describes the different interacting components that make up critical junctures. These components include the critical antecedents (Slater & Simmons, 2010), permissive condition, productive condition, outcome, end of critical juncture, mechanisms of reproduction, and consequences (Soifer, 2012).

The permissive conditions is defined as the factors that “change the underlying context to increase the causal power of agency or contingency and thus the prospects for divergence” (Soifer, 2012, p. 1574). Basically, one can imagine that the state of developments before the emergence of the permissive condition as bound to a previous interlocked structural path. The permissive condition would then serve to loosen the structure, giving rise to the state of ergodicity (high contingency). It is described then that

the end of the permissive condition marks the end of the critical juncture itself. However, this is not to say that the state of ergodicity, opened by the permissive condition, is equal to the critical juncture; the permissive condition acts as the scope condition to the causal relationship among the other components that is necessary but insufficient to cause a critical juncture. The permissive conditions are described as an exogenous force that starts and end the critical juncture.

The productive condition is defined as the component of the critical juncture that “shapes the initial outcomes that diverge across cases” (Soifer, 2012, p. 1575). To put it simply, the state of ergodicity opened by the permissive condition itself would only imply that a diverging path is possible, but the direction of which the path is heading is shaped by the productive condition. Again, a single or multiple productive condition is necessary but insufficient to cause a critical juncture. Thus, the presence of both the permissive and productive conditions are needed to have a critical juncture.

The critical antecedents (Slater & Simmons, 2010) of critical junctures contributes the historical institutionalism perspective to this theory; this is because critical antecedents explains how critical junctures do not start with a blank slate. Critical antecedents helps determine the causal effect of the independent variable across cases when the critical juncture exogenously came about (Slater & Simmons, 2010). Here, the critical antecedents are there preceding the permissive condition, thus the critical juncture altogether, but it does not necessarily cause the permissive condition, although it can be connected to the productive conditions (Soifer, 2012). In other words, the critical antecedents are the backgrounds of the productive conditions, but without the productive conditions, there is no driving factor that can shape the direction of the paths. The importance of critical antecedence is that it helps shed light to solving the ‘infinite regress’ problem in historical analysis (Soifer, 2012). Infinite regress refers to the statement that there is a cause for every cause (Pierson, 2004); critical antecedents, permissive condition, and productive condition, as part of critical juncture, helps draw the line of how far back the historical view of analysis should begin (Pierson, 2004; Slater & Simmons, 2010; Soifer, 2012); this can only be done, however, using a comparative view of historical analysis.

Critical antecedent	Strength of middle class and labour as of 1929
Permissive condition	Collapse of world trade and economic challenges of Great Depression and World War II
Productive condition	Economic ideas of EFCLA and more general rise of economic nationalism
Outcome	Inward-looking industrialization implemented to varying degrees in Latin America
End of critical juncture	Recover of world trade by 1950, and especially after the Korean war
Mechanisms of reproduction	New political coalitions among bureaucrats, domestic elites, and organized labour
Consequences	Crises of populist rule and bureaucratic- authoritarian regimes

Table 1. Inward-looking industrialization as a critical juncture (Soifer, 2012)

The mechanisms of reproduction explain why a particular juncture is ‘critical’. To be critical, the outcome of the causal factors need to stay after the factors themselves disappear (Soifer, 2012); otherwise, the self-reinforcing mechanism following the critical juncture, in path II, do not have anything to reinforce. In light of this, the mechanism of reproduction are the factors that help put the outcomes in place.

In the paper by Soifer (2012), the example of import substitution industrialization was used to illustrate how to use the critical juncture framework in context, as illustrated in Table 1. The critical antecedent, the strength of middle class and labour as of 1929, is there to begin with, but would not produce the outcome by itself. Here, it is important to note that the permissive condition, the collapse of world trade and economic challenges, is an exogenous force. The productive condition, the economic ideas of EFCLA and general rise of economic nationalism, was the shaping force that would lead to the outcome of inward-

looking industrialization. Should the productive condition be the opposite, non-economic nationalism, then the outcome would highly likely be the opposite, an outward looking industrialization. The critical juncture was ended alongside with the fading permissive condition, which is the recovery of world trade. After the initial inward-looking industrialization movement was initiated, the new political coalitions among bureaucrats, domestic elites, and organized labour served to become the mechanism of reproduction that puts the position into place. The resulting path out of this critical juncture are the crises of populist rule and bureaucratic-authoritarian regimes.

Discontinuous Technology Adoption of Family Firms

Family Firms

Family firms are defined as businesses that are "governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or a small number of families in a manner that is potentially sustainable across generations of the family or families" (Chua, Chrisman, & Sharma, 1999, p.19). Family firms have what is called family particularistic behaviour, which is the behaviour of family firms that are idiosyncratic with that of non-family firms (Carney, 2005). And one of the main distinctions between family firms and non-family firms lies on the fact that family firms make decisions based on non-economic goals in addition to economic goals (Chrisman and Patel, 2012). Goals in family business are part of their strategic drivers (Chrisman et al., 2016). However, family particularistic behaviours by family firms would not appear unless the family firm possess both the ability to act idiosyncratically and the willingness to pursue the family firm particularistic behaviour (De Massis, Kotlar, Chua, & Chrisman, 2014).

The concept of non-economic goals revolves around the social economic wealth (SEW) theory (Berrone, Cruz, and Gómez-Mejía, 2012). The SEW theory states that family firms are motivated to preserve their SEW; several dimensions of SEW include Family control and influence, Identification of family members with the firm, Binding social ties, Emotional attachment of family members, and Renewal of family bonds to the firm through dynastic succession (Berrone, Cruz, and Gómez-Mejía, 2012). Since the nature of SEW *per se* is not financial, the decisions family firm executives make fulfils non-economic goals. But since it was shown that family firms are heterogenous, it was also shown that there are varying non-economic goals among family firms (Berrone et al., 2012; Zahra, Hayton, and Salvato, 2004). Thus, it could be said that family firms have non-economic goals based on socio-economic wealth, although it could not be generalized, since family firms are heterogeneous.

Understanding that family firms have non-economic goals is one thing but understanding how it effects their decision making is another. It has been shown that family firm's non-economic goals significantly affect their behaviour and decisions in different ways (Gómez-Mejía, Haynes, Nunez-Nickel, Jacobson, and Moyano-Fuentes, 2007; Chrisman and Patel, 2012). More specific towards technology adoption, a theoretical framework by König, Kammerlander, & Enders (2013) pointed out that family influence affect adoption of discontinuous technology (Tushman & Anderson, 1986). Particularly, this study focused on the positive or negative influences that families exert towards the barriers of discontinuous technology adoption, and how the affected barrier factors influence the different factors of discontinuous technology adoption. However, this study did not focus on the specific decision-making process of the technological adoption. In addition, the study by König et al. (2013) had been noted to ignore the heterogeneous behaviour of family firms (Chrisman, Fang, Kotlar, & De Massis, 2015). Chrisman et al. (2015) noted that the model by König et al. (2013) overlooked the fact that family firms' goals is subject to change according to critical situations, and that family firms' government structure is more flexible. Thus, subsequent study on discontinuous technology of family firms need to be done, that takes into consideration heterogeneity of family firms.

Technological adoption is part of innovation investments of a family firms (Kotlar, Fang, De Massis, & Frattini, 2014). A study had shown that family firms invests less in research and development than non-family firms in general (Chrisman & Patel, 2012). However, while the lesser investment in R&D of family firms is a general trend, it is also shown that the heterogeneity in family firms contributes to the increased variance of R&D investment. The important implication that we would like to highlight from Chrisman & Patel (2012) is the high presence of path dependence in technological adoption in family firms that is

affected by the heterogeneous family goals and influence. This implication can be made because of the general lesser R&D investment trend, and the presence of family firms that invest very little in R&D due to high variance in R&D investment; these are the types of family to be focused on.

In a recent literature by Chrisman, Chua, De Massis, Minola, & Vismara (2016) there is a call for research towards the execution of management in family firms. This paper summarized the literature in family firms, and proposed that the management process of in family firms (required tasks, actors, assignment/delegation of tasks, sequence of actions, accountabilities and deliverables) are affected by their strategic drivers (resources, governance, and goals), which in turn are affected by their behavioural propensities (ability and willingness) (Chrisman et al., 2016; De Massis et al., 2014). It is argued that while there is much research among the behavioural propensities and strategic drivers, there are less research for the management process in family firms. One of the management process in family firms is the sequence of actions. The sequence of action adds the temporal aspect towards the family firm's management process. In relation to this, De Massis, Chirico, Kotlar, & Naldi (2014) measured the relation between the age of family firms and their proactiveness. In this literature, firm proactiveness was measured in terms of commitment to R&D, technological leadership and innovation in a five point scale (De Massis, Chirico, et al., 2014). It was found that there is a cubic relationship (horizontal S-curve) between the proactiveness and age of family firms. In sum, in the initial founding phase, family firms tend to show high proactiveness, followed by a phase of low proactiveness, then followed by another high proactiveness, which is followed by another phase of low proactiveness. It can be argued, that within the moments of low proactiveness, investments towards a technology can show path dependence characteristics. This is reflected by the reluctance to make a useful change (lack of innovation). The main implication from this study is that the innovation trend of family firms is not constant over time; the heterogeneity of family firms renders a complex temporal dynamics of family firm innovation. Related, this study focuses primarily to when family firms show path dependent (low proactiveness) characteristics in innovation, specifically discontinuous technologies.

Organizational Imprinting

The study of path dependence most of the literature in family firm path dependence are inclined more towards organizational imprinting, which has an unclear initial stage, and this is the knowledge gap for the historical institutionalism view to fill. It is important to point out that the organizational imprinting theory states that firm founders have imprinting effect towards not only firms' policies and culture, but also resource investment preferences (Carroll & Hannan, 2000; Stinchcombe, 1965); the theory of organizational imprinting revolves around the notion that founders' firm structure, operating practice, and strategies have lasting effects in time within the firm (Stinchcombe, 1965). This implies that, based on organizational imprinting theory family firm's innovation investment are also part of the path that was set by the founders (Garud et al., 2010). Since family firms strive to be sustainable across generations and have long term goals (Chua et al., 1999; Miller et al., 2008), imprinting of the founders influence was designed to last across generations. Even so, it is said that it is unclear how organizational imprinting of the founders can be transmitted across successive generations (Kammerlander, Dessì, Bird, Floris, & Murru, 2015). Although a study had been done to show the presence of second-hand imprinting, the "social transmission of imprints between individuals" (Tilcsik, 2014, p. 25), it has not been done yet in the context of family firm succession.

The definition of organizational imprinting revolves around three characteristics: the existence of a sensitive period with high susceptibility to environmental influence, the powerful impact of the environment during the sensitive period, and the persistence of the characteristics developed during the sensitive period (Marquis & Tilcsik, 2013). It is argued that through these characteristics, the founder of an organization sets a structure that results in the path dependence of an entity (Stinchcombe, 1965). However, organizational imprinting theory takes the initial phase of path dependence for granted (Schreyögg & Sydow, 2011). Organizational imprinting focus on why and how the initial structure of an organization is stable rather than why and how the organization came to become path dependent (Marquis & Tilcsik, 2013). In addition, the lack of clarity in the trans-generational transmission of imprinting adds another flaw to the use of organizational imprinting theory in the family firm literature. On the other hand, Sydow et al.'s (2009) organizational path dependence view has the means to incorporate trans-

generational effects by not predefining the actor of the path dependence initiator; this implies that path dependence is not bound to only the founder but is open to other actors.

In sum, since most of the literature in family firm path dependence are inclined more towards organizational imprinting, which has an unclear stage, it is difficult to elaborate on the causal factors of how a family firm can be path dependent in the temporal view. As an alternative, the organizational path dependence view, with its clearer critical juncture components, is used.

Decision Making Models

To reclarify, it was argued that the critical juncture view lacks the micro view that allows events in the form of decisions to be analysed. Thus, a decision-making model (DM) is used as the means for the micro view for the critical juncture theory. This literature review shows the DMs available in the literature and their differences and similarities. A review by Langley, Mintzberg, Pitcher, Posada, and Saint-Macary (1995) indicated that a dichotomy within the DM involves the sequential versus the anarchical views.

Sequential-Anarchical Continuum

To understand the dynamics of decisions, there is a need to understand how an individual makes a decision. The sequential view of decision making revolves around Simon's (1960) work that established the dominant idea that the decision making process involves three phases: intelligence, design, and choice. The basis of Simon's (1960) work is that decision making is a rational process that starts in the sequence of problem identification (intelligence), designing (design) the solutions, and finally deciding (choice) the perceived optimal solution to the problem. Following Simon's (1960) work are DMs like that of Mintzberg, Raisinghani, & Theoret (1976) that adapted Simon's trichotomy into three central phase, three sets of supporting routines, complemented by six dynamic factors; they concluded their model with seven types of DM configurations. In addition, also based on Simon (1960), Nutt (1984) created a DM in a form of five sequence model (formulation, concept development, detailing, evaluation, and implementation) with three phases within each sequence (search, synthesis, and analysis). Other authors focus more into elaborating each of the three phases, based on Simon (1960), like Pounds (1969), Lyles & Mitroff (1980), Dutton et al. (1983), and Alexander (1979) who focus in problem finding, problem formulation, diagnosis, and design alternatives respectively. However, the sequential view of DMs are not without its limitations. For example Cohen, March, & Olsen (1972) argued that the sequential view of decision making fails to take into account the complicated interaction among problems, actors, and decisions within an organization; the sequential view could not capture what happens in reality.

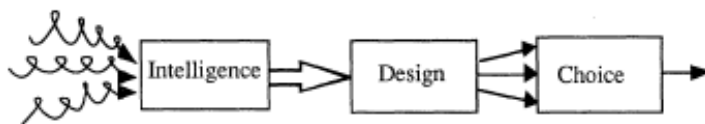


Figure 2. Model 1: Illustration of the sequential model (Langley et al., 1995; Simon, 1960)

The anarchical views of DM stems from the work of March (1962) that proposed that business decisions are made in a view of political coalitions with less independent constraints and goal inconsistency. March (1962) implied that if decisions are made to achieve goals, under the assumption that the superordinate

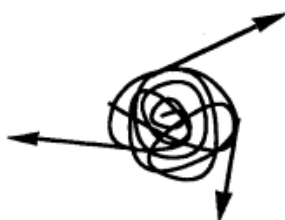


Figure 3. Model 2: Metaphor of the garbage can model (Hickson et al., 1986; Langley et al., 1995)

alternative choices are chosen, then if the goals are inconsistent to begin with, the sequential view of DM is not viable. Later, Cohen et al.'s (1972) work contributed to the anarchical view of DM by proposing a Garbage Can Model; this model represented problem and solutions as linked in random ways, that are driven by serendipity and idiosyncrasy of participation in choices. The high level of complexity and ambiguity within decisions lead to the anarchical structure of the model. However, like the sequential view, the anarchical view of DM has its own disadvantages. For example, it is tempting to use the chaotic nature of the Garbage Can DM to solve for unexplained variance that could otherwise be solved with a better structured semi-sequential DM (Langley et al., 1995; Pinfield, 1986). In other words, the Garbage Can DM runs into the possibility to overlook unidentified systems of DMs.

Langley et al. (1995) summarized the two different DM views by putting them into one sequential-anarchical continuum, with Simon's (1960) DM on one end (the sequential view: model 1) and Cohen et al.'s (1972) on the other (the anarchical view: model 2). With the sequential-anarchical continuum, one can evaluate a DM as in between models 1 and 2, like the DM by Mintzberg et al. (1976), which they categorized as the iterative view (model 3). In the iterative view, Mintzberg et al. (1976) tried to combine both models 1 and 2 by establishing a linear sequential model but complimenting it with dynamic factors that represents the anarchical view. The sequential feature is shown how the model follows the three intelligence, design, and choice model, but can be influenced or interrupted by the chaotic dynamic factors. When the dynamic factors come to play, model 3 requires its actors to fall back to previous phases with varying distances within its sequence, hence the iterative nature of the model; the model 3 is then ended with the final choice as an outcome. Langley et al. (1995) uses the illustration in Figure 2, Figure 3, and Figure 4 to portray models 1, 2, and 3 respectively.

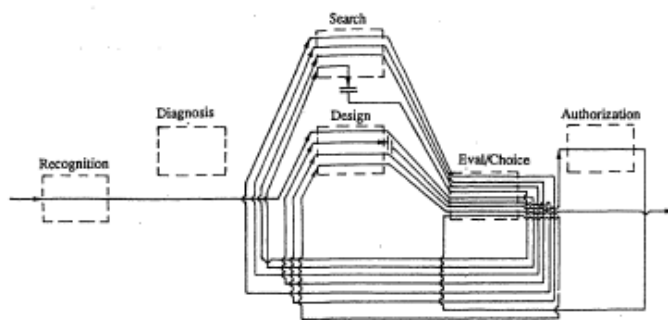


Figure 4. Model 3: Example of an iterative view (Mintzberg et al., 1976; Langley et al., 1995)

Limitations and Alternative Models

As much as the three models explain the decision-making process, there are a few limitations that they all share. As Langley et al (1995) put it, three common limitations the mainstream literature suffer include reification, dehumanization, and isolation. Firstly, reification refers to how the mainstream literatures define decision as an exact moment of 'choice', but this creates a structural bias within the literature. One cannot be sure about when an actor truly made the decision. For example, given two alternatives A and B, the CEO of a company might have decided to adopt one of the alternative before coming to the meeting, but the only evidence to study is the meeting minutes. This shows that the timing of the decision becomes obscure. This illustrates that the exact pinning of decisions is contingent to the context of the research. In response to this limitation, several scholars contributed to the created of the convergence model of DM as portrayed in Figure 5, also called as model 4 (Hage, 1980; Langley et al., 1995). The underlying idea of model 4 is that instead of having a certain point of decision viewed in a sequential model (Simon, 1960) or cycles (Mintzberg et al., 1976), decision making goes through a gradual convergence to an image of an ultimate outcome. Here, decisions are made by moving forward, with the possibility to explore outwards, though limited.

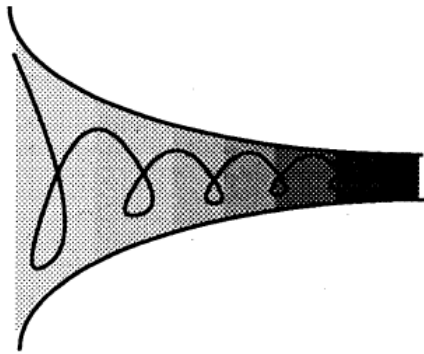


Figure 5. Model 4: Metaphor of the convergence view of organizational decision making (Langley et al., 1995)

Secondly, dehumanization refers to how the mainstream literatures leave out the irrational aspect of the human nature. Langley et al. (1995), instead, argued that decision processes should be viewed holistically as an organization that takes into consideration the forces of affect, insight, and inspiration. In response to this limitation, Langley et al. (1995), modified model 4 into model 5, as illustrated in Figure 6. Model 5 revolves around the idea that decision makers are decision creators, actors and carriers. Decision makers as creators refer to how they go beyond the concept of the economist's rational man towards the insightful man. The insightful man makes decisions influenced by insights, which can be described as revelations or Archimedes' 'Eureka!' moments, the sudden realization caused by a stimulus and dormant background factors. As carriers, the insights are based on the organizations tacit knowledge and organizational memory, including individual memories, culture, transformations, structure, and ecology (Nsonaka, 2007; Walsh & Ungson, 1991). Thus, model 5 is similar with model 4, in terms of the convergence, but the adaptations of goals, problems, and decisions, are shaped by insights.

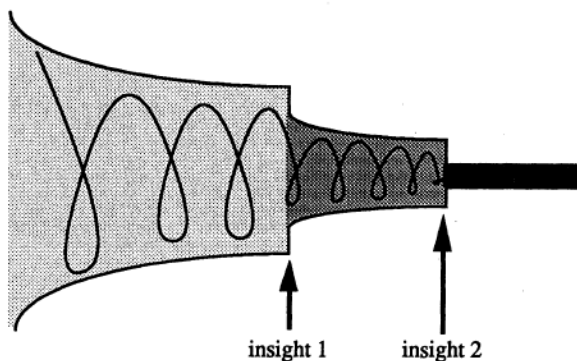


Figure 6. Model 5: Decision making as insightful (Langley et al., 1995)

Lastly, isolation refers to how most of the mainstream literature missed the interaction between the decisions within an organizational context. In their paper, Langley et al. (1995) questioned whether each decision can be isolated from one another within the dynamics of an organization. Here Langley et al. (1995) introduced the concept of issue streams to look at the interaction between decisions, as portrayed in Figure 7. As can be seen in Figure 7, the issue stream dynamics comprised of two axis, time and issue dimension. Within an issue stream (1), there can be multiple decisions, portrayed by Decision A and Decision A+; the interaction between these decisions are called sequential linkages. On the other hand, Decision B lies on the issue stream (2) parallel to Decision A+, and their interaction are called lateral linkages. In addition, notice that prior to decision B, Decision A affected the course of stream 2, and this is called precursive linkages. Langley et al. (1995) then went further with describing the different variation of these linkages, that can be seen in Table 2.

Because the decisions between the issue stream are interconnected with each other, the issues themselves and their interactions are collectively called issue networks (model 6) (Langley et al., 1995). These issue networks are then put into an intensity continuum; here intensity refers how intense the decisions are linked with each other. The intensity continuum starts with fully-coupled issue network (most intense), followed by stylistically-coupled, intricately-coupled, formally-coupled, and loosely coupled (least intense) issue networks.

Linkage Types			
No.	Sequential	Lateral	Precursive
1	Nesting	Pooled	Enabling
2	Snowballing	Contextual	Evoking
3	Recurr[ing]		Pre-empting
4			Cascading
5			Merging
6			Learning

Table 2. Decision linkage types (Langley et al., 1995)

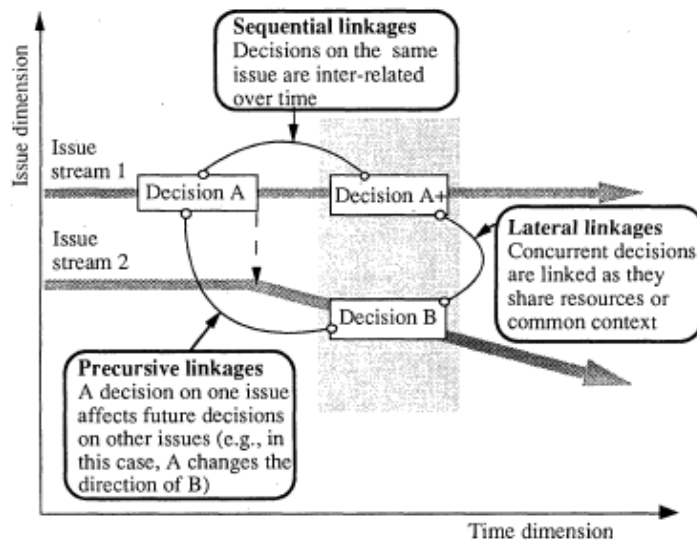


Figure 7. Representation of issue streams and decisions (Langley et al., 1995)

After the issue network theory posed by (Langley et al., 1995), there were a progressive emergence of notable scholarly articles involving DMs, but none of which focused on the issue networks specifically. For example, J. E. Dutton, Ashford, O'Neill, & Lawrence (2001) focused more towards issue networks, Mintzberg & Westley (2001) focused more towards reviewing models 1, 2 and 3, but adding 'doing first' making decisions under uncertainty without both insight nor thinking, (Sinclair & Ashkanasy (2005) focused more in the truth behind intuition, and Nutt, in his papers, continued to focus on the technicalities of model 1 based DM (Nutt, 2000, 2001, 2007, 2008). In short, most of the more recent papers continue to build on the sequential-anarchical continuum, leaving the reification limitation standing and the issue networks open. Since there is a need for empirical study for the issue network model, the use of the issue network model within this framework would contribute to the decision model literature. The integration of the issue network model, and why it is chosen will be elaborated in the conceptual framework section.

Conceptual Framework

The conceptual framework section will start with the explanation of the coherence of the theories and will be ended with the presentation and explanation of the proposed integrated framework of the theories.

Coherence of Theories

As previously mentioned, there is a research gap within the family firm literature, which is the lack of clarity for the initial stages of the organizational imprinting (Schreyögg & Sydow, 2011). This study serves to fill that gap by using the organizational path dependence framework (Sydow et al., 2009). This framework describes the initial phase of path dependence as critical junctures (Sydow et al., 2009), and the critical juncture framework is part of the historical institutionalism point of view (Capoccia, 2015; Slater & Simmons, 2010; Soifer, 2012; Thelen, 1999). While the review had elaborated the use of historical institutionalism perspective towards path dependency, it had not clearly defined how historical institutionalism view is coherent with the issue network model and the technology adoption literature. Thus, this section serves to clarify why the issue network model is chosen to complement the critical juncture framework and the technology adoption literature.

The study of critical juncture is through the view in the institution level (macro view). The critical juncture literature (Capoccia, 2015; Soifer, 2012; Sydow et al., 2009) argues the causal inference of using the critical juncture as an explanation tool towards path divergence. However, a limitation within the existing critical juncture literature is that they are missing the decision-making mechanism (micro view) among the actors within; in other words, without the micro view, the critical juncture theories would be too abstract for practical data collection. But we think that this is understandable, since most actors among the political science literature are political entities that are comprised of many individuals (e.g. the state and labour unions in the countries in Latin America in Collier & Collier, 2002). Studying specific decision-making mechanisms within a phenomenon with such big of a scope would result in a complexity that would be empirically unfeasible. However, this might not be the case with organisations, like companies, because organisations are usually smaller in scope. For example, one can study a small medium enterprise with a cut-off of less than 250 employees (Ayyagari, Beck, & Demircuc-Kunt, 2007). The study of an institution comprised of 250 individuals is smaller in scope than that of an institution with the size of countries, states, and citizens. Therefore, it might be the case that the micro view is more suitable with critical juncture studies within the organisational sciences rather than with the political sciences.

In relation to the previous argument that a micro view of analysis can be feasible in organisational studies, we strive to use the issue network model (model 6) of DM as the perspective of micro view of study, instead of the other 5 models. There are four main reasons for the use of the issue network model in for the critical juncture analysis: the issue network theory (1) uses issues as unit of analysis instead of only decisions (2) considers the historical view (3) considers not only individual but also groups, norms, and culture (4) is consistent with the contextual nature of historical institutionalism.

As previously mentioned, one of the differentiating properties of the issue network model is that it looks at issue streams instead of just decisions. The use of issue streams (Figure 7) as units of analysis can explain the interaction between decisions among the decisions made by various decision-making actors (Langley et al., 1995); the other five models could not describe this interaction. In addition, model 6 is also consistent with the argument, within the critical juncture literature, that the initial choices that shape the critical junctures takes form not just with a single choice, but a cumulative of choices that makes “small events” (Arthur, 1994; Capoccia, 2015; Sydow et al., 2009); here, ‘events’ can be framed as part of a network of outcomes of decisions, within the issue network model. The events within the critical juncture cannot be explained by other models as it involves multiple decisions and their interaction with each other.

Most of the mainstream literatures within the sequential-anarchical continuum (Cohen et al., 1972; Mintzberg et al., 1976; Nutt, 1984; Simon, 1960) assumed temporal factors ranging only several years before the focal decisions; this is called middle-distance. However, the opening of DMs by the issue network model rendered the middle-distance view as insufficient (Langley et al., 1995), for the interaction of decisions may have an extended temporal range of analysis. For example, it is possible that the sequential link between decisions span between both 1-year or 20-years. While the middle-distance view

may explain that of the 1-year interval, it will indefinitely miss that of the 20-years'. Without a longer temporal span of view, an empirical analysis of issue networks cannot be done. Here, the historical institutionalism view can be a contextual framework for the analysis of the issue network model. In other words, the integration of issue networks to the critical analysis framework contributes to the DM literature by providing it the historical context that the DM literature needs.

As suggested by Langley et al. (1995), their framework of issue network considers, and in need of clarification of, the roles of insight, inspiration and emotion. Langley et al. (1995) suggested in this paper that by considering the history, emotion, and insights of each of the actor of decision making, a study would take into consideration individual differences. The congruence between the suggestions by Langley et al. (1995) and Thelen's (1999) characteristic of historical institutionalism gave rise to my argument that both frameworks can be compatible with each other. In this integration of frameworks, we strive to show the roles of insight, inspiration and emotion within the consideration of norm and culture within historical institutionalism. Thus, with this integration, the proposed framework would assume not only the rational view of decision making, but also the non-rational aspects of decision making. Most importantly, this characteristic of both historical institutionalism and issue network model is what makes the integrated framework compatible with the family business literature. This is because it fits the notion that family business have non-economic goals that are affected with their socioeconomic wealth (Berrone et al., 2012; Gómez-Mejía, Haynes, & Núñez-Nickel, 2007; Kammerlander & Ganter, 2015; König et al., 2013).

One of the characteristics of a comparative historical analysis is that it is usually highly contextual and has low generalizability, and it builds up proposed framework from an empirical phenomenon (Thelen, 1999). It is important to notice that the other DMs (model 1-3) are more congruent with the rational choice view since most of them already have a general theory of how decisions are made, and studies the deviation from equilibrium. The issue network model is more in harmony with historical institutionalism, as Langley et al. (1995, p. 261) suggested that "decision making must be studied in toto and in vivo, at the individual level to include insight and inspiration, emotion and memory, and at the collective level to include history, culture, and context in the vast network of decision making that makes up every organization".

Therefore, we propose to use issue network model, within the study of family firm discontinuous technology adoption, with organizational path dependence's critical juncture theory, since the issue network model uses issues as unit of analysis instead of only decisions, considers the historical view, groups, norms, culture, and is consistent with the contextual nature of historical institutionalism. The integration of theories is discussed in the subsequent section as a proposed framework.

The Framework

The conceptual framework, as seen in Figure 8, shows a conceptual framework of how the theories (König et al., 2013; Langley et al., 1995; Slater & Simmons, 2010; Soifer, 2012; Sydow et al., 2009) can be integrated with one another. The first thing to pay attention to in Figure 8 is the path of consequence, the discontinuous technology adoption inertia itself, because everything else in the framework exist to explain this path of consequence. The red boxes and arrow indicates the phase within organizational path dependence. Note that the temporal position of the permissive condition is fixed as the start and the end of critical juncture, the critical antecedents are fixed as to before the critical juncture, and the path of consequence is fixed to the lock in phase. In contrast, the productive condition can start before or during the critical juncture, while the mechanism of reproduction can be established at any of the critical juncture, depending on the context, hence the un-fixed temporal position. However, this framework respects the notion that while the start of critical juncture is marked by the permissive condition, **the critical juncture cannot start without the presence of the productive condition** (Soifer, 2012).

As previously mentioned, the organizational path dependence takes the macro view, and the issue network model takes the micro view towards discontinuous technology adoption. Simply, the micro view serves to help answer the question: *when does a company adopt a technology? Which decision is it? And by whom?* As previously mentioned, **without the micro view, the critical juncture theory would be too abstract for practical data collection and analysis**. This framework assumes that the adoption of a technology can contain multiple decisions, that are structured within the issue network model; this is to anticipate the modular nature of technologies. A simple example is the following: if the adoption is a desktop Windows

PC by a household, then the adoption itself can be the cumulative purchase of the CPU, Mouse, keyboard, and operating system. But maybe these decisions are not made at the same time, and that the decision to use a windows operating system influences the decision to buy a windows compatible CPU, keyboard, and mouse. With the issue network model, the adoption of technologies can be explained in detail, hence its empirical practicality. However, consistent with the historical institutionalism characteristic, this framework cannot make the generalization of the exact interaction of issues and decisions as well as their presence within the components of the critical juncture. This is due to the heterogeneous nature of family firms, as previously mentioned. However, this study would do a comparison between cases of family firm adoption of discontinuous technology to show that the similarities and differences of issue network and critical juncture patterns can be clarified and explaining the path dependence altogether.

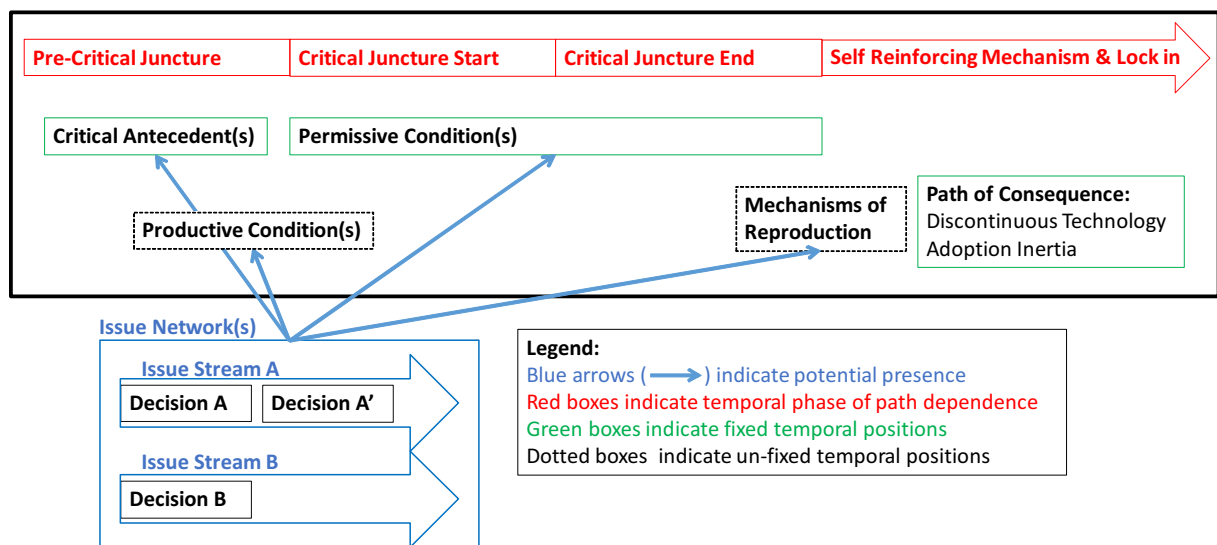


Figure 8. Family firm discontinuous technology adoption path dependence: critical juncture and Issue network conceptual framework

Methodology

The methodology section will start by describing the general research design, followed by a description of the research context, and ended with the data collection method.

Research Design

The Abductive View of Scientific Method

As previously mentioned, this research will use the scientific abductive method, as opposed to the inductive or deductive methods. The fundamental scientific reasoning of the abduction is inferring plausible hypotheses that can explain a certain phenomenon; these hypotheses would later be evaluated if they are the best explanation to the focal phenomena (Magnani, 2005). A simple illustration is adopted from Magnani (2005, p.269), given the following premises:

- (1) if a patient is affected by pneumonia, his/her level of white blood cells is increased.
- (2) John is affected by pneumonia.
- (3) John's level of white blood cells is increased.

The syllogism of deductive reasoning would be that (3) can be inferred from (1) and (2), while inductive reasoning would be that an inductive generalization (1) can be said from (3) and (2). In contrast, the syllogism of abductive reasoning would be that (2) can be an inferred hypothesis given (1) and (3), but the hypothesis (2) should be evaluated against its alternatives. The abductive research that is used in this study is the *abductive theory of method* (ATOM) by (Haig, 2005); it is important that ATOM provides a broad

framework of research design, but not specifically the data collection method. The data collection method and analysis in this study would be done using the grounded theory of qualitative analysis (Glaser & Strauss, 1967), but will be elaborated further in subsequent sections.

The reason ATOM is used instead of the inductive or hypothetico-deductive method is because the latter do not fit with the context of this study. First, the inductive method revolves around inductive generalization from enumerated observation statements about the focal phenomena (Chalmers, 2013; Haig, 2005). The inductive method is said to put extreme trust on the power of inductive generalization (Chalmers, 2013), which is not at all the case with historical institutionalism (Thelen, 1999); this is because historical institutionalism does not focus on generalization of theories. Second, the hypothetico-deductive method revolves around taking an existing theory and testing it with observational predictions (Haig, 2005; Laudan, 1981). However, such approach would fall under the rational choice view of institutionalism as discussed in the literature review section (Thelen, 1999), which is not the view used in this study. Thus, both the inductive and hypothetico-deductive method is not suitable for this study.

The research design provided by ATOM starts with the phenomena detection stage. According to ATOM, a phenomenon is a relatively stable, recurrent, general feature that is to be explained (Haig, 2005). In the case of this study, the phenomenon is the path dependence of discontinuous technology adoption by family firms; this classification of phenomenon is viable because the inertia of family firms in technology adoption had been shown as consistent in previous studies (Jaskiewicz et al., 2015; Kellermanns & Eddleston, 2007; Zahra, 2005; Zahra et al., 2008). The detected phenomenon is then abductively explained by inferring the existence of causal mechanisms (Haig, 2005); the abductive inference is based on reasoning and theoretical explanations for the causal mechanisms. The explanatory theories are then constructed into a possible model, which then would be evaluated in comparison to alternative models (Haig, 2005). The reason ATOM is suitable for this study is that each analysis would have to start with a specific phenomenon. This is consistent with the assumption that the history of each institution is specific to its own institution, as previously mentioned in the literature review (Thelen, 1999).

Using the Abductive View In context

It is important to reiterate that the **primary objective** of this study is to explain the critical juncture path dependence of discontinuous technology adoption within family firms through a novel theoretical framework, including the incorporation of the issue network theory. From these objectives, the formulated **general research question** of this study is: *What is the critical juncture pattern of the path dependent adoption of discontinuous technology within family firms.*

To answer the general research question, the ATOM was used to formulate the sub research question and to answer them. The **sub research questions** are: **(1)** *What is the path dependent adopted discontinuous technology that will be the focal phenomena?* **(2)** *What are the components from both the critical juncture and issue network frameworks within the context of the focal phenomena* **(3)** *What is the integration structure between the components from both the critical juncture, discontinuous technological adoption within family firms and issue network frameworks using the historical institutionalism view* **(4)** *What are the difference and similarities among the patterns of critical junctures from the studied cases.*

The structure of ATOM used in this study would be divided into four stages. The four research stages include (stage 1) defining the focal path, (stage 2) developing the grounded model, and (stage 3) comparing cases for similarities and differences in patterns, (stage 4) formulating the case. Stage 1 would answer the sub research question (1), stage 2 would answer sub research question (2) and (3), stage 3 would answer sub research question (4), and stage 4 would present a narrative description of the case. The research would be in the form of a case study research and a comparison of the formulated cases.

Research Context: The sheet metal fabrication industry in Southeast-Asia

This study was done in collaboration with a multinational machine tool supplier that has customers in Southeast-Asia. One of the industries that machine tools serve is sheet metal fabrication. To illustrate the industry better, it is easier to imagine the production of most consumer goods (e.g. food or mobile phones). Most consumer goods have components that are produced using machines. Most of the time, the body of these machines are made of sheet metals; even some of these goods themselves use sheet metal frames

(e.g. automobile aluminium body frames or elevator steel frames). Although the use of sheet metals is not confined to the mentioned applications but, pertaining this study, the most important point is that the core of the sheet metal fabrication industry revolves around the machine tool companies as the suppliers and their customers that use the machines to process sheet metals for other industries. The type of technologies that can be classified as machine tools ranges from milling machines to laser cutting machines. The discontinuous technologies used in this study are determined based on the methodology section.

As of 2017, most of the known machine tools that supplies the Southeast-Asian sheet metal fabrication multinational companies are from outside Southeast-Asia (e.g. Germany, Belgium, Italy, USA, and Japan). The authors of this study have had preliminary interviews with a former executive and current executive of the Southeast-Asian division of one of the machine tools suppliers. Based on this preliminary interview, they estimated that approximately 90% of their customers in Southeast-Asia are overseas Chinese family firms. In addition, the collaborating machine tool supplier has multiple discontinuous technologies as part of their technology portfolio; their competitors, that serve the same market, also have similar portfolios. Thus, the sheet fabrication industry in Southeast-Asia is an appropriate research setting for this study, as it contains of numerous family firms as consumers of the machine tools and the presence of multiple discontinuous technology by the multiple machine tool suppliers.

Data Collection Method and Analysis

This section will include the data collection method and analysis for the four stages mentioned in the previous section.

Stage 1: Defining the focal path: selecting the cases to study

Defining the focal path, answering sub research question (1) "*What is the path dependent adopted discontinuous technology that will be the focal phenomena?*", is a form of determining the phenomena in ATOM. As previously mentioned, a phenomenon is a relatively stable, recurrent, general feature of the world that is to be explained (Haig, 2005). The description of a phenomenon in ATOM (Haig, 2005) fits the profile of a dependent path, as have long discussed in the historical institutionalism path dependence literature (Thelen, 1999). Given their coherence, the first step of this study is to determine which path, within the adoption of discontinuous technology of family firm in the sheet metal fabrication industry in Southeast-Asia, should be studied; each path would then be considered as a study case on its own. There are two fundamental dimensions within a case, including *the discontinuous technology*, and *the family firm (the institution)*, and *the path dependence level*. For comparative analysis in stage 3, it is best that the different cases should have the same discontinuous technology as a control dimension but have differing family firms as the adopters. In addition, it is a requirement for each case that a path dependence phenomenon does exist. Thus, the step that must be taken to determine a phenomenon and select a cases to study are: (1) determine the discontinuous technology, (2) determine the family firms that had adopted the focal discontinuous technology, (3) show that the family firms had shown path dependence

characteristics (technological adoption inertia). In their paper, Tushman & Anderson (1986) defined technology discontinuity as an order of magnitude improvement in the maximum achievable price vs performance frontier of an industry. In this case the performance of an industry can be both products (e.g. piston vs jet engines) or processes (e.g. blown window glass vs drawn window glass) (Tushman & Anderson, 1986). Thus, the determination of discontinuous technology should be done by selecting a parameter of measurement and identifying the % improvement relative to the previous best of multiple technologies within the sheet metal fabrication industry. As an illustration is Figure 9 from (Anderson & Tushman, 1990). The Y axis is the % improvement over previous best (in terms of flat-glass square feet per hour) and the X axis is the year; here the lubbers machine, Colburn machine, and float glass are discontinuous technologies, as can be seen by the peaks in the figure. The same analysis should be done in the technology within the sheet metal fabrication industry, taking the consideration of *industry time range (years)*, *measure of performance (% improvement over previous best)*, *data source (internal vs external data of Trumpf)*,

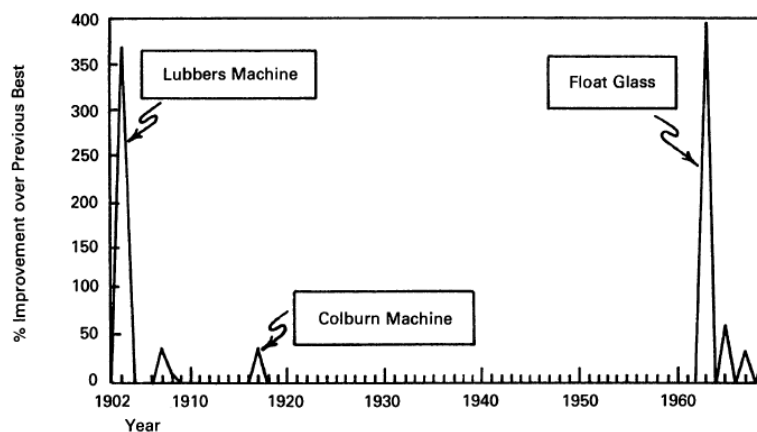


Figure 9. Technological progress of machines in the U.S. flat-glass industry, in square feet per hour (Anderson and Tushman, 1990)

magnitude order range of performance.

The second step in the determination of the phenomenon is to determine which family firm has adopted the discontinuous technology. Since in this study the discontinuous technology adoption is relative to the previous best performing technology, the family firm that fits the case profile will be those whom had already had the previous technology before adopting the newer discontinuous technology. It is important to note that the family firm selected has to have both the ability and willingness of family particularistic behaviour (De Massis, Kotlar, et al., 2014). Ability is defined as "...the discretion of the family to direct, allocate, add to, or dispose of a firm's resources" (De Massis et al., 2014, p. 346), while willingness is defined as "... the favourable disposition of the involved family to engage in distinctive behaviour" (De Massis et al., 2014, p. 347). The indicators that can show that a family firm has ability and willingness is shown in Table 3, as a summary from De Massis et al. (2014). The effects in Table 3 indicates the positive or negative relationship between the presence of the sub variable to either the ability or willingness of family firm particularistic behaviour. The initial presence of willingness and variable is first defined using archival data, and confirmed further in stage 2. The sub-variable used will depend on the available field data to access.

Measure of	Variables	Sub-Variables	Effect
Ability	family ownership	control concentration	+
		"relationalness" of agency contracts	+
		presence of other institutional or private large block share holders	-
		control risk	-
		stage of family ownership	-
	family governance	family CEO is also chairman	+
		agency cost control mechanisms	-
		number and ratio of independent directors to the board	-
	family management	family member is CEO	+
		CEO tenure	+
		board's monitoring of top management	-
		management team size	-
		number of non-family managers involved	-
		criticality of family firm's dependence on non-family managers	-
Willingness	intention toward transgenerational succession	intention toward transgenerational succession	+
		family's and owner's desire or preference to retain the control of the firm	+
		CEO has a successor in mind	+
		willingness to give up family control	-
		the family has considered "going public"	-
	family's commitment to the business	family's commitment to the business	+
		owner-manager's commitment to the organization (measured by financial stake)	+
		investment of time and effort in the family business by the future leader	+
	other variables	percentage of the owner's wealth invested in the business	+
		preservation of socioemotional wealth	+
		altruism among family members	+

Table 3. Measures of ability and willingness of family particularistic behaviours (De Massis et al., 2014)

The third step in the determination of the phenomenon is to show that the family firm selected are path dependent; in other words, it needs to be shown that in some point within the organization history, the family firm were in the phase III (lock in) of organizational path dependence. According to Sydow et al. (2009), organization lock in is reflected in the organization's predominant social influence, towards decisions, but still has scope for variation; this is a laxer conception than a completely deterministic path. In other words, Sydow et al. (2009) is arguing that lock in should not be only complete repetition of outcomes, but rather a preferred action pattern. For example, Bruggeman's (2002) illustrated how NASA is path dependent to their Apollo mission, putting a human face to exploration, and high bureaucratic inflexibility due to their initial decisions to their political race the Soviet Union of putting a human on the moon. In short, their path dependence manifest in their difficulty to focus on innovations and missions other than putting a human face on exploration (e.g. humans arriving on mars), given their social structure

(e.g. alliance of networks, hierarchical decisions, and internal capabilities). Therefore, within the context of family firm, the predominant social influence should be the focus of analysis for organizational lock in.

While it is mentioned that predominant social influence is important for the selection of path dependent family firms, the social structure of the families could not be determined before doing data collection. For this reason, the selection of family firms should be done by analysing their preferred technology purchase history (preferred action pattern). In other words, path dependence can be shown by continuous adoption of **the previous best performing technology** by the family firm, in the **presence and knowledge of the discontinuous technology in the market**. The actual path dependence could then be further empirically shown from data collection, by finding instances when opportunity arose for decision makers to adopt the discontinuous technology, but chose to (or not) adopt the technology.

By the end of the third step, the research had determined its focal phenomenon, which are multiple cases of discontinuous technology adoption path dependence by family firms. But so far, only the path dependence timeframe had been determined, but not yet the critical juncture. The reason for this is that the time frame of critical juncture for each case is determined by first completing stage 2.

In summary, stage 1, the determination of the focal path, would be an empirical research and preliminary analysis, which has the purpose of filtering which technology, and family firms are suitable for this study. The variables that needs to be collected and the source, as previously mentioned, are listed in

Step Number	Variable	Criteria/Units	Source
1	Technology measure of performance	% improvement over previous best	Trumpf's customer archival data and Factory Testing
2	Family Firm's adoption of previous best technology	yes/no	Interview with customer and supplier
2	Family Firm's adoption of discontinuous technology	yes/no	Interview with customer and supplier
3	Technological Path Dependence (previous best technology)	number of purchase of products that share the technology criteria	Interview
3	Technological Path Dependence (discontinuous technology)	number of purchase of products that share the technology criteria	Interview

Table 44.

Stage 2: Developing the combined model

The product of the previous stage are cases to study. It is important to note that each case will have its own data collection and analysis, that will be compared in the third stage of the research. The methodology of data collection and analysis used in stage 2 and 3 will be an adaptation from the grounded theory of qualitative research (Glaser & Strauss, 1967; Strauss, 1987). The grounded theory of qualitative research revolves around the construction of theories from data (grounded), rather than from existing theories (Glaser & Strauss, 1967); related, the grounded theory also fits the abductive method in the theory construction step, once a phenomenon has been determined (Haig, 2005).

Elements of a theory

According to the grounded theory (Glaser & Strauss, 1967), elements of theories include categories, properties of categories and hypotheses. Categories are distinctions from dimensionalizing a concept, and the properties of the categories are the most concrete features that can be conceptualized (e.g. idea, thing, person, event, activity, relation) (Strauss, 1987). The final theoretical model is a visual representation of the hypothetical interaction between the categories with the desired conceptual density (Strauss, 1987).

One **important** point that needs to be point out in is that there are different orders of category, core categories and non-core categories; core categories are categories that are central to the integration of the theory (Strauss, 1987). The grounded theory suggests that one should not start from an existing theory to prevent initial delimiting of theory creativity (Glaser & Strauss, 1967); this characteristic of the grounded theory follows the inductive reasoning of theory building. However, since this study uses abductive reasoning (Haig, 2005), it **assumes several initial concepts**: the issues network theory and critical juncture theory, as presented in Figure 8. Thus, the higher order categories are predetermined from both concepts as presented in Figure 10. From these core categories, the sub research questions: (2) *“What are the components from both the critical juncture and issue network frameworks within the context of the focal phenomena? And (3) “What is the integration structure between the components from both the critical juncture, discontinuous technological adoption within family firms and issue network frameworks using the historical institutionalism view?”* were formulated. Thus, the categories that should emerge from this study should be the hypotheses of the interaction between the core categories, new core categories, and sub-categories (categories of a category) to answer the sub research questions mentioned. In other words, this study is constructing a novel theory from the data but **having the theoretical sensitivity** (thinking about data in theoretical terms) of the concepts of critical juncture and issue network. The definition of each category and concept had been elaborated in the literature review.

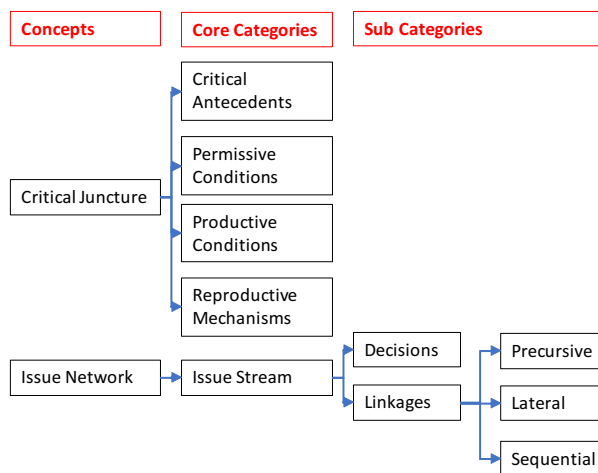


Figure 10. Core concepts and categories

Coding, Memoing, and Theoretical Sampling

Before explaining how to do data collection, the concept of coding and memoing as part of data analysis should first be explained. This is because, unlike other processes of research, the grounded theory goes back and forth between data collection, coding and memoing as needed by the research (Strauss, 1987) (Figure 11).

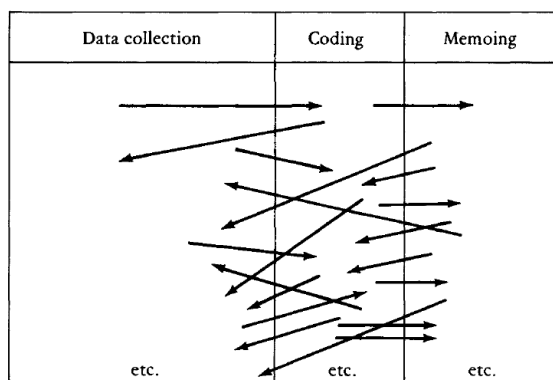


Figure 11. Research structure (Strauss, 1987, p.19)

Coding is defined as the general term of conceptualizing data, this includes raising questions, and giving provisional hypothesis as their answers (Strauss, 1987). A code, the product of coding, can be in the form of a category or the relation among the categories (Strauss, 1987). Coding should be guided by the coding paradigm (Strauss, 1987): conditions, interaction among the actors, strategies and tactics, and consequences, in the context of the research. Open coding is done in the initial stages of research (less restricted) and axial coding is done in the later stages of research (more focused on the developed categories). Coding follows upon and leads generative questions, which will result in the discovery of categories and hypothesis and will be the base of the integrated theory.

Theoretical memos are writings of theoretical questions, hypotheses, summary of codes, etc. In other words, memoing is a method to keep track of the results of coding, stimulate further coding, and a major mean of theory integration (Strauss, 1987). The general form of a memo starts with stating the memo type, the intent of the memo, comments for the memo, and further appropriate notes (Strauss, 1987). Memos will be written as separate for data to prevent confusion and can be modified as the coding process continues. It is important to note that the coding and memoing process is done using the program "ATLAS.Ti".

The data collection method for the grounded theory is called theoretical sampling. Theoretical sampling, as defined in Glaser and Strauss (1967), is the process of data collection where the researcher jointly collects, codes, and analyse his/her data, and decides what data to collect next, where to find them to develop his theory as it emerges; this is like the research structure presented in Figure 11. For example, typical basic questions in theoretical sampling would be, "what groups does one turn next in data collection? And for what theoretical purpose?" (Glaser & Strauss, 1967, p. 47). The data collection method in theoretical sampling can take form in interviews, observations, and archival data analysis (Strauss, 1987). In addition, theoretical sampling should always be done with theoretical sensitivity (thinking in theoretical terms) (Glaser & Strauss, 1967), which refer to the process of always relating the result and data collecting process to the focal existing and emerging theory. Theoretical sensitivity is build up cumulatively as theoretical sampling progress.

Even when the family firm for the given case has been determined, the respondents/groups as sources of data need to be selected carefully. The respondents to be selected for theoretical sampling must correspond to their theoretical relevance. In other words, the data source should be selected based on the lead obtained from codes, regardless if it is established or provisional; this is also keeping in mind the scope of this study, which is the family firm network (e.g. siblings, family managers, and suppliers). In addition, "in research carried out for discovering theory, the [researcher] cannot cite the number and types of groups from which he collected data until the research is completed" (Glaser & Strauss, 1967, p. 50). The study concludes data collection when theoretical saturation for the established categories is reached. Theoretical saturation refers to the moment when no additional data are useful where the researcher can develop properties of the focal category (Glaser & Strauss, 1967); this means saturation can occur to one category

but not another. However, time and money will also be considered for the concluding of theoretical sampling for practicality.

Finally, it is important to mention that since theoretical sampling require simultaneous data collection and analysis, the combined model will be developed during theoretical sampling. For developing the combined model for each case, when analysing for categories via coding and memoing, the constant comparative method is used as a rule of thumb (Glaser & Strauss, 1967). The four stages of constant comparative method include (1) comparing incidents applicable to each category, (2) integrating categories and their properties, (3) delimiting the theory, and (4) writing the theory. First, the comparison of incidents for each category assures that each category is mentioned or occurs multiple times in the data. Second, the integration of categories and their properties helps build a dense interconnected theory. Third, the delimiting of theory (in the level of the theory itself and categories) ensures that the theory is not out of scope. And lastly, in writing the theory, the memos are sorted and collated, based on the category, to provide illustration of the theory.

Interview protocol

When the cases were selected, it is important to determine the interviewees. The most important criteria in selecting the interviewees is their involvement in the decision-making process of the technological adoption. For data source triangulation, it is preferred that each case include interviewees who are family members and non-family members; this is to reduce personal biases from the family members.

As previously mentioned, theoretical sampling requires simultaneous data collection and analysis, and one of the main data collection methods are interviews. The interviews with the interviewees range between 1 to 1.5. Due diligence (company and individual profile of the interviewees) is done before interviewing the family firms to prevent miscommunication and reluctance to answer questions. While the interviewers may ask questions that are predetermined (according to the known categories, Figure 10, as part of theoretical sampling), improvisation of questions are used to uncover unexplored categories; this is consistent with the exploratory nature of this research (abductive method). In addition, all interviews are done by more than one person. While one person acts as the interviewer, the other acts as the observer. The role of the interviewer is asking the questions, while the role of the observer is to observe the mannerisms and keep note on body language or possible biases; this triangulation of interviewers serve to reduce as much interviewing bias as possible. At the end of the interview, the theoretical saturation is assessed by the interviewers. Should additional interviews be needed, the researchers would ask for referrals for the next interviewees from the current interviewee. This is because connections to the family firm executives are very limited.

Stage 3: Comparing cases for similarities and differences in patterns

The outcome of the first two stages would be a theoretical model for each of the different cases. It is very likely that, since the different cases revolves around different family firms, the outcome of the grounded constructed theories would be distinct with one another. This research stage attempts to answer the sub research question (4) *“What are the difference and similarities among the patterns of critical junctures from the studied cases?”*. This part of the research is in the post-theoretical sampling phase. No more data is collected, and using the resulting categories and hypotheses from the developed cases, the difference and similar patterns of codes are analysed.

While it is understood that the historical institutionalism approach does not focus on generalization (Thelen, 1999), it is important to understand, within the specific industrial context which components of the grounded theoretical models are similar or different with each other. This is because the context of this research is in the level of the industry. Thus, comparison between cases within the same industry and technology would increase validation of the framework. In addition, a comparison between the cases would also help suggest further categories to consider for subsequent studies.

Stage 4: Case Formulation

The last stage is the case formulation stage. The case formulation is a narrative description of the family firms' adoption of discontinuous technology specific to the sheet metal fabrication in Southeast-Asia. The formulated case is the product of all the previous phases. A narrated formulated case should provide the

explicit differentiation as to the specificity of the analysis. The case formulation stage also serves to present to the readers of how to interpret the analysis, and as a guide to subsequent studies using the methodology and basic concepts used in this study. The presentation from this part would be in the managerial implication section of this paper.

Findings

To reiterate, the general research question of this study is: What is the critical juncture pattern of the path dependent adoption of discontinuous technology within family firms. The findings section serves to elaborate on the discontinuous technologies and family firms studied in this research; this section will answer the sub research question (1) What is the path dependent adopted discontinuous technology that will be the focal phenomena? In addition this section will describe the found categories using the grounded theory methods.

The Discontinuous Technology

As mentioned in the methodology, the first stage of this study is to define the focal path and select the cases to study. To do this, the first step was to define which discontinuous technology(s) should be studied. As previously mentioned, the collaborating machine tool supplier company had multiple discontinuous technology portfolio. To describe the sheet metal industry, the suitable analogy to use is the Japanese paper origami. However, instead of papers, the industry revolves around metal sheets. Thus, some typical manufacturing processes in the sheet metal industry include: (1) Design (blueprinting), (2) Cutting, (3) Bending, (4) Welding, and (5) Polishing. Thus, instead of cutting and folding papers, the industry cuts and folds sheet metals. However, it was found that, among all other manufacturing processes, only sheet metal cutting had multiple discontinuous technology that can perform the same process within our context. These discontinuous technologies include punching, CO2 lasers, and fiber laser machines.

The most basic way to explain how the punching and laser machines work is by first discussing the input and output of these machines. The primary input for the machines are metal sheets with varying material, length, width, and height (thickness). The second input for the machines are drawing designs that have been designed using a software. The accompanying inputs are the electricity, tools for the punching machines, CO2 for the CO2 laser machines, Nozzles for all the laser machines, and etc (explaining the remainder of the inputs is outside the context of this study). To put it simply, the output of the machines are metal sheets that have been cut according to the drawings. To achieve the same output, a company can use either punching, CO2 laser, or fiber laser machines.

As previously mentioned, Tushman and Anderson (1986) defined technological discontinuity as an order of magnitude improvement in the maximum achievable price vs performance frontier of an industry. Based on industry expert opinions (the executive of supplier company and the CEO of one of their customers) from the preliminary interview, it was determined that one of the most important measure of performance is the speed of completing an order, and the benchmark of a performance is to produce a quantity of 100 metal sheets. It is also important to note that the time taken to complete an order is divided into the machine running time and the administration time; thus, the total time taken to complete an order is the sum of the two. In sum, the performance measure that is used in this research to define the discontinuity of the technologies is the speed to produce a quantity of 100 metal sheets, where the shorter the time is better.

While the performance measure has been defined, to show that the punching, CO2 laser, and fiber laser technologies are indeed discontinuous, the output job-type needs to be classified further. This is because the parameters to which the sheet metal experts determine to use either laser machines or punching machines are numerous. One of the classification criteria that was used to determine the discontinuity of the technology is to look at the output's variability and cutting length measures. Variability refers to how many types of shapes does the output drawing should have and cutting length refers to how much cutting length (or surface areas of the shapes) that needs to be cut. The example of output as well as classification of the jobs can be seen in Figure 12. It is important to note that the most important job types that are present in the industry are job types B and D. This is because jobs with low cutting length is very rare, as it

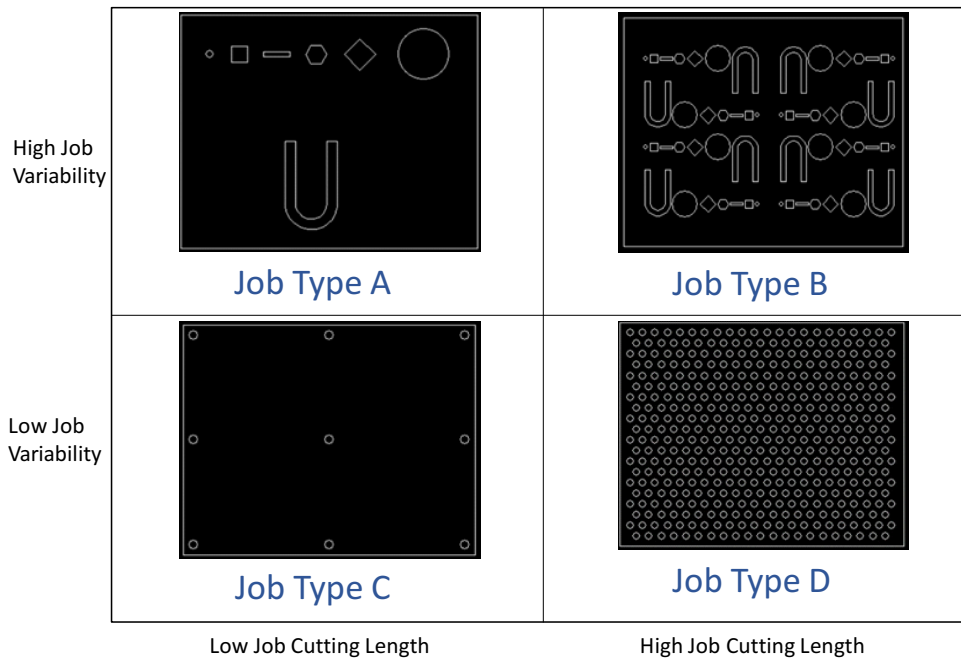


Figure 12. Sheet metal output job types by variability and cutting length.

will be very inefficient and expensive to produce.

Based on the classification seen in Figure 12, test runs were done in one of the supplier's customer's factory. For all the tests, the sheet metal inputs were standardized to have a height (thickness) of 2mm, width of 2438 mm, and length of 1219 mm. The different machines that were used can be seen in Table 5. In Table 5, it could be seen that for every technology there are two additional incremental technology improvements on top of the first row and different discontinuous technologies for each column. Based on the supplier's archival data, sequentially, the technologies were invented in the order from the left (punching) to the right column (fiber laser). With this being said, it was still possible that discontinuous technologies were developed concurrent with the incremental ones. This means, it is possible that the first generation of fiber laser was invented before the third generation of the CO2 Laser. This is because while

	Discontinues Technology		
	Punching	CO2 Laser	Fiber Laser
Series (incremental)	Punching 1 st Generation	CO2 Laser 1 st Generation	Fiber Laser 1 st Generation
	Punching 2 nd Generation	CO2 Laser 2 nd Generation	Fiber Laser 2 nd Generation
	Punching 3 rd Generation	CO2 Laser 3 rd Generation	Fiber Laser 3 rd Generation

Table 4. Incremental and discontinuous technology list for sheet metal cutting

a family firm had adopted a new technology, it may still use the previous best technology (for reasons other than speed, e.g. cutting quality and ease of use).

To show the discontinuity of the technology, this study replicated the performance measurement compared to the previous best analysis, like as seen in Figure 9. The comparison over previous best analysis of the different machines for job types A, B, C, and D. can be seen in Figure 13. The X axis of the figure lists the technologies in the order of technological improvement from the first generation punching machine to the third generation fiber laser machine. To clarify further the following premises would be an example of how to read the figure: (1) for the case of the 2nd generation punching machine, the 1st generation punching machine was the previous best technology, which is an incremental improvement and (2) for the case of the 1st CO2 Laser machine, the 3rd generation of punching machine was the previous best technology, which is a discontinuous improvement. Additionally, the Y axis is the percent of improvement compared the previous best technology. Based on Figure 13, we define in this research discontinuity as more than 40% improvement; this is relative to the incremental improvements that were approximately 10%.

Based on Figure 13, it could be seen that the laser machines improve performances only for job types A, B, and C, but not D. In fact, it could be seen for job type D, the supposedly discontinuous transition between the 3rd generation punching machines and the 1st CO2 laser machines discontinuously worsen the performance measure. And since, as previously mentioned, job types B and D are the most commonly encountered job types in the industry, family firms in SEA still had a reason to keep the punching machines on top of the new laser machines. In addition, the more discontinuous technological improvement for job type B are the transitions between the 3rd generation punching machines and the 1st CO2 laser machines, as well as the transition between the 3rd generation CO2 laser machines and the 2nd generation fiber laser machines. Because of this, and information from the supplier, a lot of the machine tool buyers transition from the CO2 laser machines to the 2nd generation fiber machines instead of the 1st generation.

One of the information that was not obtainable was the performance measurement using conventional machines (non-automated) before the first punching machine technology. The reason for this is because the company that we collaborated with did not have the conventional machines ready to use; most of these machines were used before the 1970s, thus it is reasonable for the factories to not have these

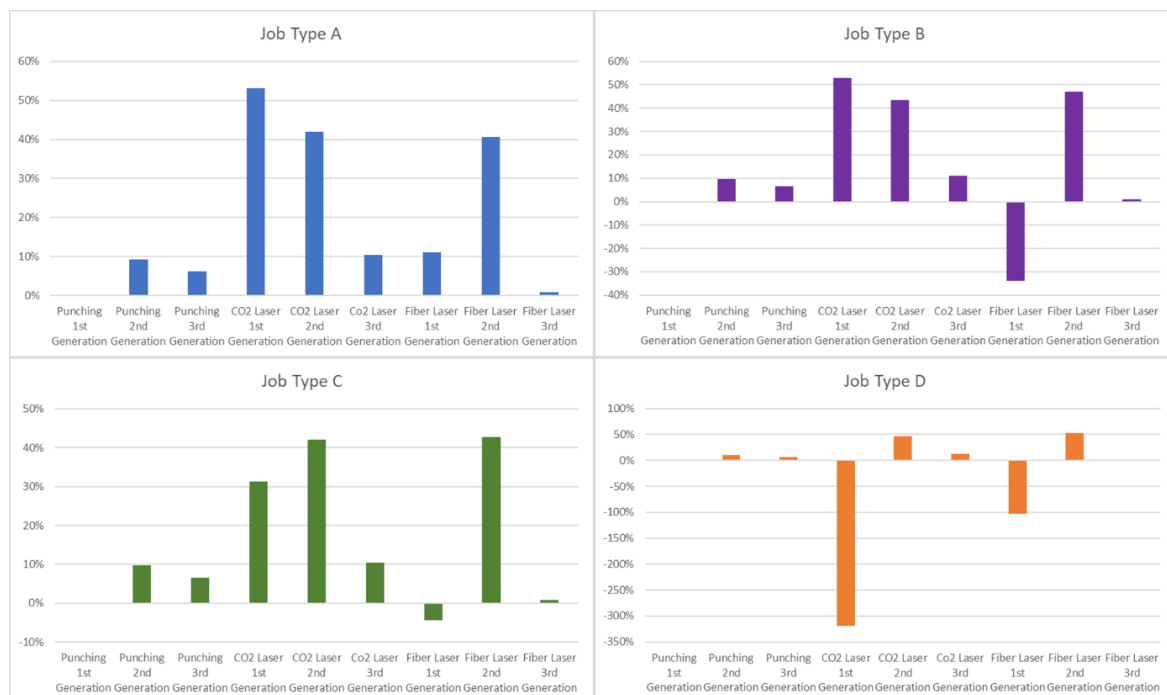


Figure 13. Technological discontinuity analysis; comparison over previous best for jobs A, B, C, and D. The Y axis is the percentage improvement over the previous best technology and the X axis of the figure lists the technologies in the order of technological improvement from the first generation punching machine to the third generation fiber laser machine.

conventional machines anymore. However, from the interviews with the family firms that had owned conventional machines before, they admitted that the adopted punching machines could improve their output by more than 100%. This is primarily because the conventional machines were operated using bare hands, while the punching technologies are automated.

Therefore, based on the testimonies from the interviewees, and the test results, it could be said that at least for job types A, B, and C, the punching, CO2 laser, and fiber laser technologies are discontinuous technologies (above 40% improvement in performance over previous best). In addition, for job type D, the punching machine is discontinuous relative to the conventional non-automated machines.

To end the section about the discontinuous technology. It is important to note that there are three supplier brands that are mentioned in this study (supplier 1, supplier 2, and supplier 3). This is because, based on the interview with the collaborating supplier, there are less than 5 brands that are dominant in the machine tool market in Southeast-Asia.

The Studied Cases

Studied Cases	Interviewees	Relation to the company	Countries	Family Member Status	Generation of Interviewees	Founder's Nuclear Family
Company 1	Mr. K	President and founder	Country 1	Yes	1st	Yes
	Mr. Q	General manager		No	-	-
Company 2	Mr. A	Son of founder		Yes	2nd	Yes
	Mr. Z	Cousin of Mr. A		Yes	2nd	No
Company 3	Mr. X	First son of founder	Country 2	Yes	2nd	Yes
	Mr. P	Son of Mr. X		Yes	3rd	Yes
	Mr. V	Good friend of Mr. X		No	-	-
Company 4	Mr. Y	Younger brother of founder		Yes	1st	Yes
Company 5	Mr. W	Trusted General manager of founder		No	-	-
	Mr. R	Trusted General manager of founder (Successor of Mr. W)		No	-	-

Table 5. Information about the cases and the interviewees

The authors of this paper used the social and formal connections from the collaborating supplier of machine tools to get access to the family owners and managers of their customers in the sheet metal industry. The reason the connections are important is because a lot of the family owners hold executive positions and had very little time to spend on interviews; the social and formal connections helped overcome the scepticism and lack of urgency of the interviews of the potential interviewees. Additional connections with the interviewees were obtained through referrals from other interviewees. At the end, we identified eight of the biggest and most important family firms that were customers to the collaborating supplier; however, information regarding how big and important they are to the supplier is confidential. Unfortunately, out of the eight family firms that were contacted, only five responded and were willing to be interviewed. It is important to note that all the responding companies came from only two countries from Southeast-Asia; since the interviewees are high contributing customers to our collaborating supplier, the name of the countries are hidden.

As mentioned in the methodology section, the family firm that fits the case profile will be those whom had already had the previous technology before adopting the newer discontinuous technology. In addition, the family firms selected must have both the ability and willingness of family particularistic behaviour (De Massis, Kotlar, et al., 2014). It was also mentioned, as illustrated Figure 8, that the issue network theory would clarify the issue streams and decision-making process that were involved in the adoption of the discontinuous technologies. Therefore, this section would provide elaborations on the studied cases in terms of the information about the interviewees, the background of the company, the path dependent discontinuous technology, and the issue network model that lead to the adoption of the discontinuous

technology. The overview of the interviewees and their ability and willingness to show family particularistic behaviour can be seen in **Error! Reference source not found.** and **Error! Reference source not found.** respectively.

The following sub-sections show how each of the family firms that were designated as case studies show

Legend		
Stage of Family Ownership (Gomez-Mejia, 2007)	Ownership	Management
Stage 1	Founding Family	Founding Family
Stage 1.5 (own addition)	Founding Family	Non-Family
Stage 2	Non-Founding Extended Family	Non-Founding Extended Family
Stage 3	Non-Founding Extended Family	Non-Family

Table 6. Stage of family ownership (Gomez-Mejia et al., 2007). Note that stage 1.5 is the addition of the authors of this research because the literature by Gomez-Mejia et al. (2007) did include a family stage that has founding family as the owner and non-family as the management; the purpose for this addition is purely for descriptive purposes in the context of this research.

family particularistic behaviour and are path dependant on a specific discontinuous technology. In addition, the following sub-sections also clarify on who the interviewees were in relation to the family firms.

Company 1

Company 1 is an overseas Chinese family company in the sheet metal fabrication industry in country 1. Based on **Error! Reference source not found.**, there were two interviewees from company 1. The first interviewee, Mr. K is the founder (1st generation), president of the company, and family member of company 1. Company 1 itself is a subsidiary of a holding company. Although Mr. K is the founder of company 1, he is the 2nd generation relative to the founder of the holding company, which is his father. Mr. K himself is the second child of three children, and he was born in the 1950s. He has one elder sister and one younger brother. However, none of his siblings were part of company 1. The second interviewee from company 1 is Mr. Q, and he is a non-family member who was hired to be the general manager of company 1 by Mr. K's family when setting up the company. Mr. Q was formerly a general manager for a multinational company and was hired by Mr. K because of his technical expertise in operations management. For company 1, the interviews were done separately in the language of country 1. The interviews were then translated into English for further analysis. In addition, the interviews were done with a third-party observer from the side of the interviewer. Both interviews were done in January of 2018.

Cases				Company 1	Company 2	Company 3	Company 4	Company 5
Country				Country 1	Country 1	Country 2	Country 2	Country 2
Generations				1	2	3	1	2
Measure of	Categories	Sub-Categories	Effect					
Ability	family ownership	control concentration	+	Evident	Evident	Evident	Evident	Evident
		"relationalness" of agency contracts	+	Evident	Evident	Evident	Evident	Evident
		presence of other institutional or private large block share holders	-	Not Evident	Not Evident	Not Evident	Not Evident	Not Evident
		control risk	-	Not Evident	Not Evident	Not Evident	Not Evident	Not Evident
		stage of family ownership	-	Stage 1.5	Stage 2	Stage 1	Stage 2	Stage 1
	family governance	family CEO is also chairman	+	No	Yes	Yes	Yes	Yes
		agency cost control mechanisms	-	Not Evident	Not Evident	Not Evident	Not Evident	Not Evident
		number and ratio of independent directors to the board	-	1 to 1	Unknown	Unknown	Unknown	Unknown
	family management	family member is CEO	+	No	Yes	Yes	Yes	Yes
		CEO tenure (Long: More than 10 years)	+	Long	Long	Long	Long	Long
		board's monitoring of top management	-	Evident	Evident	Not Evident	Evident	Evident
		management team size (Number of people)	-	Small (3)	Small (2)	Small (3)	Small (4)	Small
		number of non-family managers involved	-	Low (2)	Low (0)	Low	Low (0)	Low
		criticality of family firm's dependence on non-family managers	-	High (operations)	Low	Low	Low	Low
Willingness	intention toward transgenerational succession	intention toward transgenerational succession	+	Hesitant	High	High	Low	High
		family's and owner's desire or preference to retain the control of the firm	+	High	High	High	High	High
		CEO has a successor in mind	+	Not Evident	Evident	Evident	Not Evident	Evident
		willingness to give up family control	-	Low	Low	Low	Unknown	Low
	family's commitment to the business	the family has considered "going public"	-	Not Evident	Not Evident	Not Evident	Not Evident	Not Evident
		family's commitment to the business	+	High	High	High	High	High
		owner-manager's commitment to the organization (measured by financial stake)	+	High	High	Unknown	High	High
		investment of time and effort in the family business by the future leader	+	Not Evident	High	High	Not Evident	High
	other vairables	percentage of the owner's wealth invested in the business	+	High	High	High	High	High
		preservation of socioemotional wealth	+	High	High	High	Unknown	High
		altruism among family members	+	Evident	Unknown	Unknown	Evident	Unknown

Table 7. Ability and willingness on family particularistic behaviour of the studied cases. The red boxes indicate the irregularities of the family firm regarding that specific sub-category. Irregularities refer to all of the sub-category feature of a family firm that are neither a double positive nor double negative.

Based on the interviews with Mr. K and Mr. Q, the ability and willingness on the family particularistic behaviour of company 1 can be seen in **Error! Reference source not found.** Throughout this section, the discussion about the ability and willingness on showing family firm particularistic behaviour would focus upon the categories in which the firm possess irregularities. In this case, irregularities refer to categories that are **neither** a double negative nor double positive; for example, if control concentration has a positive effect on family ownership and the company does not show the presence of control concentration

(negative), thus the family firm shows an irregularity in this sub-category. The irregularities are indicated by the red boxes in **Error! Reference source not found.**

Based on **Error! Reference source not found.**, it could be seen that in company 1 has four irregularities for ability and three for willingness on showing family particularistic behaviours in family firms. The first one is the fact that the CEO or general manager (Mr. Q) of the company is not also the chairman (Mr. K). This also leads to the second irregularity that the CEO or general manager is not a family member. However, since this is the case, Mr. K needed to always monitor the decisions made by Mr. Q which leads to the third irregularity of the board's monitoring the top management. Because Mr. Q oversees the operations of the company, Mr. K highly depends on the non-family manager (Mr. Q), which is the fourth irregularity. Based on the interview, both Mr. K and Mr. Q confirmed that while Mr. K was the president of the company, Mr. Q had a large say on the decision making of the company. This shows that Mr. Q, a non-family member, acts as a balancing power to Mr. K, a family member, when it comes to major decisions. Thus, in terms of stage of family ownership, company 1 did not fit the listed profiles provided by (Gómez-Mejía et al., 2007). Because of that the authors of this paper added the stage 1.5 to as a description (Table 7).

In terms of succession, based on the interviews with both Mr. K and Mr. Q, it was apparent that at the time of interview, they were still searching for potential successors. They said that they tried to find successors from the family but could not find a successor that both have interest in the sheet metal industry and have the capability to lead the firm. They said that the sheet metal industry is a very technical field and the successor needs to have passion in the industry, like Mr. Q. This succession problem leads to the fifth, sixth, and seventh irregularities, which is the fact that Mr. K is hesitant in passing his business to the next generation of family members. He also said that it is possible that the business may be passed on to non-family member professionals or outsiders in the future. However, aside from the hierarchy structure and succession problem, company 1 possess all the other qualities (sub-categories) of showing family particularistic behaviour. Thus, company 1 was suitable to be a case to study.

Based on the interview, it was uncovered that company 1 had adopted the punching and CO2 laser, and the fiber laser technologies from supplier 1. Mr. K and Mr. Q stated that the punching and CO2 laser machines were adopted at the founding of the company (in the late 1990s). However, the fiber laser machine was adopted only at 2017, which is one year before the interview. In addition, it was observed that company 1 was a loyal customer of supplier 1. It was said that even when the other suppliers had offered them new discontinuous technologies, company 1 did not ever adopt new technologies from other suppliers. For example, multiple suppliers offered fiber laser machines to company 1, when company only had punching and CO2 laser machines; this is on top of the fact that supplier 1 did not sell fiber laser machines yet to Southeast-Asia. However, at the end company 1 adopted the fiber laser by supplier 1. The observed discontinuous technology path dependence was company 1's path dependence on punching and CO2 laser machines of supplier 1. It is important to notice that the brand of the technology is part of the dependant path. Thus, there are two critical juncture that can be studied in this case, which are the critical juncture from nothing to adopting punching and CO2 laser technologies, and then the critical juncture to fiber laser technologies. While the former critical juncture shapes the dependant path, the former breaks the dependant path.

Company 2

Company 2 is an overseas Chinese family company in the sheet metal fabrication industry in country 1. The company was founded in the mid-1970s and entered the sheet metal industry in the mid-1990s. As can be seen in **Error! Reference source not found.**, there were two interviewees from company two, namely Mr. A and Mr. Z. At the time of the interview, company 2 was run by the 2nd generation family member. The founder of the company was Mr. A's father, and Mr. A, the first interviewee, was the president (owner) of company 2 by the time of the interview. It is important to note that Mr. A was the eldest son in the family. The second interviewee was Mr. Z, and he was the general manager of company 2. Mr. Z is the cousin of Mr. A and was the nephew of the founder; this makes Mr. Z part of the extended family of the family firm. The interview was done in the language of country 1 by one interviewer and one observer. The interview was later translated to English, in which transcription and analysis were done. Both interviews were done separately in January 2018.

Based on the interviews of Mr. A and Mr. Z, the family particularistic behaviour of company 2 could be seen in **Error! Reference source not found.** It could be seen that company 2 has only one irregularity, which is in the board's monitoring of top management. This is because even though Mr. Z, the general manager is part of a family member, Mr. A still needs to have a formal monitoring and reporting structure to ensure the performance of Mr. Z. One of the reasons for this is because before having Mr. Z as the general manager of company 2, Mr. A recruited a non-family member professional. Based on the interview of both Mr. A and Mr. Z, this professional did not get along with the family members and lost the trust of the family members. At the end, Mr. A decided to employ only family members as the top management, Mr. Z as the general manager and his youngest sister as the financial manager. Thus, the current family firm stage of company 2 is stage 2 (Table 7). Based on the interviews, they said that the hierarchy status within the family firm was that Mr. Z could not make a major decision without getting the approval of Mr. A; this shows a top-down management style from Mr. A. Thus, in terms of family ownership governance and management, company 2 leans very much on family member dominance within the company.

In terms of succession, it was uncovered that both Mr. A and Mr. Z were very keen in keeping the family firm ownership and management within the family. Although at the time of the interview a lot of the subsequent generation family members of the family firm were still young, there was one of Mr. A's nephew that was being groomed to become the next successor of the family firm. Based on the interview with Mr. A and Mr. Z, it was said that the nephew had high commitment to the business. Their plan was to have him progress from the bottom of the management hierarchy level to the top; this plan was initiated to develop the maturity of the potential successor. Unfortunately, the researchers could not get an interview from the potential successor; this is a potential bias from the point of view of the older generation in regards of the commitment of the successor. Nevertheless, based on the interview of Mr. A and Mr. Z, it could be said that company 2 has a high willingness to show family particularistic behaviour. The high willingness and ability to show family particularistic behaviour of company 2 makes it suitable to be a case study.

Based on the interview, it was uncovered that when company 2 was founded in the mid-1970s, they only had conventional machines. Only when they entered the sheet metal industry in the 1990s had they adopted the punching technology from supplier 1. Mr. A said that they actually knew about the technology at the time, but the founder, Mr A.'s father did not want to take the risk to adopt the technology. However, in the 1990s, Mr. A took the managerial position, and soon after his father passed away. After his father's passing, Mr. A adopted the punching technology from supplier 1 in the mid-1990s when they entered the sheet metal industry. After adopting the punching technology, it took Mr. A one decade to adopt the CO2 laser technology.

From this history it could be observed that that the initial technological path dependence of company 2 was on the conventional machines. The critical juncture studied for this case is the transition from the conventional machine technology to the punching machine technology, in which also becomes a its own path for a decade.

Company 3

Company 3 is an overseas Chinese family company in the sheet metal fabrication industry in country 2. The company was founded in the 1940s and entered the sheet metal industry in the mid-1990s. There were three interviewees for company 3, which were Mr. X, Mr. P and Mr V. The founder of the company is the father of Mr. X, but since his father passed away, Mr. X had been the president of the company. Mr X is the eldest son of the founder and this makes him the 2nd generation of the nuclear founding family. The second interviewee was Mr. P who is the son of Mr. X, which makes him the 3rd generation of the nuclear founding family. At the time of the interview, he was one of the managers of company 3. The third interviewee was Mr. V, who was a close friend of Mr. X when Mr. X decided to adopt his first punching machine. The interview with Mr. V was necessary for the triangulation of sources regarding the adoption of company 3's first punching machine to avoid personal bias from Mr. X. However, Mr. V himself was never in company 3, and he was also not a family member; but a few years after company 3's adoption of their first punching machine, Mr. V decided to work for supplier 1. Thus, at the time of interview Mr. V was the employee of supplier 1. It is important to note that Mr. V's friendship with Mr. X started when they were young, Mr. V

had even met with the founder of company 3 before his passing. The three interviews were done separately in December 2017 and January 2018. The interviews were done, transcribed, and analysed in English.

Based on the interviews, of Mr. X, Mr. P, and Mr. V, the ability and willingness on showing family particularistic behaviour of company 3 can be seen in **Error! Reference source not found..** Based on the collected data, company 3 had the least irregularity of ability and willingness on showing family particularistic behaviour. At the moment of interview, the owner and manager of company 3 were all family members. Mr. X acted as the president (owner) and CEO of the company, while his younger brother was also a manager in the company. Recently, his son, Mr. P joined the company to manage the operations of the company. From the interview it was uncovered that the management style of the company was top-down, with Mr. X on the top. However, they said that for big decisions, the family members usually hold family meetings, but they admitted that Mr. X was still the shot caller. Given this hierarchy of family management and ownership, the family stage of company 3 was stage 1 (Table 7).

In the perspective of Mr. X, the company's successor is Mr. P, his son. Mr. X said that as he himself was a successor of the family firm, he wanted the next generation to also succeed the company. Although Mr. P was already in the company, Mr. P said that his siblings were not interested to be part of the family firm. Nevertheless, this means that at least one of the subsequent generation family member is highly committed to be the successor of the company. Thus, it could be said that company 3 has the willingness to show family particularistic behaviour. In accordance to the ability, the structure and management style of the company that are family centric and top down, and willingness of company 3 to show family particularistic behaviour, it could be said that company 3 is suitable to be a case study.

Based on the interview, it was uncovered that company 3 had adopted the punching and CO2 laser technologies. While company 3 was founded on the 1970s, it took almost two decade for them to actually adopt the first punching machine. At the time, the father of Mr. X was still in the company as the president and CEO. It was uncovered from the interviews that Mr.X's father was a person who did not believe in the adoption of discontinuous technology. Only after Mr. X joined the company that he started to consider adopting the punching machine. However, once Mr. X managed to convince his father about the increased productivity of the new technology, his father allowed company 3 to adopt the punching machine technology. The role of Mr. V was in the determination of the brand for the punching machine technology that would set them in a path of being loyal to supplier 1. From the history of company 3, it could be said that they had a path dependency conventional machines. The path was then altered with the introduction of the punching machine, and this was the critical juncture studied in this research. Subsequently, Mr. X became path dependant to the punching technology of supplier 1.

Company 4

Company 4 is an overseas Chinese company in one of the manufacturing industries in country 2. The difference between company 4 and the other previously interviewed company was that company 4 used their sheet metal processing machines for their internal use. This means that the products that they sell to their customers are further down the supply chain. There was one person interviewed from company 4, Mr. Y, who is the younger brother of the founder. The founder of company 4 was the eldest brother of Mr. Y, and the company was founded in the mid-1970s. Later, they adopted their first punching machine in the 1990s. Since Mr. Y is within the same generation as the founder, he is considered to be the 1st generation in the company. The interview was done in January 2018 and was done in English and the native language of Mr. Y. Due to confidentiality, the interview with Mr. Y was not transcribed, but summarized instead.

Based on Table 8 it could be seen that company 4 had three irregularities in terms of ability and willingness on family particularistic behaviours. From the interview, it was uncovered that the owners and management of company 4 were all family members. Mr. Y said that his father had three nuclear families. Combined, there were five children from the three nuclear families, one of which (the eldest) was the founder of the company. As of the time of the interview, all the siblings occupied executive positions and were divided based on the divisions. The two older brothers of Mr. Y came from the same nuclear family, while the other two brothers came from the remaining nuclear families. Based on how Mr. Y talked, it can be observed that his level of trust is highest to the brothers from his own nuclear family and lower for the brothers from the other nuclear families. The result of this is the monitoring of top management, an

irregularity. In addition, it was also implied that the recruiting of the brothers from outside his nuclear family was a gesture of altruism by the founder. However, by the time of the interview, the founder of the company had already retired. Thus, the stage of family ownership of company 4 is stage 2.

When asked about the potential successors of the company 4, Mr. Y indicated that the executives of company 4 had high interest in keeping the family firm within the family. In fact, in the past he had offered the children of his siblings to become the successor of the company. However, Mr. Y said that none of the next generation family members had the interest to run the family firm, and at the time of the interview they were already in their 30s and 40s. Like company 1, Mr. Y indicated that he and his brothers were opening the possibility and preparing to have non-family members or outsiders to succeed the company. Nevertheless, they implied that should one day a family member would like to join the family firm, they might reconsider. With the ownership and management of the company under the family members, and their still existing willingness to keep the family firm within the reach of the family, company 4 shows family particularistic behaviour. Thus, company 4 is suitable for this study.

Based on the interview, it was uncovered that company 4 had adopted the punching technology from supplier 1. Later, they adopted the CO2 laser technology from supplier 3 instead of supplier 1. When they were the customer of supplier 1 for the punching machine technology, they got offers from other suppliers for the new technologies. However, because of certain factors (explained in subsequent sections), they lost their appeal towards supplier 1 and started opening possibilities for other suppliers. This was when supplier 3 introduced to the CO2 laser technology. Until the time of the interview, company 4 became a loyal customer to supplier 3; in fact, Mr. Y said that he rejected offers from supplier 1 multiple times and would not quote them anymore for subsequent purchases. In this study, we view the loyalty towards CO2 laser machines of supplier 3 as a path dependence and the previous affinity to supplier 1's punching machine as another. The transitions from conventional machines to punching machines and from punching machines to CO2 laser machines serve as critical junctures studied in this research.

Company 5

Company 5 was an overseas Chinese family company in the sheet metal fabrication industry in country 2. However, their expansion went to two other countries in Asia. There were two interviewees from this company. Different from the previously discussed family firms, both interviewees from company 5 were non-family members that previously had worked as general managers in company 5. Thus, while the findings from this interview suffers no personal bias from the family members, it might not reveal information that would only be known by family members. The company was founded in the 1970s but entered the sheet metal industry only in the 1980s. Mr. W (the first interviewee) was hired by Mr. B (the family member) in the mid-1980s and worked in company 5 starting from a machine programmer, sales, and finally the general manager. Mr. W worked in company 5 for eight years. Then, in the 1990s, Mr. R (the second interviewee) was promoted to become the general manager of the company until finally company 5 was acquired by another company in the 2010s; however, this is only for company 5's subsidiary in country 2. The interviews were done, transcribed, and analysed in English. The two interviews were done in January 2018.

The information on Table 8 about company 5 reflects the state of the company as of 2018. The founder of the company was the father of Mr. B. In the 1980s, Mr. B graduated from his studies and entered the company as the manager of the company. Afterwards, Mr. B's younger sister entered the company to become the accounting manager of the family firm. The reason the history is told in the perspective of Mr. B was because both interviewees indicated that Mr. B was the eldest son and the dominant decision maker of the family firm. Between the 1980s and 1990s, Mr. B. understood the lack of competence for operations within his family, and thus he hired a professional non-family member, Mr. W, as the general manager of the company. The situation remained the same until the 2000s when Mr. R became the manager of the company. However, as Mr. B's children (one son and one daughter) entered the working age, he wanted to shift back the management of company 5 to the family. This was shown by the fact that he appointed his own children to be the manager of the company after the acquisition of his subsidiary in country 2. Previously, between the 1990s and 2000, he had had two of his younger brothers to join the family firm. However, because of differences in major opinions, Mr. B's younger brothers ended up leaving the family firm. Based on the interview with Mr. W and Mr. R, it was said that Mr. B was very dominant in terms of

making the decisions; regardless the manager's status as a family member or not, he wanted to monitor the performance of the managers. This leads to the irregularity of the ability to show family firm particularistic behaviour the boards monitoring of the top management. In addition, it could be inferred from this history that company 5 went from family ownership stage 1.5 to stage 1.

In terms of succession, Mr. W and Mr. R said that it has been the ambition of Mr. B to have his children as the successor of the company. This is evident by Mr. B's grooming of both of his children; the son was first appointed to become the manager of one of his subsidiaries. However, based on the interviews, it was revealed that Mr. B noticed that his son did not have a high commitment to become the successor of the company. They said that Mr. B's son seemed to not be given a choice by his father. On the contrary, Mr. B's daughter seemed to be the one who showed high commitment to be the successor of the company. Thus, it could be said that company 5 has the willingness to show family particularistic behaviour. The ability and willingness of company 5 on showing family particularistic behaviour makes them suitable as a case study.

In terms of discontinuous technology, it was uncovered that company 5 had adopted punching technology and CO2 laser from supplier 2. Based on the interviews, it was uncovered that Mr. B is a risk seeking person. Based on the company's history, he is a customer that has a high bargaining power to the suppliers because when he adopts new technologies, he purchases multiple machines at the same time to press prices. Because the company's ability to purchase machines are limited, it would take time for him to purchase additional machines, making him path dependant to a type of machine from a supplier. With that being said, the critical juncture being studied in this research is that of the transition between the punching technology to the first CO2 laser technology from supplier 2. This is also because this specific transition was witnessed first-hand by the interviewees.

Grounded Categories

As mentioned in the methodology, according to the grounded theory, categories are distinctions from dimensionalizing a concept, and the properties of the categories are the most concrete features that can be conceptualized (e.g. idea, thing, person, event, activity, relation) (Strauss, 1987). As explained in the methodology, the grounded theory was accompanied with the abductive method of research. With this research design, the researchers alternated between using known core categories and finding new core categories as well as sub-categories.

The research started with two concepts, which were the critical juncture and issue network concepts. After data collection and continuous analysis of family firm's adoption of discontinuous technology and their path dependence, it was found that there were three major categories which were the meta, internal, and external categories. First, the meta category refers to the higher-level categories that could include other categories. Second, the internal categories refer to the categories that are related with the actors within the family firm. Third, the external categories refer to the categories that are related to the external business environment of the family firm.

The Meta Categories

The in the start of the research, it was assumed that the critical juncture (Figure 10 and Table 1) was in the macro level of analysis. The sub-categories of the critical juncture were the permissive condition, productive condition, outcome, end of critical juncture, and the mechanisms of reproduction. After data collection and analysis, it was found that for each of the cases, the sub-categories could be determined only after all the other major categories had been identified and mapped. This means that the content of a sub-category of critical juncture (e.g. critical antecedent), can include sub-categories of an internal category (e.g. family hierarchy); with this example, the critical antecedent of the critical juncture is the family hierarchy (an internal category). Thus, it was concluded that the critical juncture categories are part of the meta categories.

Other meta categories were the issue network categories (Figure 10). From the research design, it was said that the issue network theories served to be the micro level of analysis. This means that the issue network categories delineate the decision-making dynamics, including the issues and relationship among decisions, that leads to the adoption of discontinuous technology. It was assumed (Figure 8) that some of the

decisions within the issue streams could be part of the content of the critical juncture categories. This is best illustrated with the premise: the permissive condition (a critical juncture category) includes decisions A and B that fulfil a specific issue (issue network category). However, it was found that the sub-categories of the internal or external category could be part of the content of one of the issue network categories. For example, the family hierarchy (internal category) or competitor (external category) could be an issue (issue network category) that could lead to a decision (category). Thus, it was concluded that the issue network categories are part of the meta categories.

The elaboration on the found critical junctures as well as relationship between the categories will be elaborated further in the analysis section. The analysis will be accompanied by examples from the case studies.

The Internal Categories

The internal categories refer to the categories that are related with the actors within the family firm that were observed to affect the adoption of the discontinuous technologies. As shown in Figure 14, the sub-categories internal categories include: (1) Confucianism belief within overseas Chinese in Southeast-Asia (SEA), (2) decision making hierarchy, (3) education of family members, (4) management style, and (5) succession planning.

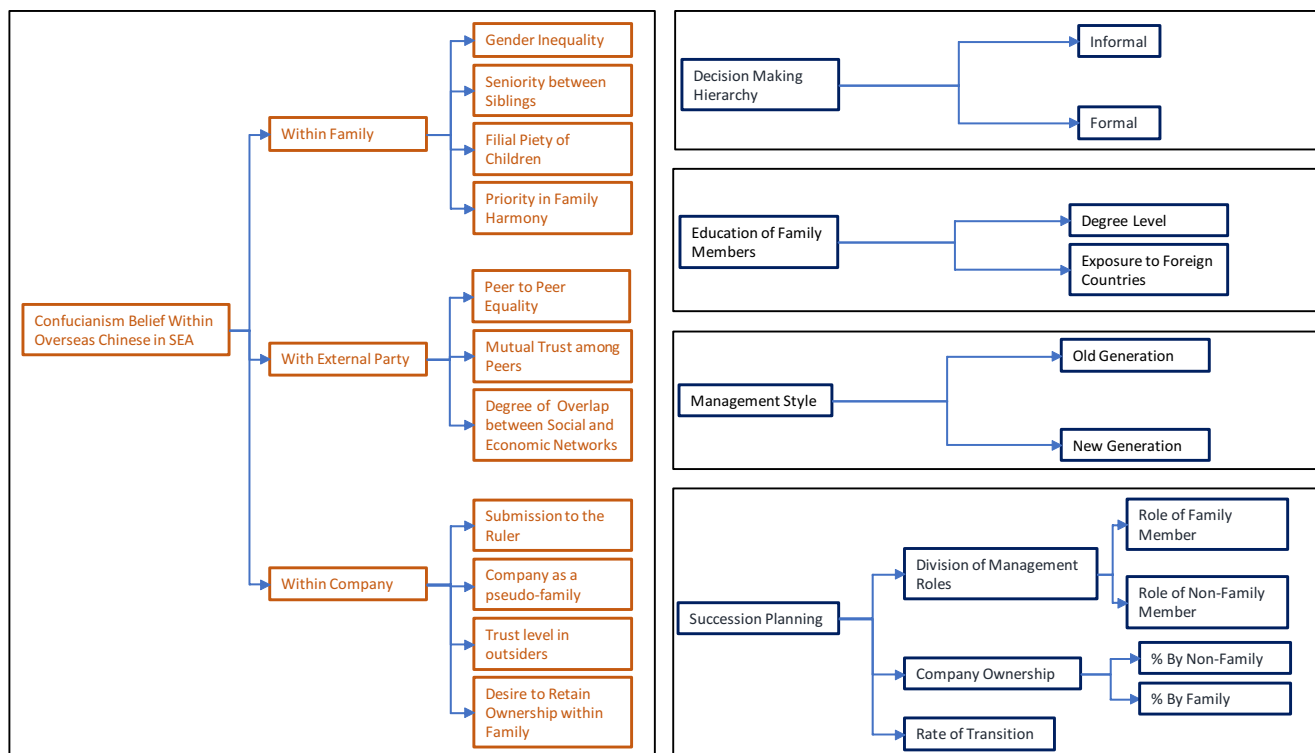


Figure 14. Internal categories

Confucianism Belief within Overseas Chinese in Southeast-Asia

Within the open coding process of this research, it was found that sayings from the teachings of Confucianism were mentioned multiple times by the interviewees. However, it was only after finishing the whole interview process did the researchers notice that Confucianism beliefs were the overarching influence on multiple decisions that lead to the adoption of a discontinuous technology. Thus, this section serves to clarify the Confucianism sub-categories based on the observation within the case studies and existing literature (to better frame the categories).

Confucianism is a form of philosophical teaching and ideology that has been present among the population in East Asia and overseas Chinese in Southeast-Asia (De Bary, 1991; Tu, 1998a, 1998b). Consistent with the summary of the Confucianism teachings by Tan & Siew (2001) and Yan & Sorenson (2006), the

Confucianism beliefs observed within the case studies can be divided into three sub-categories: (1) Confucianism within the family, (2) with external party, and (3) within the company. First, Confucianism influence within the family could be further specified into gender inequality, seniority between siblings, filial piety of children, and priority in family harmony. Second, Confucianism influence with external party can be further specified into peer to peer equality, mutual trust among peers and degree of overlap between social and economic networks. And third, Confucianism influence within the company can be further specified into submission to the ruler, treating company as a pseudo family, trust level in outsiders and desire to retain ownership within company.

It is within the belief of Confucianism, that the husband should always be respected by the wife within a family (Tu, 1998a, 1998b; Yan & Sorenson, 2006); this means that in terms of authority, it is highly likely that the males are prioritized over the females. In addition, Seniority between siblings refers to how the younger sibling needs to respect the elder sibling; this gives priority of authority to the eldest. Moreover, filial piety is a sense of obligation that the children of a Confucianism family needs to always respect and submit to their parents. In return, it is the obligation of the parents to make sure that their children are well off. Lastly Confucianism beliefs revolves around the notion that family is the basic unit of society (Yan & Sorenson, 2006); thus, it is the priority of the family to keep the family harmony. In our case, priority in family harmony can mean that certain individuals are pressured to sacrifice their needs for the sake of the family's name.

Confucianism with external party starts with the notion that the only equality recognized by Confucianism belief is among peers (Tu, 1998a, 1998b; Yan & Sorenson, 2006). In addition, it was observed that social networks among families adopting Confucianism are built on mutual trust among peers. It was also observed that the concept of reciprocity is highly regarded as the basis of friendship and trust. In addition, it is important to note that families adopting Confucianism belief often mix their social networks with their economic or business networks. This means that social reciprocity can extend to economic reciprocity.

Confucianism beliefs are also present within the company. The old Confucianism teachings were originally intended to induce the respect of the citizens to their rulers; hence, part of the teaching of Confucianism is the submission to the ruler (Tu, 1998b; Yan & Sorenson, 2006). In the case for family firms, the rulers are the executives and owners of the family firms; this reflects the top-down management of most Confucianism led family firms. In addition, family firms also treat the company as a pseudo-family. As previously mentioned, it is common that family firms have high mutual trust with their employees; so much so that they are treated like one of the family members (pseudo-family)(Tan & Siew, 2001). However, while this is so, family firms still draw a clear line between their family members and outsiders. The term 'outsider' refers to those whom the family members do not treat as part of their focal family or pseudo-family member. Like other family firm theories (e.g. Gómez-Mejía et al., 2007), Confucianism belief also encourages family firms to retain ownership within the family; this is also due to the low trust level with outsiders.

Other Internal Categories

In addition to the Confucianism beliefs, other internal categories include decision making hierarchy, education of family members, management style, and succession planning.

It is observed that within the studied cases, there are two types of decision making hierarchy types, which are informal and formal. Formal decision-making hierarchy refers to what roles and positions that the family firm assign to their family members and non-family members on paper. This is usually the hierarchy that is presented formally to outsiders. However, it is also observed that the informal hierarchy may be different with the formal hierarchy. For example, it could be that the formal hierarchy is a bottom up decision-making structure, while informally it is top-down in the perspective of the family members. In fact, it is possible that the decision maker is not even within the formal structure of the company (e.g. the retired founder and father).

The education of family members is also considered an internal category. This is explained further in the subsequent section, but it is important to note that the education of family members serve to balance the influence of Confucianism within a family firm. For the interviewees, the Confucianism beliefs are usually regarded as the 'old fashioned' views. It is believed that the term 'old fashioned' came from their

referencing from their parent's teachings. It is important to note that most of the parents of the family member interviewees were not highly educated (no more than high school level education). It was assumed that the management philosophy adopted by the parents of the interviewees were partly based on Confucianism and intuition. To contrast this, all of the interviewees in the case studies have at least a college degree; the proper higher-level education and their philosophy as what is regarded as the 'new fashioned' view. In addition, it was also observed that family members, like Mr. K (company 1), Mr. A (company 2), and Mr. X (company 3) went to America and Europe for their higher degree studies. It was observed that they made references to foreign (relative to their country) styles of management as part of the way they run their respective firms. Thus, the degree level and exposure to foreign countries of the family members or pseudo-family members can be classified as an internal category.

From the studied cases, it was observed that the family members distinguish themselves with the management style of their predecessors. Given the decision-making hierarchy of the family firm, it is important to classify the management style of the firm based on who makes the decisions. An overseas Chinese family firm succession model by Tan & Siew (2001) proposed that one of the key success factors for family firm succession is the leadership quality of the next generation; this is under the assumption that the successor implements his own management style to the family firm. However, it is possible that while succession has taken place, the management style still follows the predecessor's due to the informal decision-making hierarchy. Thus, the management style (old or new) of the family firm is considered as an internal sub-category.

Consistent with other studies within the family firm literature (De Massis, Kotlar, et al., 2014; Gómez-Mejía et al., 2007), the studied cases also showed succession planning. In this research, succession planning is defined as the planning of the future ownership and management structure of the family firm for when the current generation of family members are unable to fulfil their respective commitments (e.g. pass away or retire). The succession planning sub-section is divided further into the division of management roles, company ownership, and rate of transition. While the formal decision-making hierarchy indicates about the reporting structure, the division of management roles indicates what type of roles (e.g. accounting or operations) of the family members and non-family members. The company ownership indicates who owns the company; this sub-category serves the same purpose with the ability of family firms to show family particularistic behaviour (De Massis, Kotlar, et al., 2014). In addition, the rate of transition refers to how fast does the management style change from the old to the new generation type of management style.

The External Categories

For all the interviews about the adoption of discontinuous technology of the respective cases, there were external categories that affected the decisions of the decision-makers. The external categories are divided into two sub-categories, economic and technological.

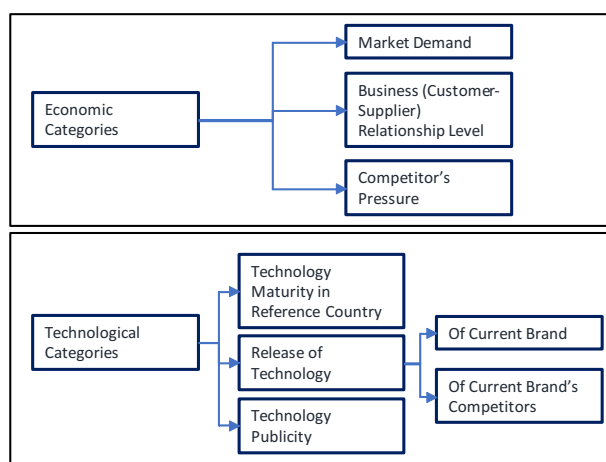


Figure 15. External categories

The economic categories can be divided further into market demand, business (customer-supplier) relationship level and competitor's pressure. For the studied cases, one of the most important reasons for the adoption of discontinuous technology is due to the market demand. In this context, market demand refers to the increase in demand for jobs with existing types of jobs and new type of jobs. For existing type of jobs, the demand creates a pressure to increase productivity that can be fulfilled by the discontinuous technology; most of the pressure comes in the form of quantity. For new type of jobs, the demand creates pressure for jobs that could not be fulfilled unless the firm adopts a new technology. For example, punching machines would never be feasible for jobs that has high complexity level and needs high precision (e.g. complex shapes for the semi-conductor industry). An important external factor for the adoption of discontinuous technology is business (customer-supplier) relationship level, which refers to the relationship between the family firm and their suppliers, as well as customers. Business relationship level includes formal customer relationships like technical and administrative services. Another important reason for the adoption of discontinuous technology is competitor's pressure. Competitor's pressure refers to how much the family firm needs to adapt to their competitors. Based on the interviews, it was determined that the sheet metal industry in countries 1 and 2 are highly competitive. This means that each family firm is highly sensitive in terms of what kind of technologies that has been adopted by other family firms.

The technological categories can be divided further into technology maturity in reference country, release of technology, and technology publicity. Based on the interviews, it was found that all the decision makers from the study cases admitted to waiting for technological maturity in their respective reference country. For example, company 1 tries to wait until the discontinuous technology is matured in Europe before taking the risk to adopt the technology in Southeast-Asia. The reason for this waiting is that they are unwilling to take the risk of adopting a technology that might not work for their case. This is consistent with the argument that family firms are conservative in R&D investment than their non-family counter-parts (Chrisman & Patel, 2012). In addition, the release of technology in the region, although it might seem like truism, affects the adoption of discontinuous technology; this is with the distinction of whether the technology is released by the current supplier's brand or the competitor supplier's brand. Because, the fact that the release of technology is by the current supplier or not can affect a family firm's adoption of that technology. Lastly, once the technology is released, the way and intensity of the publicity for the technology can affect family firm's adoption of that technology. Based on the interviews, the most mentioned ways of publicizing the technology to the family firms by the suppliers were through international expositions and invitation to visit the HQ of the supplier.

Analysis

To summarize, the findings section of this research described the studied cases and the found categories from the interviews, answering the first sub research question. The analysis section serves to answer the sub research questions: (2) What are the components from both the critical juncture and issue network frameworks within the context of the focal phenomena, (3) What is the integration structure between the components from both the critical juncture, discontinuous technological adoption within family firms and issue network frameworks using the historical institutionalism view; the answer of this sub research question is a proposed theoretical framework based on empirical data collection (4) What is the difference and similarities among the patterns of critical junctures from the studied cases. To answer sub research questions (2), the issue network and critical juncture analysis will be elaborated. Next, to answer sub research question (3), the proposed theoretical model, derived from the critical juncture analysis will be elaborated. Finally the similarities and differences among the patterns of critical junctures will be discussed based on the proposed theoretical model

Issue Network Analysis

As mentioned in the conceptual framework section, the organizational path dependence takes the macro view and the issue network model takes the micro view towards discontinuous technology adoption. Simply, the micro view serves to help answer the question: *when does a company adopt a technology? Which decision is it? And by whom?* As previously mentioned, without the micro view, the critical juncture

theory would be too abstract for practical data collection and analysis. This sub-section shows how the issue networks were used to analyse the series of decisions and issues that lead to the adoption of a discontinuous technology. While the issue network analysis was done for all the family firm cases, only that of company 3 would be elaborated as an illustration. Should all cases be to be elaborated, the information would be too lengthy and complex for the scope of this paper, not to mention its redundancy. However, the issue network analysis of each company would be attached in the appendix of this paper.

As can be seen in Figure 7, Figure 10, and Table 2, the issue network can be divided into issue streams. Then, within the issue streams there are decisions and linkages. The linkages could then be further divided into precursive, lateral and sequential linkages. The issue network analysis was done by first defining the case, the discontinuous technology, and the critical juncture to study. Then, the issue stream analysis was done. The issue network analysis for company 3 can be seen in **Figure 1**Figure 16. However, since the issue network view in Figure 16 does not describe events chronologically, the event map for company 3 is presented in Figure 17 to solve this problem. The event map in Figure 17 shows not only the chronological order of the decisions, but also some milestone time points (P) relative to the adoption of technology.

To describe the issue network of company 3 (Figure 16), it is important to start from the decision to adopt Confucianism belief by the founder in their family, which is the starting point of the event map in Figure 17. As previously mentioned, the founder of company 3 was the father of both Mr. X and his brother. Based on the interviews, it seemed that the founder made the decision to adopt and follow the Confucianism belief of keeping the family firm within the family. Because of this decision, an issue came up which was the need for a successor. To solve this issue, the founder encouraged his sons to join the company. Given the sense of obligation from Confucianism beliefs to submit to parents (filial piety), the sons of the founder decided to join the company.

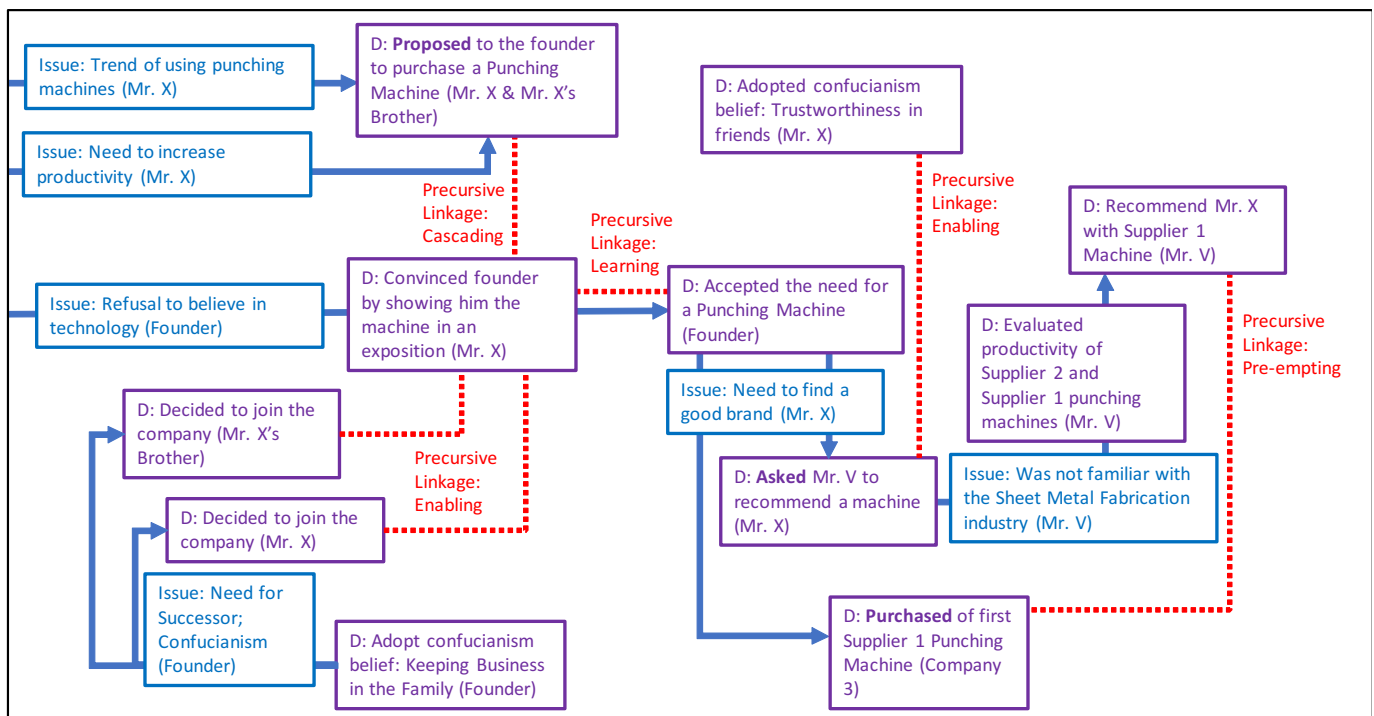


Figure 16. The issue network of company 3. The blue boxes and arrows represent the issue streams; the parentheses describe the owner of the issue. The purple boxes represent the decisions; the parentheses describe the decision maker. The dotted red lines represent the linkages between the decisions.

The joining of Mr. X and his brother to the company changed the dynamic of decision making within the company from a sole decision maker (the founder) to multiple decision makers (the family). At that time, it was uncovered that the founder was still the informal ultimate decision maker, while the children were supporting decision makers. Mr. X figured out that there were two economic issues for company 3, which were the need to follow the trend of using punching machines and the need to increase productivity. Thus,

Mr. X and his brother proposed to the founder to purchase a punching machine; at the time, the punching machines had been released in the European market for a few years. However, it was uncovered that the founder was path dependent to conventional machines. The founder grew the business using his own tacit knowledge and competency. The founder did not believe that adopting a punching machine could help the business further, and this was an issue (refusal to believe in technology).

To solve this issue, Mr X and his brother took the founder to multiple expositions to see the punching machines themselves; the expositions were provided for the customers by the suppliers (technology publicity). It is important to note that the decision to convince the founder on the punching technology was enabled by the decisions of the sons to join the company (precursive linkages: enabling) and was a follow up of the decision to propose the machine to begin with (precursive linkage: cascading). Although it took some time, at last the founder accepted the need for a punching machine (precursive linkage: learning) after being given enough information. However, it is important to note that based on the interview, the acceptance of the founder to listen to their children took a large mental effort from the founder; this was an easy decision for him.

After the sons had a green light from the father, the decision bottle neck to adopt the technology was solved. However, Mr. X was not aware of which punching machine brand that they should buy (Issue: need to find a good brand). Before elaborating on how to solve this issue, it is important to note that earlier in their life, Mr. X befriended Mr. V; at the time, Mr. V was not even in the sheet metal industry. Earlier, it was mentioned that the family of Mr. X decided to adopt Confucianism belief, and this include the mutual trust among peers. Because Mr. X trusted Mr. V in terms of his information gathering competence, Mr. V, a part of his social network became part of his economic network (overlap between economic and social network). However, since Mr. V was not familiar with the sheet metal fabrication industry (issue), he decided to evaluate the productivity of supplier 1 and 2 by himself. The familiarity issue was solved with the decision to recommend supplier 1 to Mr. X by Mr. V. This decision became the pre-emptive precursive linkage for Mr. X and company 3 to finally purchase their first punching machine from supplier 1. This concludes the issue network analysis for the adoption of the punching machine for company 3. Following the issue network analysis is the critical juncture analysis in the subsequent section

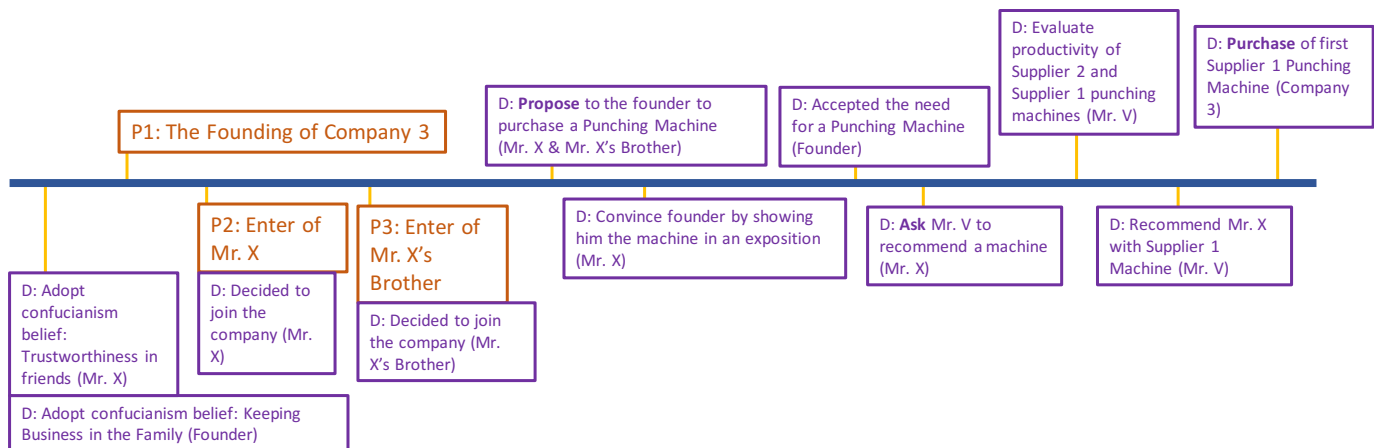


Figure 17. Event map of company 3. It is important to note that the symbol P represents an event at a point of time and the purple boxes with the D symbol refers to the specific decisions that were made. Within each decision box, the actors in the parentheses are the maker of the respective decisions.

Critical Juncture Analysis

Up to this point, all the foundational components necessary to do the critical juncture analysis had been elaborated, which were the discontinuous technology, the suitability of the family firm, the categories and issue network. As elaborated in the literature review and meta category, the sub-categories of the critical juncture include the permissive condition, productive condition, outcome, end of critical juncture, and the mechanisms of reproduction. The critical juncture analysis for all the studied cases can be seen in Table 9. In this section, the critical juncture analysis process will be shown using the study case of company 3. This is because the issue network analysis of company 3 had been elaborated in the previous section.

The Critical Juncture of Company 3

As previously mentioned, the critical juncture studied for company 3 is that between the path dependence of conventional technology and punching technology. Before the critical juncture started, the founder was path dependent on conventional technologies. To start the critical juncture analysis is to look at the permissive condition. As previously mentioned, the permissive condition serves as the triggering or the opening from the previous dependant path. From the issue network analysis, one could have been mistaken that the permissive condition was when the brothers proposed to the founder to purchase a punching machine. However, the permissive condition was when the founder finally accepted the need for punching machine, since if he had not change his mind, the previous path would be unchanged. While the

Cases	Transition	Critical Antecedent	Permissive Condition	Productive Condition	Outcome	End of Critical Juncture	Mechanisms of Reproduction
Company 1	From Molding to Punching and CO2 Laser Cutting Technology	Decision Making Hierarchy: Balanced Deciding Power Between Manager and Board; Education of Family Members: German Educated	Issue: Chinese Culture of Not Wanting to lose Face (Company 1's Holding Company)	D: Agreed to have Supplier 1 as Supplier (Mr. K, Mr. F)	D: Purchase of first Supplier 1 Punching Machine (Company 1); D: Purchase of first Supplier 1 CO2 Laser Machine (Company 1)		Confucianism: Good Social-Business Relationship with Supplier 1; Relatively Best Customer Relationship Management (Supplier 1)
	From Punching and CO2 Laser Cutting Technology to Fiber Laser Cutting Technology	Decision Making Hierarchy: Balanced Deciding Power Between Manager and Board (Non-IV); Release of Technology: Supplier 1 Fiber Laser Machine; Succession Planning: Opening up for non-family member; No potential successors (Uncertain)	Issue: External pressure; competitors already using Fiber Lasers (Supplier 1 and other brands)	D: Decision to maintain trustful relations with Supplier 1 (Company 1)	D: Purchase first Supplier 1 Fiber Laser Machine (Company 1)		Confucianism: Good Social-Business Relationship with Supplier 1; D: Purchase of Supplier 1's Platform, a small ERP for production planning control (Company 1); also to attract potential professionals to succeed the company
Company 2	From Conventional Technology to Punching Technology	Decision Making Hierarchy: Top Down by Mr. A; Release of Technology: Supplier 1 Punching Machine; Education of Family Members: University Degree in the US (Mr. A); Management Style: New	D: Became the Director/CEO of Company 2 (Mr. A) – Mr. A's Father Passed away	D: Put trust in Company 1's Supplier 1 Punching Machines (Company 2)	D: Purchase of first Supplier 1 Punching Machine (Company 2)		Confucianism: Good Social-Business Relationship with Supplier 1; Confucianism: Good Social-Business Relationship with Company 1; Relatively Best Customer Relationship Management (Supplier 1)
Company 3	From Conventional Technology to Punching Technology	Decision Making Hierarchy: Top Down by Mr. X and his brother; Release of Technology: Supplier 1 Punching Machine; Education of Family Members: University Degree (Mr. X); Management Style: Old/New	D: Accepted the need for a Punching Machine (Founder)	D: Recommended Mr. X with Supplier 1 Machine (Mr. Y)	D: Purchase of first Supplier 1 Punching Machine (Company 3)		Confucianism: Good Social-Business Relationship with Supplier 1; Relatively Best Customer Relationship Management (Supplier 1); Confucianism with External Party: Having Mr. Y, a good friend, as a Supplier 1 employee (Company 3)
Company 4	From Conventional Technology to Punching Technology	Decision Making Hierarchy: Top Down by Mr. Y; Release of Technology: Supplier 1 Punching Machine; Education of Family Members: Highly Educated (Mr. Y and his brothers)	Issue: Supplier 1 provided bad service (Mr. Y)	Issue: Supplier 1 has better technology and presentation than Supplier 2 (Mr. Y)	D: Purchase of first Supplier 1 Punching Machine (Company 4)		Excellent Technology Performance
	From Punching Technology to CO2 Laser Cutting Technology	Decision Making Hierarchy: Top Down by Mr. Y; Release of Technology: Supplier 1 and Supplier 3 Laser CO2 Machines; D: Became social friends with Mr. Y (Supplier 3 Director)	D: Accepted the need to purchase a punching machine (Mr. Y)	D: Give and pay for Mr. Y a tour in Supplier 3 HQ and meet the founder of Supplier 3 (Supplier 3 Director)	D: Purchase of first Supplier 3 CO2 Laser Machine (Company 4)		Confucianism: Good Social-Business Relationship with Supplier 3
Company 5	From Punching Technology to CO2 Laser Cutting Technology	Decision Making Hierarchy: Top Down by Mr. B; Release of Technology: Supplier 2 CO2 Machine; Issue: Personal preference of wanting to be one of the first to own a new technology (Mr. B); D: Develop a good relationship with Mr. B (Supplier 2 Sales Person); Education Level: College Degree (Mr. B)	Issue: High human error cost; difficult machine operation (Company 5)	D: Give and pay for Mr. B a tour Supplier 2 HQ (Supplier 2 Sales person); D: Have his non-family manager check the machine (Mr. B)	D: Purchase of first Supplier 2 CO2 Laser Machine (Company 5)		Confucianism: Good Social-Business Relationship with Supplier 2 (Mr. B)

Table 8. Critical juncture analysis of the studied cases. The content of the critical juncture categories may be more than one and is separated by the semicolon symbol. The letter D refers to a particular decision and the word issue refers to an issue stream. The parentheses refer to either a decision maker or the owner of an issue.

green-light given by the founder gave the chance for Mr. X and his brother to adopt a new technology, the permissive condition alone could not determine whether a new path would be formed. This is because it

was still possible that, in spite of the acceptance of the founder, the brothers decided not to adopt the punching technology. Such an event would lead to the failure of the critical juncture.

As discussed in the literature review, while the start of critical juncture was marked with the permissive condition, the critical juncture could not have started without the productive condition. The productive condition was the force that shaped the direction of the subsequent path. In this analysis, the direction of the path could be framed as either the type or the brand of the discontinuous technology. However, it came to the understanding of the researchers that alternative discontinuous technologies were absent in the Southeast-Asian market at the time. Hence, the direction of the path was defined as the brand of the discontinuous technology. This is also important because, within the industry, different types of brand could result in different mechanisms of reproduction or self-reinforcing mechanism. For example, there was a shared knowledge by the interviewed family firms that suppliers from certain countries ensure lower product life than other countries. Should a family firm choose the path of discontinuous technology from such suppliers, they might have a weaker self-reinforcing mechanism that would reduce the time gap between the previous and the subsequent critical juncture. In the case of company 3, the productive condition was the decision to recommend Mr. X with the punching machine of supplier 1 by Mr. V. Here, the Confucianism belief with external party of Mr. X came to play by having the mutual trust with Mr. V.

As elaborated in the literature review section, the end of the critical juncture is marked by the end of the permissive condition. In this case, the permissive condition was the acceptance of the need to purchase the punching machine. Thus, the decision to purchase the punching machine ended the critical juncture by fulfilling the need for the machine. However, it was apparent for this case that the outcome of the critical juncture was the same with the end of the critical juncture.

What came after the outcome of the critical juncture was the mechanism of reproduction. As discussed in the literature review, the mechanisms of reproduction explain why a particular juncture is 'critical'. To be critical, the outcome of the causal factors need to stay after the factors themselves disappear (Soifer, 2012); otherwise, the self-reinforcing mechanism following the critical juncture do not have anything to reinforce. In this case, the mechanisms of reproduction were the good social-business relationship with supplier 1, the relatively best customer relationship management with supplier 1, and maintaining a good relationship with Mr. V whom were recruited by supplier 1. Here, good social-business relationship with supplier 1 refers to the sincere social relationship between Mr. X and the employees of supplier 1, beyond the topic of business. However, Mr. X said that the good social-business relationship was complemented by supplier 1's relatively best customer relationship management. Here, customer relationship management refers to the technical and business relationship (e.g. technical service and customer service). The term 'relatively best' refers to the attitude of Mr. X that all the suppliers could not provide an outstandingly satisfactory customer service, however, supplier 1 was the best among the worse. In addition, because Mr. X had a strong relationship with Mr. V, the presence of Mr. V in Supplier 1's office helped ensured Mr. X's belief that supplier 1 was his best alternative through insider insights. The mechanisms of reproduction were uncovered when Mr. X was asked about the reasons he never switched brands.

It is important now that the critical antecedents are discussed. The critical antecedents are the factors needed to enable the permissive condition, productive condition, and mechanisms of reproduction to arise. The first critical antecedent in this critical juncture is the decision-making hierarchy in company 3. It was uncovered in the beginning that the founder was the informal decision maker, while Mr. X and his brother were the formal decision makers. Informally, Mr. X had more authority compared to his brother. The interviews indicated that Mr. X was the one who proposed the idea of adopting the punching machine and received no resistance from his brother. However, due to the resistance from the founder, the proposal could not be fulfilled. But when the founder accepted the need for the punching machine, Mr. X became the highest authority figure in the decision-making hierarchy of the company, as the resistance from the founder was gone. The second critical antecedent is the release of the punching technology itself. Because without the release of the technology, the technology would not have been adopted. The third critical antecedent was the high-level education of Mr. X. It was uncovered that the state of open-mindedness towards technology that lead to the discovery and proposal of the discontinuous technology was due to the high-level of education of Mr. X. The fourth was the presence of both the old management style and

the new management style. Like the first antecedent, the change in decision making hierarchy led to the change in management style (from less innovative to more innovative) supported the company to be open towards new technology. The analysis of the critical antecedent concluded the critical juncture analysis for company 3.

The Proposed Critical Juncture Theoretical Framework

The previous sub-section elaborated on how the critical juncture analysis was done and determined all the critical juncture sub-categories of company 3. The researchers did the same analysis with all the studied cases as could be seen in Table 9, to answer the sub research question (2). Subsequently, to answer sub-research question (3) and (4), the grounded critical juncture theoretical model of family firm's path dependence on discontinuous technology was formulated and proposed, as can be seen in Figure 18. The nature of the proposed model is inclusive, meaning that it includes and maps the relationship of all the found categories from the case studies. The inclusivity of this model ignores the frequency of appearance of each category within the studied cases. However, the frequency of appearance will be discussed further in the following paragraphs to illustrate the similarities and differences between the case studies.

The first thing to notice from the framework is the red arrow streams on the very top of the box. This arrow represents the temporal sequence of the critical juncture, which include the pre-critical juncture phase, the start of the critical juncture, end of critical juncture, and finally the phase when the self-reinforcing mechanisms are seeded, followed by the lock in. Next, as mentioned in the findings section, it is important to notice that the critical juncture categories lie more on the macro level among the other categories. The critical antecedents contain multiple categories, while the productive, permissive conditions, and outcome are affected by the issue networks. The mechanisms of reproduction, on the other hand, are affected by some other categories but this will be further elaborated.

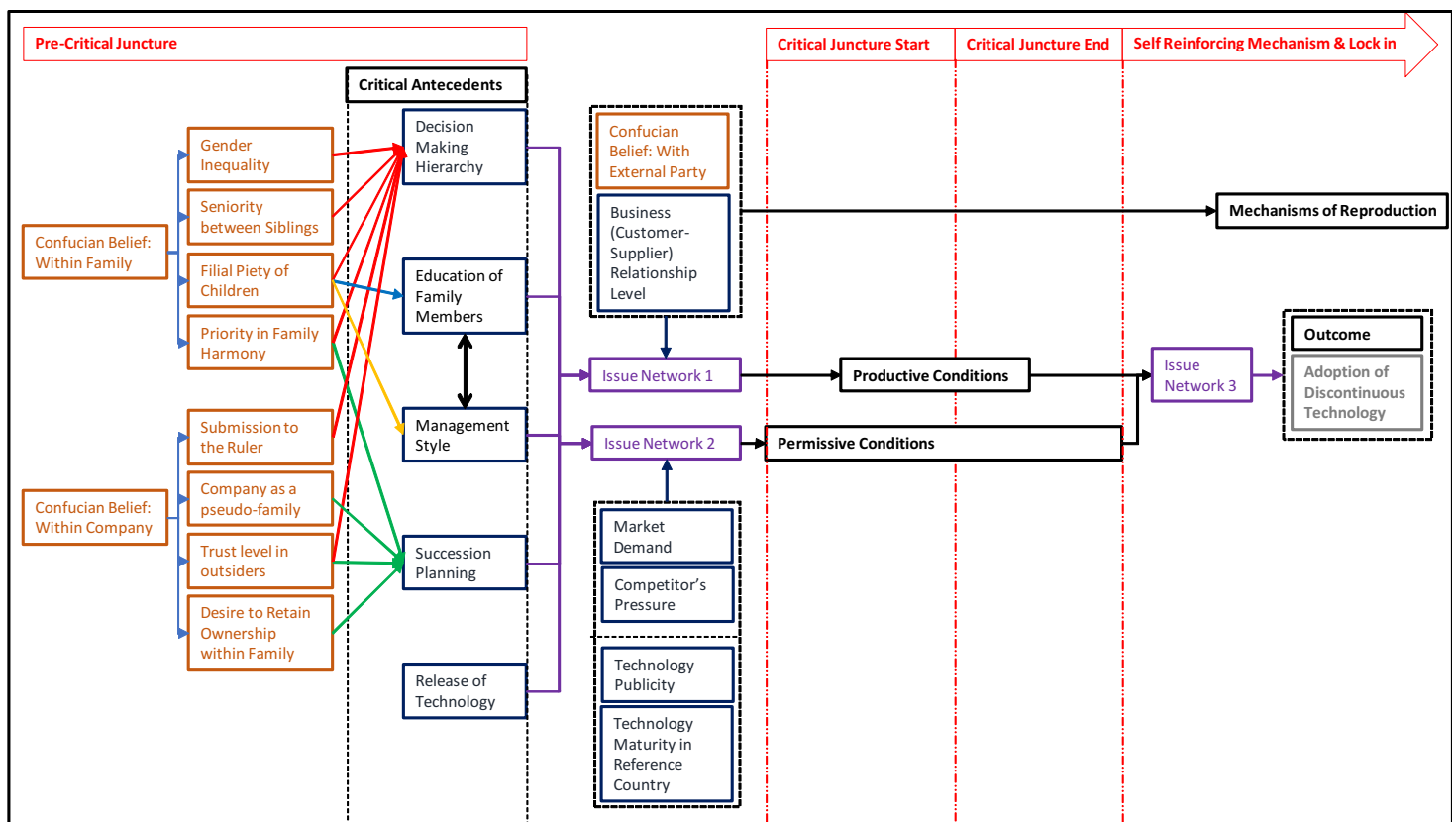


Figure 18. The Grounded Critical Juncture Theoretical Framework

Pre-Critical Juncture Phase

During the pre-critical juncture phase, it could be seen that there are three major sub categories which are the critical antecedents, the Confucian belief within family and Confucian belief within company. In this model, it could be seen that the decision-making hierarchy, education of family members, management style, succession planning, and release of technology sub-categories had all been part of critical antecedents. With this in mind, it was uncovered that the Confucian beliefs within family and within company affected the critical antecedents.

The first critical antecedent sub-category is the decision hierarchy. The decision hierarchy within the company is a critical antecedent because it affects the family particularistic behaviour of the company. In addition, it could also affect the resisting and enabling factors in the issue network. The decision hierarchy determines whose idea will most likely to be realized or not-realized. For example, should the founder in company 3 not agree with the proposal of the adoption of the punching machine, the permissive condition would not arise. However, if the founder was not the decision maker, but was Mr. X to begin with, then there would not be any resistance towards the proposal. However, the important question here is what determined the decision-making hierarchy to begin with. From the case studies, it was concluded that four out of five of the family firms had top-down management, with only company 1 having a balanced decision-making hierarchy.

The authors of this paper found a pattern that the Confucian belief within the family was reflected in the company hierarchy. Within the family, Confucian teachings suggest that the wife should respect the husband; however, within the observed culture of the studied countries, it became apparent that this teaching provided a basis for a patriarch style of management. Couples with the seniority between siblings, Confucian families prioritize the eldest son or father to be the decision maker within the family, regardless of the quality. This trend was observed in the case studies with the evidence of only company 5 had a woman executive, which was the daughter of Mr. B. In fact, based on the interview, the appointment of the daughter of Mr. B was a back-up plan due to his finding out that his first son was not suitable for an executive position. The rest of the families had the eldest son or/and father leading the company (companies 1, 2, 3, and 4).

In the case that the next generation of successors (the eldest son or other children) do not want to obey the Confucianism rule, the reaction of the family firm will depend on to what degree the parents are willing to enforce the Confucian beliefs. This is because the Confucian belief teaches filial piety of the children and priority in family harmony. This implies that if the parents or old generation demanded the next generation successors to submit to their demand, the next generation would have to do so. Should the next generation not submit to their parents, there would be social punishments. In the studied family firms, the filial piety of the children was observed in companies 2 (Mr. A), 3 (Mr. X), and 5 (Mr.B). The decision makers of the three mentioned companies were all second-generation family members who did not have much choice in joining the family firm. In addition, Mr. B and Mr. A also had their children join the family firm. In contrast, the decision makers in companies 1 and 4 were the first-generation family members and did not force their children into the family firm.

The decision-making hierarchy within the family firm is also affected with the Confucian belief within the company. Once the formal roles of the executives were defined, the 'rulers' of the family firm were defined. Of all the studied cases, the middle and lower management of the company always have to submit to the executives. An interesting trend that was observed in terms of the recruitment of non-family members into the family firm depends on the trust level in outsiders. While there was a case like company 1, where an outsider was appointed as the general manager, there was a case like company 4 where there were no outsider executives within the firm. In addition, there were also cases like companies 2 and 5 who started with having outsiders as family firm executives, only to give back the positions to family members later. It is important to note that the company who had high trust to outsider, company 1, treated the non-family member like a family member. In fact, the interview with Mr. Q (the non-family member of company 1) revealed that he did admit being treated like part of the family by Mr. K. Thus, it could be said that from the studied cases, there are varying level of trust level to outsiders despite the company's adoption of other Confucian belief.

The second critical antecedent sub-category is the education of the family members. Among the five cases, all had the education level of the decision makers as the critical antecedent. It was previously discussed that most of the studied cases had high educated decision makers. It was observed from the cases that all the ideas for the adoption of discontinuous cases come from the highly educated family members. It was inferred that due to the higher level of education, the decision makers became more open towards innovation. In addition, for companies 1 and 2, whom the decision makers were foreign country graduates, Mr. K and Mr. A respectively, they seemed to have higher trust level in outsiders. However, it was uncovered from the interviews that one of the reasons why the decision makers has higher level of education is because of the suggestion of their parents. Thus, the filial piety Confucianism belief had an effect on the education of the family members within the family.

The third critical antecedent sub-category is the management style of the family firm. As discussed in the findings section, the management style of the family firm refers to whether the family firm follows the new or the old generation style of management during the critical juncture. However, when discussing about the management style, one has to consider in who's perspective the new/old management style is being evaluated. In addition, this critical antecedent is not applicable towards companies 1 and 4 whom were still managed by the 1st generation of family members and who had no successor in mind. In contrast, company 2, 3, and 5 were being managed by family members from the 2nd and 3rd generations. The management style of the family firm affects the resisting and enabling factors of the adoption of discontinuous technology alongside the decision-making hierarchy. From the case study of company 3, it could be seen that they had a shift in management style from the founder's old generation (1st generation) to Mr. X's new generation management style once he accepted the need to adopt punching machine. However, in the case of company 2, the old management style of the founder (father of Mr. A) became a resisting factor towards the adoption of the punching machine because he was path dependant on conventional machines. Only after the founder of passed away and Mr. A assumed the executive position did company 2 managed to adopt their first punching machine. In addition, the education level of the family members also affects the management style. In the studied cases, it was observed that all the 2nd generation decision makers that ended up being the new decision makers were all highly educated; this increased their open mindedness towards innovation.

In the perspective of the 3rd generation successors (Mr. A's nephew from company 2, Mr. P from company 3, and Mr. B's son and daughter for company 5), it seemed that their respective companies still adopt the older management style of their parents at the time of the interview. An interesting observation by the observer in the interview with Mr. P, it seemed that Mr. P refers to his father to most of the questions asked about the decision to adopt the discontinuous technologies; it is important to note that the researchers could not get interviews with the other 3rd generation successors of the remaining companies. With this observation, it was inferred that Mr. P had to submit to the decisions of his father, even when the interview with Mr. X inferred otherwise. This not only showed that Mr. X was the informal decision maker, it also showed that filial piety affected the fact that the company adopted the older generation management style, even if Mr. P assumed the role of an executive in company 3. Thus, it could be said that filial piety of the children can affect the management style of the family firm.

The third critical antecedent sub-category is succession planning. As previously mentioned, succession planning is defined as the planning of the future ownership and management structure of the family firm for when the current generation of family members are unable to fulfil their respective commitments (e.g. pass away or retire). Based on the studied cases, succession planning was part of the critical antecedent of only company 1. The case study of company 1 looked at two critical junctures. For the critical juncture towards the potential path dependence of the fiber laser machine, one of the causal factors for Mr. K's adoption of the fiber laser cutting technology was the its compatibility to the ERP platform that was created by supplier 1. This is because the new fiber machines of supplier 1 are equipped with advance machine sensors that could be compatible with the ERP. Mr. K said that he was preparing for the future succession of the company, he assumed that should the family firm be sold to an outsider, he needed to make the firm data driven and transparent. In addition, he said that the increase in transparency of the company through the adoption of the new machines and ERP system might encourage his children to become the successor of the company.

The succession planning of company 1 was observed to be affected by Mr.K's desire to retain ownership within the family and priority in family harmony; this was shown by his hope that his children may still succeed him. However, Mr. K was a person that had shown trust in outsiders before, in contrast to the Confucianism belief of not trusting outsiders. Because of this, he said that he was open to the possibility of selling the company to an outsider, as long as he trusts them (treating the company as a pseudo-family).

The last critical antecedent sub-category was the release of the technology. Based on the archival data from supplier 1, it was apparent that the release of technology in Southeast-Asia usually had a delay of a few years compared in several other reference countries (especially the country of origin of the suppliers). Thus, while it may sound obvious, the fact that the release of technology in Southeast-Asia is a critical antecedent should still be mentioned.

With the critical antecedents having had been elaborated, it is important to mention that the pre-critical juncture phase does not have to happen within a short time-span. The critical antecedents are the pinnacles of all critical historical events that provided all the antecedents required for the critical juncture to start. Thus, it is highly likely that the pre-critical juncture phase happens for a longer timespan than the critical juncture.

The Critical Juncture Phase

Once the critical antecedents are all in place, the permissive condition will mark the start of the critical juncture. The question is now, how does the critical antecedents create the right environment for the permissive condition to arise? The solution to this question is the issue networks from the issue network theory. Unlike the pre-critical juncture phase, the critical juncture phase tends to be shorter than the pre-critical juncture phase. Therefore, the issue network model is suitable to be the micro level view of critical juncture analysis.

The issue networks within this model are divided into issue networks 1, 2, and 3. Issue network 1 leads to the productive condition, issue network 2 leads to the permissive condition, and issue network 3 leads to the outcome from both the permissive and productive conditions. The reason the issue networks were divided was because, based on the case studies, the issue networks that lead to both conditions were affected by different sub-categories. To explain this, the issue network for company 3 is used as an illustration (Figure 16).

The permissive condition of company 3's critical juncture was the decision of the founder to accept the need to purchase their first punching machine. It could be seen in Figure 16 that the issue network (issue network 2) that lead to the permissive condition was started with the issue of the trend of using punching machines and the need to increase productivity. The trend of using punching machines issue falls under the competitor pressure sub-category, while the need to increase productivity issue falls under the market demand sub-category. In addition, the decision of Mr. X to convince his father was in a form of taking him to an exposition, which falls under the technology publicity sub-category. In addition, one of the reason they proposed the technology was because the technology had already matured in their reference country; hence the sub-category. Here, the market demand and competitor pressure are sub-categories that are the causal factors of the start of the issue network. On the other hand, the technology publicity and technology maturity in reference country are the assurance factors that leads to the permissive condition. While the framework fits company 3, the same is also observed in the other cases. In fact, as can be seen in the appendix, the starting point of the issue networks of the other cases also falls under the mentioned causal factors. Some examples include company 1 with the issue of diversifying the market of the company, company 2 and 4 with their issue of increasing market demand, and company 5 with their issue of needing to reduce human error cost. The same could be observed with the assurance factors. For example, companies 1 and 2, in their interview, also claimed that they waited for technological maturity in their reference countries. Companies 4 and 5 were invited by their suppliers to visit the company's headquarters to look at their machines (technology publicity).

The productive condition of company 3's critical juncture was Mr. V's recommendation of the punching machine of supplier 1 to Mr. X. It could be seen that the issue network (issue network 1) that lead to the productive condition was affected by the Confucian belief with external party of Mr.X, specifically his mutual trust with Mr. V. Without the decision to adopt Confucianism's teaching of trusting friends for

economic issues, Mr. V's recommendation would not have shaped the direction of the emerging technological path. The trend of social relationships affecting the productive conditions can also be seen in the critical juncture of companies 1, 2, and 4.

The other sub-category that affects issue network 1 is the business (Customer-Supplier) relationship level, which refers to the relationship between the family firm and their suppliers, as well as customers. Business relationship level includes formal customer relationships like technical and administrative services. The evidence for the effect of this sub-category can be seen primarily in company 4. Mr. Y of company 4 decided to switch suppliers for their adoption of their first CO2 laser cutting technology because of two issues and one decision, this includes the bad customer service by supplier 1 issue, Mr. Y's offended by supplier 1 issue, and the decision of supplier 3 to be good personal friends with Mr. Y. Sometime in the history of company 4, one of the employees of supplier 1 offended Mr. Y in a social context. Based on the interview with Mr. Y, because of this offense, he became very sensitive towards the unsatisfactory customer service provided by supplier 1 (business relationship). On top of the negative perception towards supplier 1, Mr. Y had developed a good personal relationship with supplier 3. This combination lead to the productive condition of going to the HQ of supplier 3 instead of supplier 1. Thus, from this example, the social relationship between the suppliers and the family firms affects the sensitivity of the family firms towards the business relationships. Finally, both relationships are considered in the issue network that leads to the productive condition.

After the productive and permissive conditions have arisen, the issue network that integrates both conditions are the issue network 3, that ultimately leads the outcome (the adoption of discontinuous technology by the family firms). In addition, it can be seen in the framework that the end of the permissive condition will end the critical juncture. In the studied cases, the outcome and the end of the critical juncture were all the same. However, this might not be the case for other critical junctures that were not studied in this research.

Once the technology had been adopted by the family firm, the mechanisms of reproduction are put into place. Based on the studied cases, the sub-categories that affects the mechanisms of reproduction are the same mechanisms that affects the productive condition, which are the Confucian belief with external party and business relationship sub-categories. An illustrative example of this is the case with company 2. During the interview, the researchers asked Mr. A and Mr. Z on why they never changed suppliers after being the customer of supplier 1 for more than 10 years. The reason they gave was the good relationship that they have built with supplier 1. In contrast with the story of company 4's productive condition, company 2 had developed a good social relationship with supplier 1 (high degree of social and economic network overlap). Because of that, even when supplier 1's customer service was unsatisfactory, they still regarded supplier 1 as the relative best among the other suppliers. To Mr. A, all the other suppliers' service was equally unsatisfactory, but supplier 1 was the best among all. This shows that the good social relationship between Mr. A and supplier 1 decreased the sensitivity of company 2 towards supplier 1's low business relationship level.

Another example for the effects of Confucian belief with external party is with company 1. In short, company 1 was previously a joint venture company with supplier 1, this lead them to adopt their first punching and CO2 laser cutting machines. However, after the joint venture broke off, they decided to maintain good relationship with supplier 1. When Mr. K was asked why they never changed suppliers, one of the answers that he gave was the mutual trust and reciprocity between him and Supplier 1; Mr. K and Mr. Q even admitted that they were approached by the competitors of supplier 1. It was uncovered that the social relationship between company 1 and supplier 1 locked company 1 to supplier 1's products and became a loyal customer. In return, supplier 1 considered company 1 as a special customer by providing insider information and better customer support; the authors of this paper confirmed this with the southeast-asia executive of supplier 1. Thus, the mutual trust, reciprocity, and the good business relationship (e.g. customer service) became a mechanism of reproduction for company 1 towards supplier 1's discontinuous technology. As can be seen in Table 9, the other cases were affected by the same sub-categories. Therefore, it could be inferred that the mechanisms of reproduction of the outcome

In summary, this section served to answer sub-research questions 3 and 4. With all the sub research questions answered, the research question, what the critical juncture pattern of the path dependent

adoption of discontinuous technology within family firms is, can be answered. To look at the patterns of critical juncture, one needs to look at the found categories as well as the similarities and differences among the different companies for each category. An important trend to notice was that most of the categories that had similarities among the cases were in the critical antecedents. This was why it was appropriate to include other sub-categories within the critical antecedent sub-category. On the contrary, it could be seen that the permissive and productive conditions did not include other sub-categories but were instead affected by them. This was because the permissive and productive conditions were highly variable between the cases. In fact, the most variable within the cases were the issue networks. Most of the variability between the issue networks, permissive and productive conditions were due to the randomness of events surrounding the business environment. However, the sub-categories that affected them had a theme, and that was why it was appropriate to infer the causal relationships. With all that being said, we think it is safe to say that the framework represents the pattern of critical antecedents and the factors affecting the permissive and productive conditions, as well as the mechanisms of reproduction; however, it is highly unlikely that there will be a pattern for the productive condition, permissive condition, and the issue networks themselves. Therefore, the answer of the research question lie in the framework presented in Figure 18.

Academic Contribution and Limitations

As previously mentioned, this study serves to contribute to all three academic fields, namely the family firm, the critical juncture, and decision-making model academic fields.

To begin with, the main point of study of this research is the inertia towards innovation by family firms. As previously mentioned, the inertia of innovation, including the adoption of discontinuous technology, within family firms, is likely to be an effect of path dependency (Fawcett et al., 2013; Garud et al., 2010; Stanley, 2010; Sydow et al., 2009; Wright & Kellermanns, 2011). It was then found that most of the family firm path dependence theories are through the view of organizational imprinting. It was mentioned in the introduction that the research gap to be fulfilled is the unclear initial stage of the organizational importing theory in path dependence, and for that the organizational path dependence theory was chosen (Schreyögg & Sydow, 2011). More specifically, the critical juncture theory served to be part of the initial phase of the organizational path dependence framework (Sydow et al., 2009), and the critical juncture framework is also part of the historical institutionalism point of view (Capoccia, 2015; Slater & Simmons, 2010; Soifer, 2012; Thelen, 1999). The problem with the critical juncture theory was that it had no empirical study yet in the field of organizational research. Most of the research done using the critical juncture theories were in the fields of political science to explain political movements and events (e.g. Capoccia, 2015; Collier & Collier, 2002). Because of this, the researchers uncovered that the critical juncture theory alone was not sufficient to study the shorter time span of events within organizational path dependences. The limitation within the existing critical juncture literature is that they are missing the decision-making mechanism (micro view) among the actors within; in other words, without the micro view, the critical juncture theories would be too abstract for practical data collection. To solve this problem, the issue network theory was used.

The research question, what the critical juncture pattern of the path dependent adoption of discontinuous technology within family firms is, was answered with the proposed theoretical model in Figure 18. However, as mentioned in the research design section, the proposed model in this research was not meant to be generalizable towards other industries, since this research is a grounded multiple case study. The main contribution towards the critical juncture theory is the fact that the researchers managed to empirically study the critical juncture of an event of a family firm as an organizational institution. The framework illustrates how the critical juncture sub-categories are in fact macro level categories that need other sub-categories to be holistically useful. The framework also shows that the issue networks can indeed be used alongside with the critical juncture categories to pin point the dynamic of events, issues and decisions that lead up to the start of a dependant path. The creation of this model shed light to the initial stages of family firms' path dependence, which was the research gap within the family firm literature to begin with. Additionally, this paper also elaborated on how the analysis was done beginning from the

mapping of the issue network, temporal sequence of the events, and finally the critical junctures. Thus, this model illustrates how the inertia towards innovation by family firm could be formed.

From here, additional research can be done in terms of how this model can be integrated with other studies within the family firm innovation literature that could explain the rise of the causal factors. Because one thing that was not focused in this model was the generalizability of the causal factors. For example, it was said that Confucianism beliefs affected the critical antecedents; also, the economic and technological categories affected the issue network. However, it is highly likely that if one studies the path dependence critical junctures outside of Southeast-Asia, within a different industry, the economic and technological categories might not be the same. In fact, it might be the case that the internal and external categories can be completely different, while still having the same meta categories. However, this is something that is not known and can be explored further within the literature of family firms. Thus, a study of the patterns for the causal factors that affects the critical junctures is encouraged; such a study should be a quantitative cross-sectional study. In fact, the ideal study is one that studies the pattern of critical juncture towards a discontinuous technology of family firms world-wide, to explain family firm's innovation inertia further.

The limitation of our study of the critical juncture theory was the lack of emphasis on the path dependence. In this paper, the authors elaborated much on the sub-categories of the critical juncture, but not so much in the sub-categories of the dependant path. For instance, this paper did not elaborate on the self-reinforcing mechanisms of the paths. In addition, the findings of this research also missed the duration of the critical juncture and the paths. One of the reason for this was because there were very limited interview times with the interviewee since most of them are busy (high level executives); most of the time, the interviewers forgot the exact years and months of the decisions, and they did not have the time to check. In addition, the interviewees may also suffer retrospective biases because most of the information that were used in this study were in the time points between 1970s-1990s. In addition, even when requested, the family firms were reluctant to share archival data due to confidentiality; on the other hand, the websites of the interviewed family firms were not useful for the purpose of this research. Future similar studies should incorporate a clear method on how to define the dependant path sub-categories (e.g. state of ergodicity, self-reinforcing mechanisms, and the duration of lock in).

In terms of the decision-making theory, although this research did not primarily focus on how the individual actors make decisions per se, the use of the issue network theory (Langley et al., 1995) within this research gives it an empirical context. The issue network analysis in Figure 16 served as an empirical evidence that the issue network can in fact be used to illustrate a certain outcome; in addition, the framework in Figure 18 showed that the issue network can be useful for other theories as well. However, the researchers of this study also uncovered the limitation for the use of the issue network. While the use of issue network can illustrate the dynamic of decision making, it failed to consider the magnitude of the decision. The issue network failed to consider which decisions are more important than others. The importance of a decision can vary according to the defined parameters of the analysis. In addition, one other difficulty that was observed while doing the analysis was determining the start of the issue network. Because, theoretically, without the guide of the critical juncture, the issue network could suffer the infinite regress problem. Given the premise that each issue is preceded by another issue, then the issue network can extend to infinity. The critical juncture theory served as the limit for the infinite regress.

Several other possible limitations regarding the issue network theory was the possible bias from the answers of the interviewees. As mentioned in the Confucian belief, overseas Chinese family firms in Southeast-Asia put a high priority in family harmony; one of the feature of family harmony is the reputation of the family name. Thus, it is highly possible that some questions were answered untruthfully to save the face of either the individual and the family. One detected example was how, during the interview, Mr. P (company 3) was observed to pay close attention not to undermine his father when answering the question. Likewise, Mr. X (Mr.P's father) was observed to make sure that his answers to the question did not want to indicate that he was the top authoritative figure in the family firm. This meant that it is possible that there were issues or decisions that were undisclosed because of their nature of harming the name of the family. Thankfully the triangulation of interviewees (Mr. V) clarified this problem with the case of company 3. However, the same triangulation could not be done for every company. Again, this was because most of the potential interviewees were executives, and this meant that getting interviews to begin with

was not easy. In addition, there was also the factor that Confucianism beliefs suggest low trust in outsiders; the researchers observed that the family firms who did not want to be interviewed because they were suspicious on the nature of the interviews.

Regarding the family business literature, as previously mentioned, this paper shed light towards the initial path dependent phase towards the adoption of discontinuous technology. However, the found categories incorporated in the framework provided insights towards the inertia of family firm path dependence in Southeast-Asia specifically. The framework provided insights toward how Confucianism beliefs could influence the adoption of technology in Southeast-Asia. Additional research could study the degree to which the Confucian beliefs affect the critical antecedents using a cross-sectional quantitative study. Such a study could also serve to improve the generalizability of Figure 18. The Grounded Critical Juncture Theoretical . In addition, this research also illustrated the use of the framework provided by (De Massis, Kotlar, et al., 2014) to determine family firm's ability and willingness on showing family particularistic behaviour. It could also be observed that there was some overlap in terms of the found categories between the family particularistic behaviour theory with the found Confucianism beliefs (e.g. succession planning and desire to retain ownership). A recommendation for future research, in this respect, could be about the influence of Confucianism on family particularistic behaviours.

Managerial Implications

The target audience of this section are the institutions and individuals that either is part of a family firm or has business relationships with family firms, although there is a special emphasis to the sheet metal industry in SEA.

Suppliers perspective

In the perspective of the suppliers, as previously mentioned in the introduction, it is very likely to encounter overseas Chinese family firms when one has business relationships in SEA; in fact, based on the industry experts from supplier 1, most of their customers in SEA were overseas Chinese family firms. This study revealed that a manager in SEA should take special attention on the path dependence of the family firms (customers) when bringing a discontinuous technology from outside of SEA into SEA. Because when discontinuous technology suppliers want to do market penetration, but most of their potential customers (the family firms) are path dependant on the previous best discontinuous technology, or even a competitor brand, then they need to understand the critical juncture of the family firms. The nature of technological path critical junctures is that it could function as (1) the start of a new technological path and (2) the opening for a new path. Starting a new technological path can be in the form of bringing in a new technology from outside SEA (e.g. fiber laser technology) and opening a new path could be in the form of increasing market share (e.g. converting a customer from one brand to another).

To study the critical juncture of a family firm, the starting point should be the category that is most consistent throughout the market. The critical juncture analysis in Figure 18 revealed that most of the similarities between family firms were the critical antecedent sub-categories. In addition, this study concluded that it is very likely that the critical antecedents of each family firm are formed over a longer period compared to the critical junctures themselves. For example, the critical antecedent of company 3 started with the acceptance of the founder towards the need of a new punching machine and ended with the buying of the punching machine; this lasted for approximately two months. However, the formation of the critical antecedents (the decision-making hierarchy, the education of the family members, and etc.) were formed over years, and were very observable from the side of the suppliers. Thus, for a manager from the supplier side to understand the critical antecedent of the family firm customer is to prepare for recognizing the start of a new critical juncture. However, to recognize the start of the critical juncture, the supplier needs to understand the categories that affects the issue network of the permissive and productive condition. For example, by knowing the social and economic network overlap level between the supplier and family firm customer, the supplier can estimate the productive condition of the family firm. In addition, by knowing the market needs of a family firm customer, a supplier could notice when a permissive condition arises.

It is important to note that Confucianism is a major influence on the critical juncture of the family firms in the SEA sheet metal fabrication industry. However, while Confucianism belief theories were part of the findings in this study, it is not the focus of this study. Thus, one could refer to other Confucianism literature as a reference for practicality (De Bary, 1991; Tan & Siew, 2001; Tu, 1998a, 1998b; Yan & Sorenson, 2006). This is especially important if the suppliers came from a country that did not adopt Confucianism beliefs.

Family Firm's Perspective

The managerial implication from the family firm's perspective is to understand the path dependence of their respective family firms. It is important for the family firms to notice if they are in any form of technological path dependence. If they are, it is important to understand the critical juncture. Because if the path dependence (innovation inertia) is hampering the growth of the family firm (Chrisman & Patel, 2012), then understanding the critical juncture might uncover the causal factors that gave rise to the self-reinforcing mechanism of the dependant path. For example, Mr. X of company 3 saw the need to adopt a new discontinuous technology to cater the market need of the family firm; however, his father (the founder) was locked in a path of using conventional machines and it was assumed that the firm could not grow without the new discontinuous technology. In this case, using this model, Mr. X could map the critical antecedent sub-categories of his own family firm. Once that is done, he could try and trigger the permissive condition, by proposing and convincing his father for example. In addition, he could give rise to the productive condition based on which supplier he judge as the best for the technology. It is important for Mr. X to understand that his authority (decision making hierarchy) in the firm was, in fact, very limited with the presence of the founder.

The recommendation to understand the critical juncture sub-categories is applicable to both family members and non-family members. For example, say the manager of the family firm is a non-family member, like company 1, and he needs to adopt a discontinuous technology to cater to the market need of the company. However, the owner of the company is path dependent on the previous best technology. Then, by understanding the critical juncture sub categories (education of family members, informal decision-making hierarchy, the social network, succession plan, and etc.) of the owners, the manager could trigger a critical juncture by stimulating a permissive condition. Once the technology has been adopted, he could even prevent the mechanism of reproduction to prevent a new path from being formed. This is assuming that being path dependant towards a technology (having innovation inertia) is not favourable for the family firm.

One thing to note is that the framework proposed in this paper (Figure 18) is specific towards family firms within the sheet metal industry in SEA. Thus, the use of this model within other regions and industry should be done with this consideration in mind. Should another study be done in the perspective of other discontinuous technology (e.g. flight drones for farming or business intelligence tools for ERP systems), then this model may be further generalized.

Conclusion

The focus of this study revolved around the lack of study within family firm literature about the initial stage of their path dependence towards discontinuous technology, as a form of innovation inertia; this served as the research gap being resolved in this research. To fill the research gap, the primary objective of this study is to explain the critical juncture path dependence of discontinuous technology adoption within family firms through a novel theoretical framework, including the incorporation of the issue network theory. Through the abductive method of research, a multiple case study was done on five overseas Chinese family firms in Southeast-Asia within the sheet metal fabrication industry. The outcome from the grounded research was the proposed model in Figure 18. Most of the similarities among the cases were in the critical antecedents of the critical juncture, and thus creating a pattern for family firms in SEA. It was observed that one of the most influential categories on the critical antecedents were the beliefs of Confucianism as part of the internal category of the studied family firm. In contrast to the critical antecedents, the permissive condition, productive condition, and the issue network among the conditions were variable among the studied cases. However, while the issue networks themselves are highly variable, the sub-categories that became causal factors of the issues were not. Among these sub-categories were the

Confucian belief with external party and business (Customer-Supplier) relationship level for the productive condition issue networks; in addition, the sub-categories that were influential towards the causal factors of the permissive condition issue network include the market demand, technology publicity, competitor's pressure, and technological maturity in reference country. In conclusion, it is safe to say that the framework represents the pattern of critical antecedents and the factors affecting the permissive and productive conditions, as well as the mechanisms of reproduction; however, it is highly unlikely that there will be a pattern for the productive condition, permissive condition, and the issue networks themselves.

Since the research design of this research was a multiple-case study, it was assumed from the beginning that the results were not generalizable across industries and countries. While this is true, the proposed framework (Figure 18) managed to empirically show the critical juncture of an event of a family firm as an organizational institution. The framework illustrated how the critical juncture sub-categories were in fact macro level categories that need other sub-categories to be holistically useful. The framework also showed that the issue networks could be used alongside with the critical juncture categories to pin point the dynamic of events, issues and decisions that lead up to the start of a dependant path. In addition, this research also provided empirical support to the issue network theory (Langley et al., 1995). Also, the found categories incorporated in the framework provided insights towards the inertia of family firm path dependence in Southeast-Asia specifically. The framework provided insights toward how Confucianism beliefs could influence the adoption of technology in Southeast-Asia. Finally, the managerial implication of this research could be for market penetration and market share acquisition for the suppliers and adopting new discontinuous technologies for the family firms.

For the family firm path dependence literature, a suggested research could be how this model can be integrated with other studies within the family firm innovation literature that could explain the rise of the causal factors of innovation inertia. Another study could be a study of the degree to which the Confucian beliefs affect the critical antecedents using a cross-sectional quantitative study. Also, a quantitative study of the patterns for the causal factors that affects the critical junctures could also be useful for the generalizability of this framework.

References

- Aldrich, H. E., & Cliff, J. E. (2003). The pervasive effects of family on entrepreneurship: Toward a family embeddedness perspective. *Journal of Business Venturing*, 18(5), 573–596. [https://doi.org/10.1016/S0883-9026\(03\)00011-9](https://doi.org/10.1016/S0883-9026(03)00011-9)
- Alexander, E. R. (1979). The Design of Alternatives in Organizational Contexts: A Pilot Study. *Administrative Science Quarterly*, 24(3), 382–404. <https://doi.org/10.2307/2989919>
- Anderson, P., & Tushman, M. L. (1990). Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change. *Administrative Science Quarterly*, 35(4), 604. <https://doi.org/10.2307/2393511>
- Arthur, W. B. (1994). *Increasing returns and path dependence in the economy*. University of Michigan Press. Retrieved from https://books.google.nl/books?id=k6Vk5YZRpEC&dq=increasing+returns+and+path+dependence+in+the+economy&lr=&source=gbs_navlinks_s
- Ayyagari, M., Beck, T., & Demircuc-Kunt, A. (2007). Small and medium enterprises across the globe. *Small Business Economics*, 29(4), 415–434. <https://doi.org/10.1007/s11187-006-9002-5>
- Berrone, P., Cruz, C., & Gomez-Mejia, L. R. (2012). Socioemotional Wealth in Family Firms. *Family Business Review*, 25(3).
- Boeker, W. (1989). The Development and Institutionalization of Subunit Power in Organizations. *Administrative Science Quarterly*, 34(3), 388. <https://doi.org/10.2307/2393150>

- Bruggeman, D. (2002). NASA: A path dependent organization. *Technology in Society*, 24(4), 415–431. [https://doi.org/10.1016/S0160-791X\(02\)00033-7](https://doi.org/10.1016/S0160-791X(02)00033-7)
- Capoccia, G. (2015). Critical Junctures and Institutional Change. In J. Mahoney & K. Thelen (Eds.), *Advances in Comparative Historical Analysis in the Social Sciences* (pp. 147–180). <https://doi.org/10.1017/CBO9781316273104.007>
- Carney, M. (2005). Corporate governance and competitive advantage in family-controlled firms. *Entrepreneurship: Theory and Practice*, 29(3), 249–265. <https://doi.org/10.1111/j.1540-6520.2005.00081.x>
- Carroll, G. R., & Hannan, M. T. (Michael T. (2000). *The demography of corporations and industries*. Princeton University Press. Retrieved from https://books.google.nl/books?id=YodoS1i8gN0C&dq=The+demography+of+corporations+and+industries.+Princeton,+NJ:+Princeton+University+Press.&lr=&source=gbbs_navlinks_s
- Chalmers, A. F. (Alan F. (2013). *What is this thing called science?* Hackett Publishing. Retrieved from https://books.google.nl/books?id=s13tBAAAQBAJ&dq=what+is+this+thing+called+science&lr=&source=gbbs_navlinks_s
- Chrisman, J. J., Chua, J. H., De Massis, A., Minola, T., & Vismara, S. (2016). Management processes and strategy execution in family firms: from “what” to “how.” *Small Business Economics*, 47(3), 719–734. <https://doi.org/10.1007/s11187-016-9772-3>
- Chrisman, J. J., Fang, H., Kotlar, J., & De Massis, A. (2015). A note on family influence and the adoption of discontinuous technologies in family firms. *Journal of Product Innovation Management*, 32(3), 384–388. <https://doi.org/10.1111/jpim.12206>
- Chrisman, J. J., & Patel, P. C. (2012). Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal*. <https://doi.org/10.5465/amj.2011.0211>
- Chua, J. H., Chrisman, J. J., & Sharma, P. (1999). Defining the Family Business Behaviour. *Entrepreneurship: Theory and Practice*, 23(4), 19–19.
- Claessens, S., Djankov, S., & Lang, L. H. P. (2000). The separation of ownership and control in East Asian Corporations. *Journal of Financial Economics*, 58(1–2), 81–112. [https://doi.org/10.1016/S0304-405X\(00\)00067-2](https://doi.org/10.1016/S0304-405X(00)00067-2)
- Cohen, M. D., March, J. G., & Olsen, J. P. (1972). A Garbage Can Model of Organizational Choice. *Administrative Science Quarterly*, 17(1), 1. <https://doi.org/10.2307/2392088>
- Collier, R. B., & Collier, D. (2002). *Shaping the political arena : critical junctures, the labor movement, and regime dynamics in Latin America*. University of Notre Dame Press. Retrieved from <http://escholarship.org/uc/item/8qr1z7gc>
- Cooper, R. G., & Kleinschmidt, E. J. (1987). New products: What separates winners from losers? *Journal of Product Innovation Management*, 4(3), 169–184.
- David, P. A. (1994). Why are institutions the “carriers of history”? Path dependence and the evolution of conventions, organizations and institutions. *Structural Change and Economic Dynamics*, 5(2), 205–220. [https://doi.org/10.1016/0954-349X\(94\)90002-7](https://doi.org/10.1016/0954-349X(94)90002-7)
- De Bary, W. T. (1991). *The Trouble with Confucianism* (Vol. 525). Harvard University Press. Retrieved from [https://books.google.nl/books?hl=en&lr=&id=mmGdgDp8s20C&oi=fnd&pg=PR7&dq=De+Bary,+W.+T.+\(1991\).+The+trouble+with+Confucianism.+Cambridge,MA:+Harvard+University+Press.](https://books.google.nl/books?hl=en&lr=&id=mmGdgDp8s20C&oi=fnd&pg=PR7&dq=De+Bary,+W.+T.+(1991).+The+trouble+with+Confucianism.+Cambridge,MA:+Harvard+University+Press.)

&ots=8XD6oDXQzB&sig=pQrDIQDWZ_Q7zxlT8bzdWWRnAZ0#v=onepage&q&f=false

- De Massis, A., Chirico, F., Kotlar, J., & Naldi, L. (2014). The Temporal Evolution of Proactiveness in Family Firms. *Family Business Review*, 27(1), 35–50. <https://doi.org/10.1177/0894486513506114>
- De Massis, A., Frattini, F., & Lichtenthaler, U. (2012). Research on Technological Innovation in Family Firms: Present Debates and Future Directions. *Family Business Review*, 26(1), 10–31.
- De Massis, A., Kotlar, J., Chua, J. H., & Chrisman, J. J. (2014). Ability and willingness as sufficiency conditions for family-oriented particularistic behavior: Implications for theory and empirical studies. *Journal of Small Business Management*, 52(2), 344–364. <https://doi.org/10.1111/jsbm.12102>
- Dutton, J. E., Ashford, S. J., O'Neill, R. M., & Lawrence, K. A. (2001). Moves that matter: Issue selling and organizational change. *Academy of Management Journal*, 44(4), 716–736. <https://doi.org/10.2307/3069412>
- Dutton, J. E., Fahey, L., & Narayanan, V. K. (1983). Toward understanding strategic issue diagnosis. *Strategic Management Journal*, 4(4), 307–323. <https://doi.org/10.1002/smj.4250040403>
- Fawcett, S. E., Ellram, L. M., & Ogden, J. A. (2013). *Supply Chain Management: From Vision to Implementation*. Retrieved from <http://library.wur.nl/WebQuery/clc/2040715>
- Garud, R., Kumaraswamy, A., & Karnøe, P. (2010). Path dependence or path creation? *Journal of Management Studies*, 47(4), 760–774. <https://doi.org/10.1111/j.1467-6486.2009.00914.x>
- Glaser, B., & Strauss, A. (1967). *The Discovery of Grounded: Strategies for Qualitative Research* (17th ed.). Nursing Research. Retrieved from http://journals.lww.com/nursingresearchonline/Citation/1968/07000/The_Discovery_of_Grounded_Theory__Strategies_for.14.aspx
- Gómez-Mejía, L. R., Haynes, K. T., & Núñez-Nickel, M. (2007). Socioemotional Wealth and Business Risks in Family-controlled Firms: Evidence from Spanish Olive Oil Mills. *Administrative Science Quarterly*, 52(1), 106–137.
- Gopalakrishnan, S., & Damanpour, F. (1997). A review of innovation research in economics, sociology and technology management. *Omega*, 25(1), 15–28. [https://doi.org/10.1016/S0305-0483\(96\)00043-6](https://doi.org/10.1016/S0305-0483(96)00043-6)
- Hage, J. (1999). *Theories of organizations: Forms, process and transformation*. Wiley. Retrieved from https://books.google.nl/books/about/Theories_of_Organizations.html?id=zFWVZwcaHIUC&redir_esc=y
- Haig, B. D. (2005). An Abductive Theory of Scientific Method. *Psychological Methods*, 10(4), 371–388. <https://doi.org/10.1037/1082-989X.10.4.371>
- Jaskiewicz, P., Combs, J. G., & Rau, S. B. (2015). Entrepreneurial legacy: Toward a theory of how some family firms nurture transgenerational entrepreneurship. *Journal of Business Venturing*, 30(1), 29–49. <https://doi.org/10.1016/j.jbusvent.2014.07.001>
- Johnson, V. (2007). What Is Organizational Imprinting? Cultural Entrepreneurship in the Founding of the Paris Opera. *American Journal of Sociology*, 113(1), 97–127. <https://doi.org/10.1086/517899>
- Kammerlander, N., & Ganter, M. (2015). An attention-based view of family firm adaptation to discontinuous technological change: Exploring the role of family ceos' noneconomic goals. In *Journal of Product Innovation Management* (Vol. 32, pp. 361–383). <https://doi.org/10.1111/jpim.12205>

- Kellermanns, F. W., & Eddleston, K. A. (2007). A family perspective on when conflict benefits family firm performance. *Journal of Business Research*, 60(10), 1048–1057. <https://doi.org/10.1016/j.jbusres.2006.12.018>
- Knight, J. (1992). *Institutions and social conflict. The political economy of institutions and decisions*. Cambridge University Press. Retrieved from https://books.google.nl/books?id=VeoKtu_22q0C&dq=institutions+and+social+conflict&lr=&source=gbs_navlinks_s
- König, A., Kammerlander, N., & Enders, A. (2013). The family innovator's dilemma: How family influence affects the adoption of discontinuous technologies by incumbent firms. *Academy of Management Review*, 38(3), 418–441. <https://doi.org/10.5465/amr.2011.0162>
- Kotlar, J., Fang, H., De Massis, A., & Frattini, F. (2014). Profitability goals, control goals, and the R&D investment decisions of family and nonfamily firms. *Journal of Product Innovation Management*, 31(6), 1128–1145. <https://doi.org/10.1111/jpim.12165>
- La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. (1999). Corporate Ownership Around the World. *The Journal of Finance*, 54(2), 471–517. <https://doi.org/10.1111/0022-1082.00115>
- Langley, A., Mintzberg, H., Pitcher, P., Posada, E., & Saintmacary, J. (1995). Opening up Decision-Making: The View from the Black Stool. *Organization Science*, 6(3), 260–279. <https://doi.org/10.1287/orsc.6.3.260>
- Laudan, L. (1981). *Science and hypothesis : historical essays on scientific methodology*. D. Reidel Publishing Company. Retrieved from https://books.google.nl/books?id=txLI7bU919gC&dq=laudan+science+and+hypothesis&lr=&source=gbs_navlinks_s
- Lawrence, T. B., Winn, M. I., & Jennings, P. D. (2001). THE TEMPORAL DYNAMICS OF INSTITUTIONALIZATION. *Academy of Management Review*, 26(4), 624–644. <https://doi.org/10.5465/AMR.2001.5393901>
- Lyles, M. A., & Mitroff, I. I. (1980). Organizational Problem Formulation: An Empirical Study. *Administrative Science Quarterly*, 25(1), 102–119. <https://doi.org/10.2307/2392229>
- Magnani, L. (2005). An abductive theory of scientific reasoning. *Semiotica*, 153(153–1/4), 261–286. <https://doi.org/10.1515/semi.2005.2005.153-1-4.261>
- Mahoney, J. (2000). Path dependence in historical sociology. *Theory and Society*, 29(4), 507–548. <https://doi.org/10.1023/A:1007113830879>
- March, J. G. (1962). The Business Firm as a Political Coalition. *The Journal of Politics*, 24(4), 662–678. <https://doi.org/10.1017/S0022381600016169>
- Marquis, C., & Tilcsik, A. (2013). Imprinting: Toward a Multilevel Theory. *The Academy of Management Annals*, 7(1), 195–245. <https://doi.org/10.1080/19416520.2013.766076>
- Miller, D., Le Breton-Miller, I., & Scholnick, B. (2008). Stewardship vs. stagnation: An empirical comparison of small family and non-family businesses. *Journal of Management Studies*, 45(1), 51–78. <https://doi.org/10.1111/j.1467-6486.2007.00718.x>
- Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The Structure of “ Unstructured ” Decision Processes Author (s): Henry Mintzberg , Duru Raisinghani and André Théorêt Source : Administrative Science Quarterly , Vol . 21 , No . 2 (Jun . , 1976) , pp . 246-275 Published by : Sage Publications , Inc . on. *Administrative Science Quarterly*, 21(2), 246–275.
- Mintzberg, H., & Westley, F. (2001). It's not what you think. *Review; Spring*, 42(3), 89–94. Retrieved

- from <https://search.proquest.com/docview/224963087?pq-origsite=gscholar>
- Nonaka, I. (2007). *The Knowledge-Creating Company*. Retrieved October 3, 2017, from <https://hbr.org/2007/07/the-knowledge-creating-company>
- North, D. C. (Douglass C. (1990). *Institutions, institutional change, and economic performance*. Cambridge University Press. Retrieved from https://books.google.nl/books?id=oFnWbTqgNPYC&dq=north+1990+path+dependency&lr=&source=gb_s_navlinks_s
- Nutt, P. C. (1984). Types of organizational decision processes. *Administrative Science Quarterly*, 29(3), 414–450. <https://doi.org/10.2307/2393033>
- Nutt, P. C. (2000). Context, tactics, and the examination of alternatives during strategic decision making. *European Journal of Operational Research*, 124(1), 159–186. [https://doi.org/10.1016/S0377-2217\(99\)00165-4](https://doi.org/10.1016/S0377-2217(99)00165-4)
- Nutt, P. C. (2001). A taxonomy of strategic decisions and tactics for uncovering alternatives. *European Journal of Operational Research*, 132(3), 505–527. [https://doi.org/10.1016/S0377-2217\(00\)00141-7](https://doi.org/10.1016/S0377-2217(00)00141-7)
- Nutt, P. C. (2007). Intelligence gathering for decision making. *Omega*, 35(5), 604–622. <https://doi.org/10.1016/j.omega.2005.12.001>
- Nutt, P. C. (2008). Investigating the success of decision making processes. *Journal of Management Studies*, 45(2), 425–455. <https://doi.org/10.1111/j.1467-6486.2007.00756.x>
- Pascual Serrano, D., Vera Pasamontes, C., & Girón Moreno, R. (2016). Modelos animales de dolor neuropático. *DOLOR*, 31(2), 70–76. <https://doi.org/10.1017/CBO9781107415324.004>
- Pierson, P. (2000). Increasing Returns, Path Dependence, and the Study of Politics. *American Political Science Review*, 94(2), 251–267. <https://doi.org/10.2307/2586011>
- Pierson, P. (2004). *Politics in time : history, institutions, and social analysis*. Princeton University Press. Retrieved from https://books.google.nl/books?id=Ybvgsrg4KYQC&dq=politics+in+time&lr=&source=gb_s_navlinks_s
- Pinfield, L. T. (1986). A Field Evaluation of Perspectives on Organizational Decision Making. *Administrative Science Quarterly*, 31(3), 365. <https://doi.org/10.2307/2392828>
- Powell, W. W., & DiMaggio, P. (1991). *The new institutionalism in organizational analysis*. Retrieved from https://books.google.nl/books?id=jbTbAgAAQBAJ&dq=the+new+institutionalism+in+organizational+analysis&lr=&source=gb_s_navlinks_s
- Prasad, M. (2005). Race and Regionalism in the Politics of Taxation in Brazil and South Africa by Evan S. Lieberman. *American Journal Of Sociology*, 110(5), 1537–1538. <https://doi.org/10.1017/CBO9780511615658>
- Schreyögg, G., & Sydow, J. (2011). Organizational Path Dependence: A Process View. *Organization Studies*, 32(3), 321–335. <https://doi.org/10.1177/0170840610397481>
- Short, J. C., Payne, G. T., Brigham, K. H., Lumpkin, G. T., & Broberg, J. C. (2009). Family Firms and Entrepreneurial Orientation in Publicly Traded Firms. <http://dx.doi.org/10.1177/0894486508327823>. <https://doi.org/10.1177/0894486508327823>
- Simon, H. A. (1960). *The new science of management decision*. New York: Harper & Brothers.

<https://doi.org/10.1037/13978-000>

- Sinclair, M., & Ashkanasy, N. M. (2005). Intuition. *Management Learning*, 36(3), 353–370. <https://doi.org/10.1177/1350507605055351>
- Slater, D., & Simmons, E. (2010). Informative Regress: Critical Antecedents in Comparative Politics. *Comparative Political Studies*, 43(7), 886–917. <https://doi.org/10.1177/0010414010361343>
- Soifer, H. D. (2012). The Causal Logic of Critical Junctures. *Comparative Political Studies*, 45(12), 1572–1597. <https://doi.org/10.1177/0010414012463902>
- Stanley, L. J. (2010). Emotions and family business creation: An extension and implications. *Entrepreneurship: Theory and Practice*, 34(6), 1085–1092. <https://doi.org/10.1111/j.1540-6520.2010.00414.x>
- Stinchcombe, A. L. (1965). Social structure and organizations. In J. G. March (Ed.), *Handbook of organizations* (pp. 142–193). Retrieved from https://scholar.google.nl/scholar?hl=en&as_sdt=0%2C5&q=stinchcombe+1965&btnG=
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press. Retrieved from https://books.google.nl/books?id=y16ww5ZsJOAC&dq=qualitative+analysis+for+social+scientist&lr=&source=gb_s_navlinks_s
- Sydow, J., Schreyögg, G., & Koch, J. (2009). Organizational Path Dependence: Opening the Black Box. *Academy of Management*, 34(4), 689–709.
- Tan, W. L., & Siew, T. F. (2001). Coping with Growth Transitions: The Case of Chinese Family Businesses in Singapore. *Family Business Review*, 14(2), 123–139. <https://doi.org/10.1111/j.1741-6248.2001.00123.x>
- Thelen, K. (1999). HISTORICAL INSTITUTIONALISM IN COMPARATIVE POLITICS. *Annual Review of Political Science*, 2(1), 369–404. <https://doi.org/10.1146/annurev.polisci.2.1.369>
- Tilcsik, A. (2014). Imprint–environment Fit and Performance. *Administrative Science Quarterly*, 59(4), 639–668. <https://doi.org/10.1177/0001839214549042>
- Tolbert, P. S., & Zucker, L. (1999). Studying organization : theory & method. In S. Clegg & C. Hardy (Eds.), *Studying organization : theory & method* (pp. 175–190). Sage Publications. Retrieved from [https://books.google.nl/books?id=qd2AMTw51S8C&dq=The+institutionalization+of+institutional+theory.+In+S.+R.+Clegg,+C.+Hardy,+%26+C.+E.+North+\(Eds.\),+Handbook&lr=&source=gb_s_navlinks_s](https://books.google.nl/books?id=qd2AMTw51S8C&dq=The+institutionalization+of+institutional+theory.+In+S.+R.+Clegg,+C.+Hardy,+%26+C.+E.+North+(Eds.),+Handbook&lr=&source=gb_s_navlinks_s)
- Tu, W. M. (1998a). Confucius and confucianism. In *Confucianism and the family* (pp. 3–36).
- Tu, W. M. (1998b). Probing the “three bonds” and “five relationships” in Confucian humanism. In *Confucianism and the family* (pp. 121–136).
- Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, 31(3), 439. <https://doi.org/10.2307/2392832>
- Walsh, J. P., & Ungson, G. R. (1991). Organizational Memory. *Academy of Management Review*, 16(1), 35–57. <https://doi.org/10.5465/AMR.1991.4278992>
- Woolley, J. T., & Levi, M. (1989). *Of Rule and Revenue*. *Contemporary Sociology* (Vol. 18). University of California Press. <https://doi.org/10.2307/2073845>

Wright, M., & Kellermanns, F. W. (2011). Family firms: A research agenda and publication guide. *Journal of Family Business Strategy*, 2(4), 187–198. <https://doi.org/10.1016/j.jfbs.2011.10.002>

Yan, J., & Sorenson, R. (2006). The effect of Confucian values on succession in family business. *Family Business Review*, 19(3), 235–250. <https://doi.org/10.1111/j.1741-6248.2006.00072.x>

Zahra, S. A. (2005). Entrepreneurial risk taking in family firms. *Family Business Review*, 18(1), 23–40. <https://doi.org/10.1111/j.1741-6248.2005.00028.x>

Zahra, S. A., Hayton, J. C., Neubaum, D. O., Dibrell, C., & Craig, J. (2008). Culture of family commitment and strategic flexibility: The moderating effect of stewardship. *Entrepreneurship: Theory and Practice*, 32(6 SPEC. ISS.), 1035–1054. <https://doi.org/10.1111/j.1540-6520.2008.00271.x>

Appendix

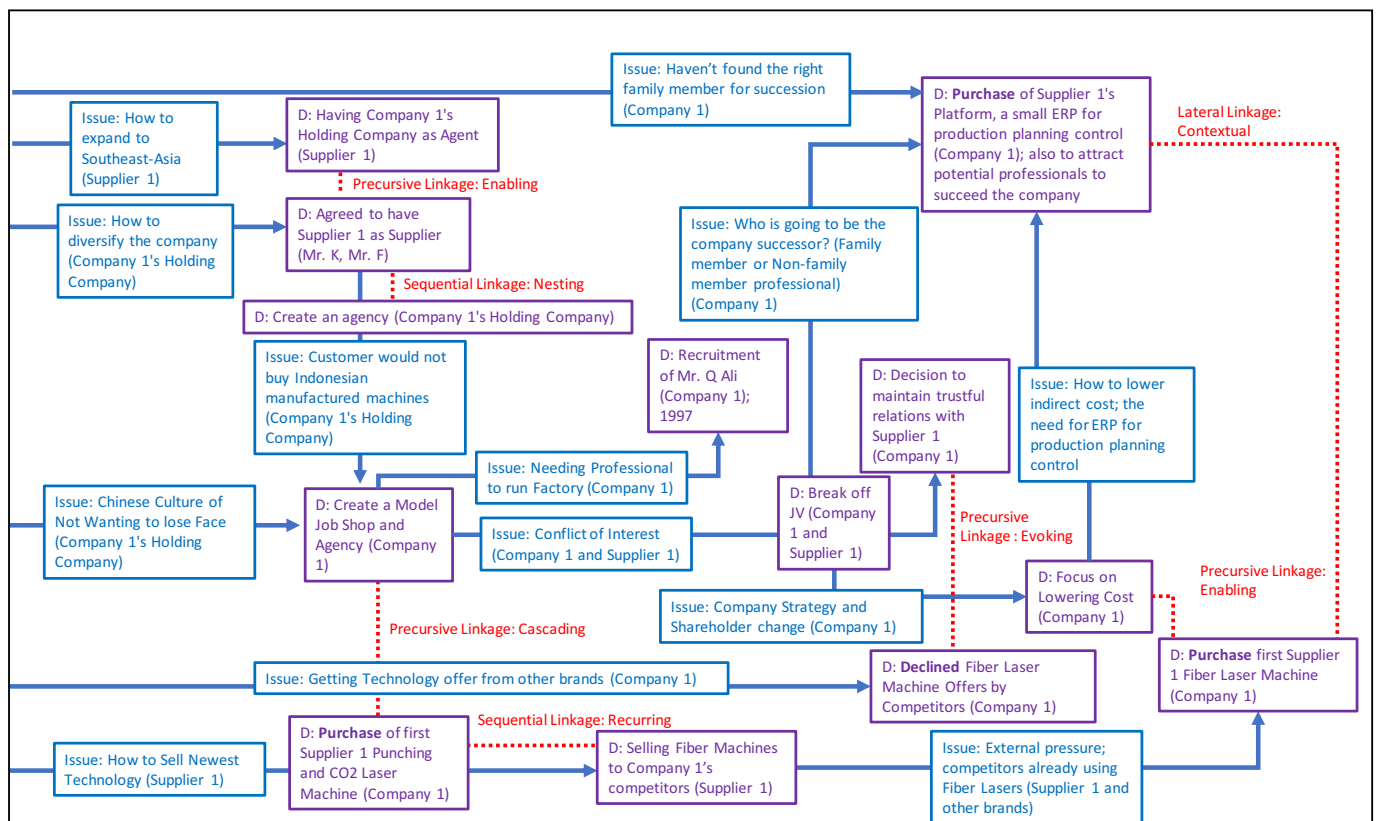


Figure 19. The issue network of company 1

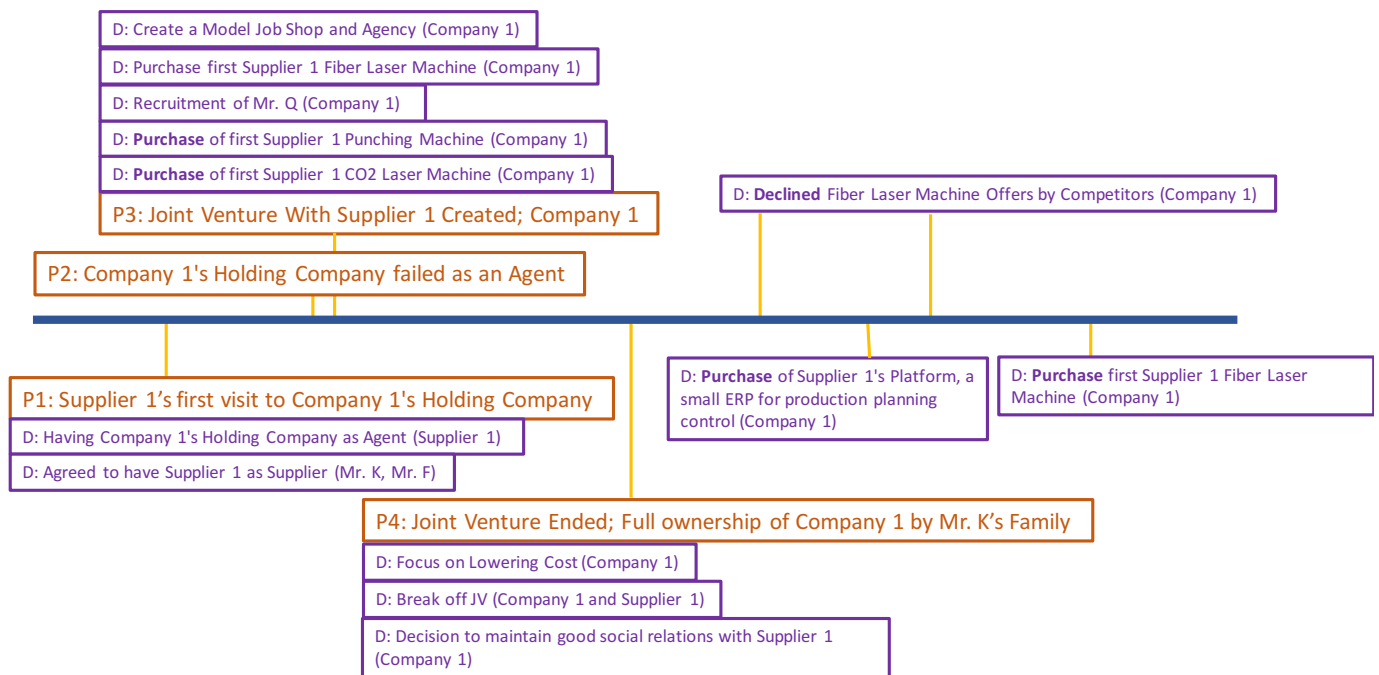


Figure 20. The event map of company 1

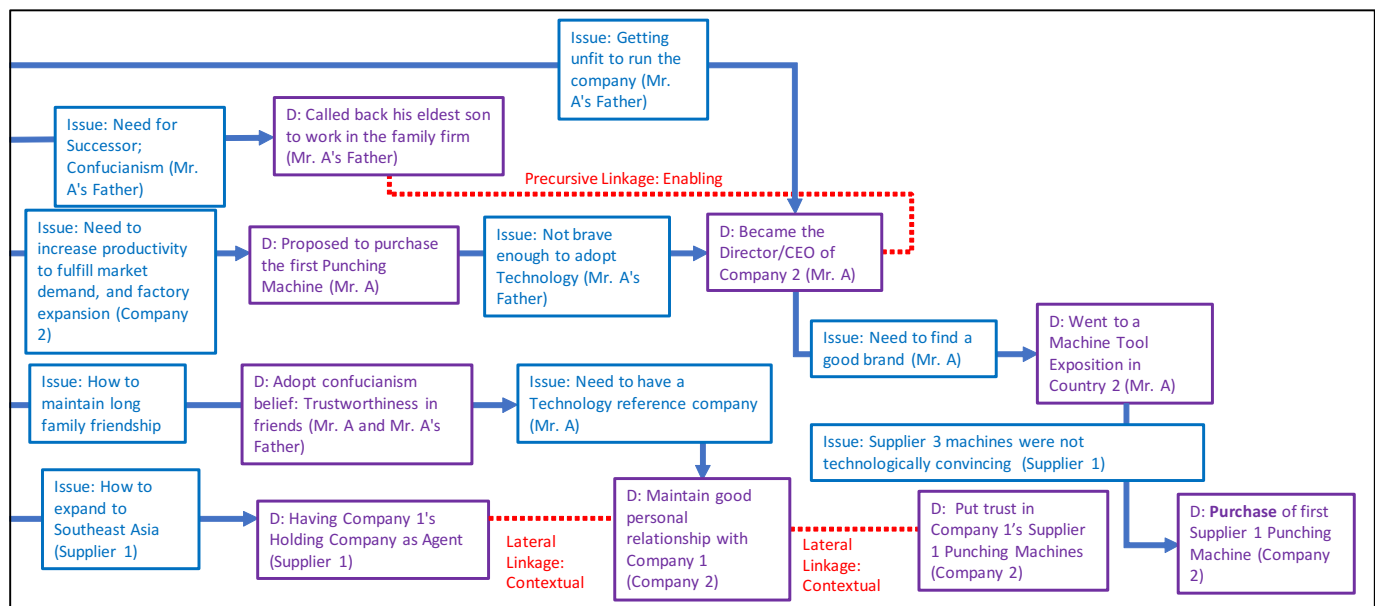


Figure 21. The issue network of company 2

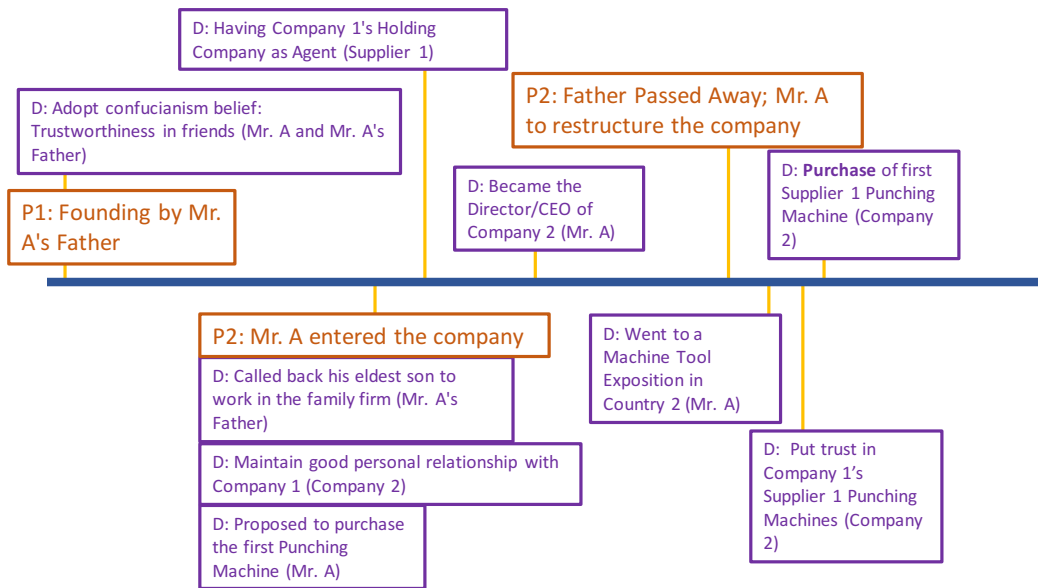


Figure 22. The event map of company 2

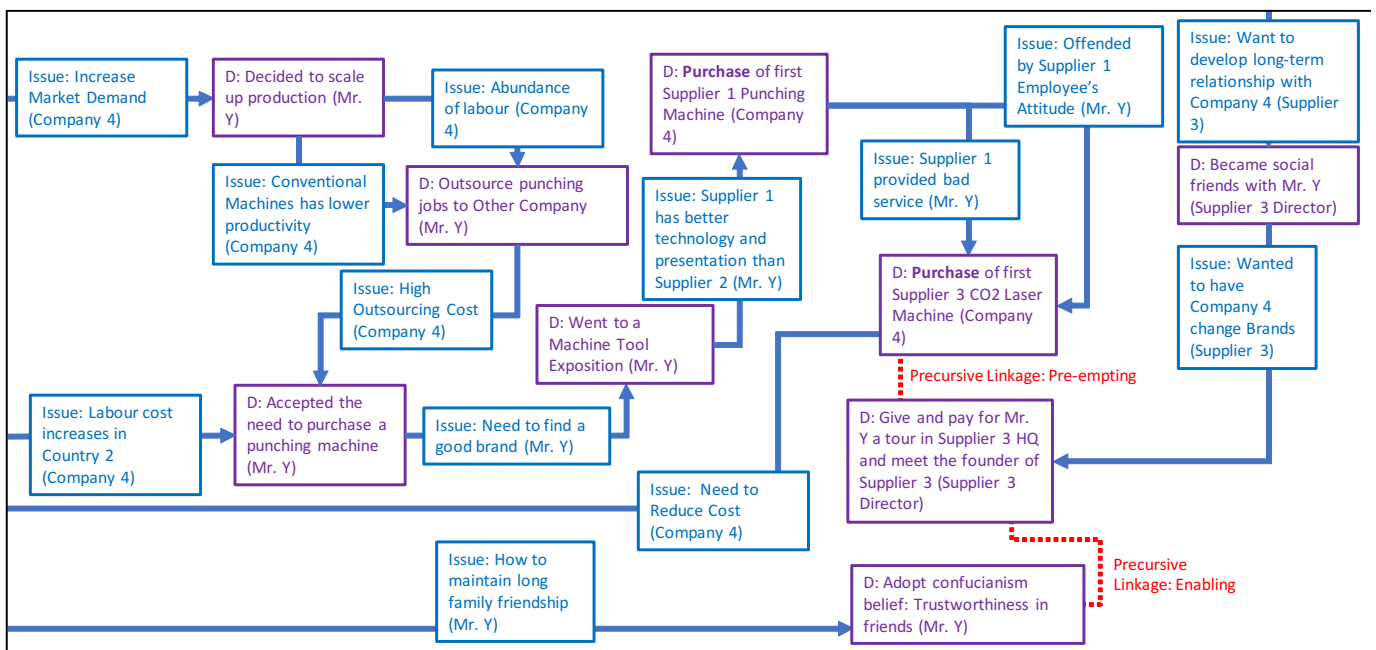


Figure 23. The issue network of company 4

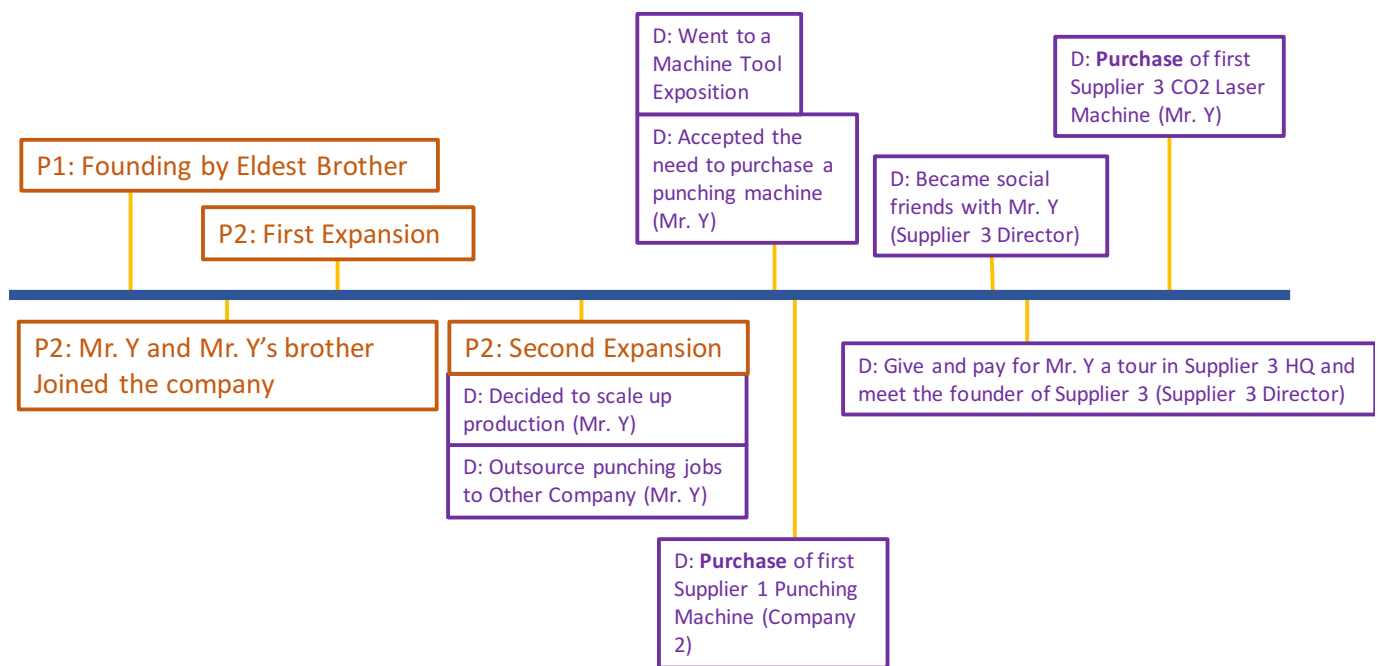


Figure 24. The event map of company 4

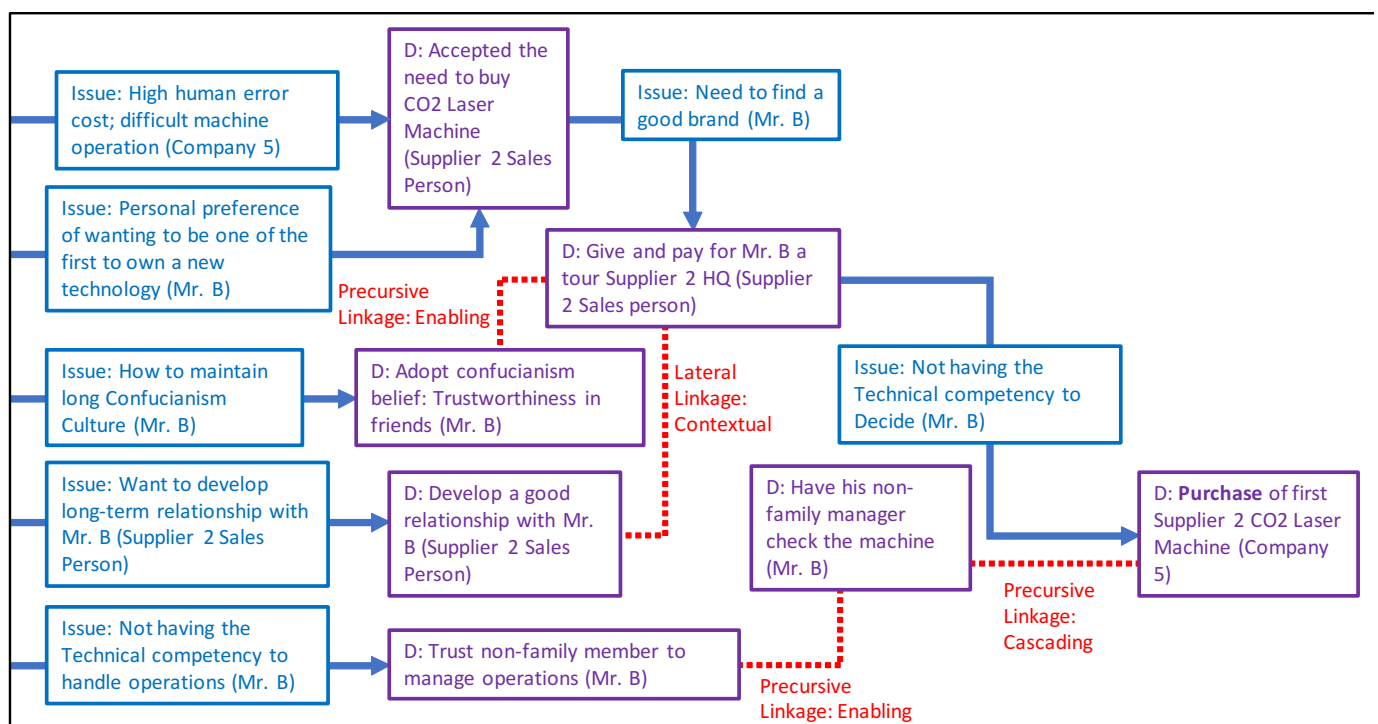


Figure 25. The issue network of company 5

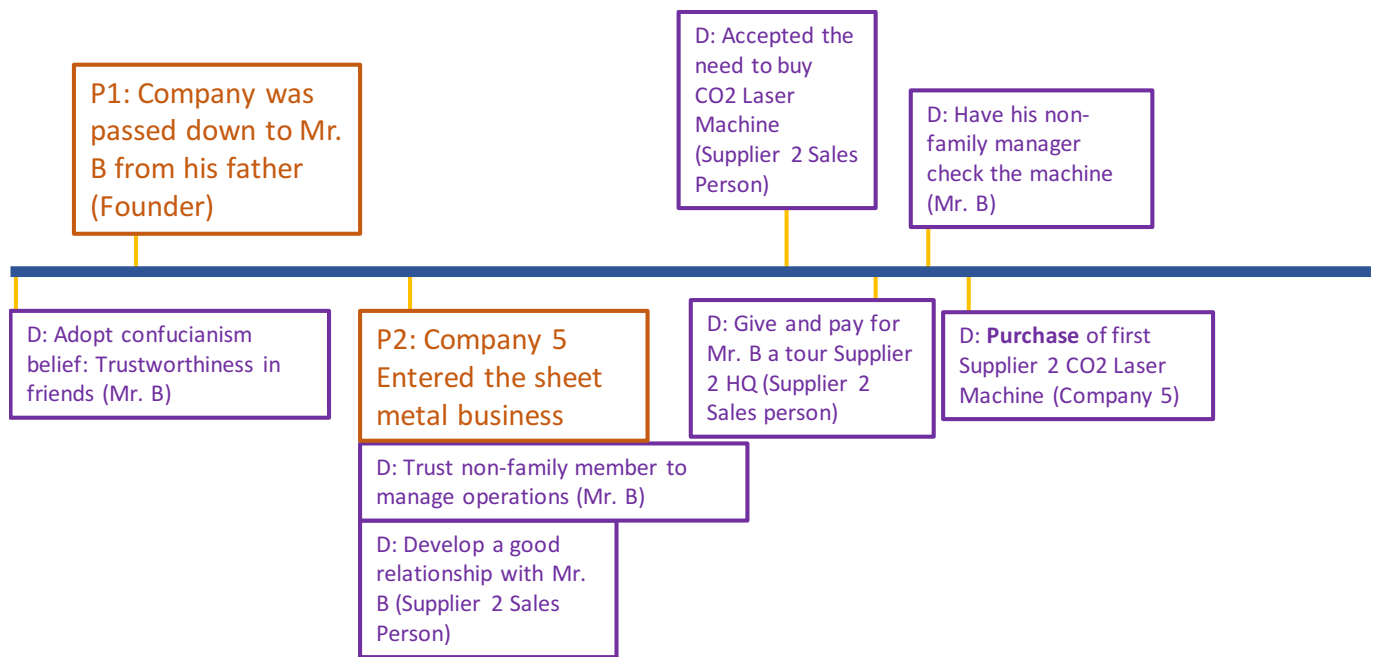


Figure 26. The event map of company 5