

What makes Variation in Investment Decisions in
Similar Firms: A Materiality Perspective

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ABSTRACT

What makes Variation in Investment Decisions in
Similar Firms: A Materiality Perspective

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What makes similar firms respond differently to the emergence of a new institutional logic? I draw on practice theory to study the differences between firms that are largely similar in the conventional macro-institutional differentiators such as position, structure and governance. To do so, I conducted a qualitative study inside two firms in the automobile industry in Jamshedpur, India and discuss that in conjunction with the cognitive (head) aspects of strategy making, the daily practices may (hands) provide a complimentary understanding. I find, surprisingly, that a machine can have an agentic role to play in a firm's response to a new institutional logic and this response could vary depending on the impact that a firm's materials have on its supply chain practices, organizational practices and the mindset of top management. Finally, my model of the centrality of materiality conceptualizes the inter-relatedness of the role of materiality, cognitive aspects and daily practices within an organization.

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CONTRIBUTION OF AUTHORS

Harshil Dokania contributed to the idea generation, to the design and implementation of the research, to the analysis of the results and to the writing and editing of the manuscript.

Dr. Jisun Yu supervised the entire research process for this thesis. She helped with developing the research idea, theoretical framing, the empirical design and analysis, as well as the writing of the thesis.

TABLE OF CONTENTS

INTRODUCTION.....	1
LITERATURE REVIEW.....	4
ORGANIZATIONAL RESPONSES TO INSTITUTIONAL COMPLEXITY.....	5
Positioning.....	5
Structure.....	6
Governance and Ownership.....	6
Identity.....	6
PRACTICE THEORY.....	7
Culture As Toolkit.....	10
METHODS.....	11
EMPIRICAL CONTEXT.....	11
DATA COLLECTION.....	12
Qualitative Data During Field Observations.....	13
Interviews with Top Managers.....	14
Data Analysis.....	15
FINDINGS.....	16
SIMILARITY AND DIFFERENCES IN CULTURAL REPERTOIRE.....	16
Investa’s Orientation: Risk-Taking and Growth.....	19
Novista’s Orientation: Caution and Quality.....	22
MATERIALITY OF CNC MACHINE.....	24
INDUSTRY WIDE IMPACT OF CNC.....	24
Impact on Supply Chain Practices.....	25
Impact on Organizational Practices.....	27
Mindset of Top Management.....	29

DISCUSSION.....	30
THE CENTRALITY OF MATERIALITY AT INVESTA.....	30
THE SOCIAL CONTEXT OF MATERIALITY.....	32
THEORETICAL CONTRIBUTIONS.....	33
MANAGERIAL CONTRIBUTIONS.....	34
LIMITATIONS AND FUTURE RESEARCH.....	34
CONCLUSION.....	35
REFERENCES	36
APPENDIX.....	41
QUESTION BANK.....	41
LETTER OF PERMISSION.....	43
COMPANY ACCEPTANCE LETTER.....	46
ETHICS CERTIFICATE.....	47

INTRODUCTION

The culture at [Investa] is one of hard-work and risk-taking. Industry 4.0 is an opportunity to leave our competition behind and grow exponentially. Better preparation will lead to smarter investments.

- President from Investa(pseudonym)

[Novista's] culture and pride is reflected in its dedicated work-force and loyal customer base. Industry 4.0 is an abstract concept that need not be looked at just yet. When the time is right, we will start to prepare.

-Director from Novista(pseudonym)

Worldwide enterprises have favored to conduct their manufacturing processes in countries that can provide cheap labor (often combined with relaxed political and legal practices) such as India. Such environments have enabled foreign enterprises to exploit both human and material resources for profitability. At the same time, however, the same local conditions have provided substantial challenges to foreign firms as learning and accommodating local business practices were often difficult for them. Therefore, as an alternate approach, in order to promote domestic manufacturing and stay competitive, engineers in Germany have begun to use innovative technology to build a manufacturing supply chain that would need little to no labor. The competency of the internet, combined with advances in robotics and automation, provides a means, if and when achieved, for achieving competitive costs by a drastic reduction in manual labor costs. This is termed as Industry 4.0 (I4.0 *hereafter*).

The global emergence of the notion of I4.0 has created a new institutional logic in Indian manufacturing industries. Interestingly, some firms in India have noticed it and made aggressive strides towards making investments in I4.0 technologies. Others, on the other hand, have taken a more cautious approach toward I4.0 with more acute recognition of the value inherent to their geographical location. For instance, Jamshedpur in India is a city that was developed primarily for manufacturing needs. In addition to the country's cheap labor, this city also offers the cheapest power supply in India, which adds further benefits to those that choose to manufacture in that location. Although local firms in this city are largely embedded in the same geographic

and historical conditions, they have shown heterogeneous responses to the emergence of the new institutional logic – I4.0, ranging from aggressive investing to cautious following.

My research question involves an examination of why similar firms embedded in the same industry and geographic context would respond differently to the emergence of a new institutional logic. In explaining the heterogeneity in firm responses to institutional complexity, the extant literature has identified several attributes such as an organization's field position (e.g., central vs. peripheral), structure, ownership, governance and identity as factors that shape different organizational responses under institutional complexity: these factors frame how firms perceive and construct the repertoire of responses available to them (See Greenwood et al, 2011 for a brief summary). Despite substantial advances in knowledge on heterogeneous organizational responses to institutional complexity, there still is a limited understanding of why firms, especially when they are similar along the aforementioned attributes, would show different responses to an emerging institutional logic. The purpose of my thesis research is to fill this gap in the literature. In particular, I point out that the conventional macro-institutional research seems to be limited in its explanation of why firms in similar positioning and structural arrangements react differently to the emergence of a new institutional logic. More specifically, I follow the recent critique on the institutional literature, which suggests that with its historical focus on the environment and macro-perspectives, the institutional literature thus far has not fully acknowledged the role of individual action of people in organizations (Becky, 2011; Barley and Kunda, 2001).

Building on these new insights from the recent scholarly conversations, my research takes a more intimate observation of firms *in similar field positioning and structural arrangements* in order to provide a deeper understanding of micro-mechanisms that drive heterogeneous responses of firms toward a new institutional logic. This focus on micro-mechanisms is closely aligned with the recent surge of institutional studies that take a more micro-perspective based on the observations of daily workings within an organization (e.g., Rindova et al, 2011; Kellogg, 2011; Vaara & Whittington, 2012). By conducting a close observation of institutional action, Schilke (2018), for instance, finds that strong organizational identification increases organizational decision-makers' resistance to environmental pressure. The shifts of focus to micro-mechanisms in institutional research has provided scholars with a

fresh lens to look at organizations in a more holistic manner and thus has greatly enriched our understanding of how organizations interact with institutions (or vice versa).

While extending this stream of institutional research on micro-mechanisms, I further point out that prior studies in this stream have predominantly relied on cognitive mechanisms that drive firm decisions such as framing, identity, and identification (Bechky, 2011; Powell & Bromley, 2015; Schilke, 2018). This places large emphasis on the cognitive aspect, i.e., what goes on inside the head of actors. Less emphasis is placed on the actual practices of those actors within an organization. To complement the cognitive-based research stream, I use the literature on “practice theories” as my theoretical guide for investigating why similar firms show heterogeneous responses to the emergence of the new institutional logic – I4.0. Practice theory has the distinct ability to link macro and micro practices and develop a dynamic understanding of structure and agency (Vaara & Whittington, 2012). This integrated understanding of strategy helps capture the *hands* of an organization and complements the literature that captures the *brains* of the organization. One manifestation of practice theories for organizational research is the culture-as-toolkit model (Swidler, 1986). The conceptualization of a firms’ resources as a “grab bag” provides a picture of the agentic use of resources, while embedded within the larger structural context. The flexible usage of resources as and when needed provides an understanding of practice that is equipped to explain how firms not only assemble resources in a manner that is advantageous but also deploy these resources strategically (Weber and Dacin, 2011). This perspective allows for a broad range of enquiry about the daily routines and mundane practices and a deeper examination of what actually goes on within individual organizations.

To examine these daily practices of firms, I conducted a qualitative study in two firms in the automotive manufacturing industry in Jamshedpur, India. Despite their various similarities, the initial sample of ten firms showed variation in their responses to I4.0. Since the primary motivation of this research was to build a theory based on the observation of micro-practices (Strauss and Corbin, 1990), I chose two firms that have made contrasting investment decisions pertinent to I4.0. The firm with the maximum investment was given the pseudonym “Investa” and the firm with minimal investment was given the pseudonym “Novista”. Using primary qualitative data from observing the daily practices and semi-structured interviews, I confirm that both firms were similar not only in terms of their structure and field position but also in their

access to social, political and cultural resources (Rindova et al, 2011; Kellogg, 2011). Further, a striking finding was that Investa's adoption of the Computer Numerical Control Machines (C.N.C. *hereafter*) in the past led to a series of changes and manifested as the primary reason why this firm has made aggressive investment decisions favorable to I4.0 whereas Novista has not. The mass implementation of the C.N.C. has an impact on Investa's supply chain, organizational practices and mindset of top management in a manner that, in combination, re-enforced and favored the attributes of risk-taking and innovation. Novista, on the other hand, did not invest in C.N.C. in the past and continued to follow its developmental path using a low-risk and low-cost approach.

Based on this observation, I suggest that a machine (C.N.C. in my case) can have an agentic role to play in shaping a firm's responses to a new institutional logic. More specifically, my analysis using the qualitative data demonstrated the long-term impact that the machine had on the firm in terms of how the firm engages with a new institutional logic -- I.40. This finding makes some important contributions. First, it adds to the recent enquiries on micro-institutional research by showcasing that material artifacts may have centrality to an organization's strategy. Second, it shows that macro-institutional literature may not have fully addressed the reasons behind heterogeneous responses of firms to an institutional logic under complex institutional conditions, and a practice lens in this regard provides a useful basis for deeper understanding. In this research, I discover the agentic role of the machine on organizational strategy and call for more research that elaborates the enabling or constraining impact that strategy has on the material. This would enable an understanding of both the material constitution of the social and the social constitution of the material (Orlikowski, 2005). The role of materiality in this context and its effect on the daily practices of a firm suggests that research in practice theory needs to acknowledge the role of materiality in organizational strategy. The manufacturing industry, ripe with materials, provides a good context for such enquiry.

LITERATURE REVIEW

As is customary with inductive, grounded approaches to theory building (Suddaby, 2006), I developed a preliminary understanding of management literature that dealt with firm responses to institutional complexity. Since this literature seemed to be unable to explain the varying

responses of the firms in my sample, I draw on the knowledge about the practice lens. Within this literature, the culture-as-toolkit (Swidler, 1986) lens proved to be useful as it can facilitate the field observation on the daily practices of the chosen firms.

Organizational Responses to Institutional Complexity

The literature on institutional complexity has evolved to embrace the notion of institutional logics (Friedland & Alford, 1991). Organizations are faced with multiple, often competing demands and must make decisions based on the limited information they possess. (Lounsbury, 2001; Pache & Santos, 2010). In the current study, my primary focus is on understanding how an organization responds to institutional complexity resulting from the emergence of a new logic. In the early institutional literature, there were two contrasting views with regard to how organizations respond to a new institutional logic: firms may have agency, and an increase in ambiguity increases the extent of discretion (Goodrick & Salancik, 1996). Or, firms may not have agency and the institutional environment and isomorphic aspirations might dictate their actions (DiMaggio & Powell, 1983). The literature has advanced significantly, and more recent studies have found positioning, structure, governance and identity as the primary differentiators between firms that explain heterogeneous organizational responses under institutional complexity. These factors are reviewed below.

Positioning

Organizations are influenced by their relative positions in the institutional fields. Institutions, in this sense, belong to either central or peripheral locations and this impacts their responses to complexity (Leblebici et al, 1991). Greenwood et al (2011) suggest that central positioning, measured in terms of size and status, is a double-edged sword. In contrast to its economic advantages, the centrality of an organization leads to a reduced flexibility, resulting from deep embeddedness into the norms of the institutional environment (DiMaggio & Powell, 1983). The peripheral organizations, on the other hand, are not so restricted in the ability to react either favorable or against the emerging phenomenon of complexity. In fact, they could be ‘insensitive to the newly emerging complexity.’ (Greenwood et al, pg. 342). Lying at the periphery of the corresponding institutional field, fringe organizations tend to allow for deviation from established practices and norms. Due to the nature of their reduced connectivity to their more institutionalized counterparts, these organizations are less aware of the institutional complexity

that surrounds them. (Davis, 1991; Westphal et al, 1997) and are likely to favor radical new practices (Leblebici, 1991).

Structure

Organizational communities “quite likely differ in their awareness of and receptivity to institutional pressures” (Delmas & Toffel, 2008:1032; Greenwood et al, 2011). The presence of multiple communities due to a large number of layers in the organization may result in the formation of multiple sets of meanings. In addition, the varied interpretations of meanings attached to complexity could lead to an increase in resistance if an organization has a more complicated structure (Leonardi, 2011). The complexity could also affect the repertoire of responses available, thereby influencing the responses of the organizations. (Swidler, 1986; Greenwood et al, 2011). Hence, organizational structure matters in not only “shaping how organizations experience complexity” but also in “determining the repertoire of responses available.” (Greenwood et al, pg. 344).

Governance and Ownership

Members of the organization that are in powerful positions tend to dictate which logic the organization engages with. Conditions of ambiguity result in interpretations of complexity in a manner that is influenced by preferences. (Miller et al, 2010). Family firms are slightly different in that certain logics are prioritized over other ones, due to the embedded nature of firms owned and managed by members of a family. Community norms, in such cases, are usually prioritized (Greenwood et al, 2011). Therefore, it follows that the composition of ownership plays a significant role in determining how receptive an organization is to a particular logic, especially during times of competing and complicated logics.

Identity

While the above mentioned categories (ownership, structure and positioning) have been studied extensively, organizational identity has only been recently recognized as a potential filter for organizational response to complexity (Greenwood et al, 2011). One advantage of picking this filter is that researchers can examine responses both at the institutional level and at the level of the organization. At the institutional level, identity is important since it provides firms with a sense of belonging. A new food business owner may, for example, choose to operate as a restaurant and not a café and this would allow and restrict certain actions. At the firm level, identity may shape which repertoire of responses are developed by the firm (Sharma, 2000).

An examination of organizational identity has brought in more micro-aspects of organizational research such as aspirations, beliefs and values and provides an alternative lens by which organizational responses may be examined. Here, the emphasis is placed on the cognitive aspects of individuals and managers (Bechky, 2011; Powell & Bromley, 2015; Schilke, 2018). Micro-institutional research on identity has provided rich and novel insights into some of the reasons behind the contrasting decisions of firms. Especially in the case of family firms, where the influence of the founder is high, identity plays an important role in determining the actions that a firm takes (Miller & Miller, 1983). This research enhances our understandings of the causal mechanisms between institutional complexity and organizational responses.

Despite the notable advances in knowledge development, the current literature has put a greater emphasis on the cognitive aspect and less on the actual practices of members of an organization. Consequently, while identity may describe part of the reason why firms respond differently to the emergence of a new logic, stating it as the primary differentiator may provide an incomplete picture of the comprehensive reasons behind the responses. In this respect, the practice perspective can offer a complementary hand to further the knowledge developed thus far. Since there may be a discrepancy in what goes on in someone's head and the actions that are performed, theories on practice may also be used to examine whether the actions of actors' complement or contrast their cognitive beliefs. It may help bridge the gap not only between conscious and subconscious but also between agency and structure. For these reasons, I investigate why two largely similar firms, responding to the same institutional complexity, engage in radically different practices. In order to facilitate a research direction that appreciates the role of identity and adds to its missing components, I utilize the practice theory literature in a complimentary manner to previous research.

Practice Theory- Strategy in Action

Practices are 'the accepted way of doing things, embodied and materially mediated, that are shared between actors and routinized over time' (Vaara & Whittington, 2012: pg 2). Practice theories highlight the co-constitutive aspect of structure and action i.e. social structures emerge from the situation action they also condition (Lounsbury & Beckman, 2015). This understanding provides a more inter-related and dynamic concept for management scholars. It allows for a

reconceptualization of strategy not as something that is purely deterministic or agentic but as *something that actors do* (Whittington, 2006).

Practice theory stems from the debate between structure and agency, not only in management science but also in the entirety of social sciences. Until the 1990's, the predominant school of thinking looked at the structural embeddedness of firms in their environment (Granovetter, 1985). Researchers that applied this framework to organizational studies explained that the environment exerted pressure on actors and this pressure influences their actions. Organizations adopted practices that were institutionalized in society and did so in an attempt to increase their legitimacy (Meyer and Rowan, 1977). They had goals that cater more to their attempt at being legitimate than internal functioning. Clearly, the prevalence of terms such as isomorphism and determinism reflected an insignificant role of agency. In the 1990's and early 2000's, as a response to overly deterministic studies, scholars emphasized the role of agents and discussed that actors make decisions from their own discretion and power (Greenwood & Suddaby, 2005; Hardy & Maguire, 2008; Battilana & Roxenbaum, 2008). Providing actors with a role that exceeded simply conforming to field-level commands, these scholars found that agents could help initiate structural change (Colomy & Rhodes, 1994). Theories of institutional entrepreneurship painted a picture of intrepidity and suggested that even single actors could play a role in shaping institutions (Eisenhardt 1980, DiMaggio 1988). This was a departure from the literature that favored stasis. (Battilana et al, 2009, Holm, 1995). Soon enough, however, research in this field was criticized for heroic accounts of actors.

One of the recent manifestations of this longstanding debate between structure and agency has been the emergence of practice theory. Reconciling the differences between two opposing perspectives, scholars that subscribe to this theory suggest that in order to better understand the actions of actors, observations of the daily, mundane practices need to be made (Swidler, 1986). Two sociologists that were influential in this stream of knowledge are Pierre Felix Bourdieu and Anthony Giddens. Habitus, one of Bourdieu's most influential concepts, refers to the deeply engrained habits, skills and dispositions that we possess as a result of our experiences. Just as a golf player knows how and where he has hit the ball without even looking at where the ball went, we all possess a certain intuitive skill that guides our actions in daily life. And this intuitive skill is a social process and neither the result of free-will nor determined by structures (Bourdieu 1984: 170, Navarro, 2006). He suggested that practices and structures are

shaped unconsciously and without any intentional pursuit of coherence. Giddens's theory of structuration (Giddens, 1983) also examined this duality of individual and social forces. Although actors are not entirely free to choose their own deeds, they are the makers of the social structure. They can, by virtue of this agency, create institutional change. This perspective acknowledges that while practices are embedded in structure (high class people act differently from lower class people), there is an agency component that allows actors to act based on their discretion.

In the last two decades, organizations and management scholars have increasingly picked this lens. In strategy literature, for instance, this practice perspective has been widely applied with the specific keyword, strategy-as-practice (Whittington 2006; Vaara and Whittington 2012; Jarzabkowski and Spee, 2009) as well as in organization theory literature under the notion of institutional work (Lawrence and Suddaby 2006 ; Zietsma and Lawrence. 2010). The SAP approach in particular moves the debate beyond either structure or agency and encapsulates practitioners (actors that perform the strategic actions), practices ("the social, symbolic and material tools ") and praxis (the flow of activity that helps enact strategy) (Jarzabowski & Spee, 2009: 70; Lounsbury Beckman, 2015). This shows the nested nature of structure, agency and the surrounding social environment and together, these three facets of the approach show that actors are part of this broader social sphere and engage in activity. (Whittington, 2006) This inter-relatedness forms a central part of this recent re-conceptualization of strategy, is in its nascent stage, and needs more theoretical and empirical work. Lawrence and Suddaby (2006), credited with the notion of institutional work, also shift the focus away from the 'iron cage' of structure to purposeful actions by actors that are aimed at creating and changing institutions. Zietsma and Lawrence (2010) use longitudinal analysis to show how agents can create change to the institutions in a field that they themselves are subject to. These have all provided valuable insights into the consequences of everyday action in organizational strategy and in conjunction with micro-institutional research, can provide a compelling direction for strategy scholars.

Research on micro-institutional work focus on elements of cognition, aspirations, beliefs and values and seems more complete once they are followed up by 'habits, skills and styles' that allow actors to convert them into practice. (Swidler, 1986). There are practical examples of a preferred ideology not working out as intended all around us. Take technology implementation for example: while the intention behind implementing a technology in a workplace may be noble

and well thought out, the actual practice of implementation and usage by actors on the shop-floor may be very different from the prescription handed out in a manual. Since there seems to be the possibility that, in some cases what is intended and what is executed may not be the same, it is important to incorporate ways to appreciate the actual practice in theory. Hence, a combination of practice theory and research on micro-institutional work seems adequate to examine the strategic decisions of managers. One theoretical perspective that lies within the broader concept of practice theory is Ann Swidler's 'culture-as toolkit' model, which is discussed below.

Culture-as-toolkit. Swidler's concept provides an interesting lens to view a firm's resources and practices. In her groundbreaking paper, she contested the existing notion that members of the poor community did not see the value in education. Using case-study method, she found that the members did, in fact, recognize the value but did not possess the "repertoire" of actions that facilitates action upon the recognition (Swidler, 2006). She suggested that a repertoire consisted of a grab-bag of resources that actors could choose from. This flexible conceptualization of strategy, within the broader scope of practice theory, means that actors have the agency to enact their practices, using their resources, in a flexible manner. This model was soon used widely by researchers and showcased its applicability at the organizational level. Lounsbury (2001), for example, showed that university students used tactics employed by the National Recycling Coalition to encourage actors to reuse materials, thereby promoting recycling practices on their campus. More recently, Giorgi et al. (2015: pg 21) presented a model that recommends that whilst values are deterministic, during times of environmental change, an organization "may need to mix and match from different toolkits and repertoires to make sense of its identity or update its business model" (Tripsas & Gavetti, 2000). This model promotes the idea that neither values nor toolkits have greater inherent values and are, instead, having an effect on each other and as a combined result, resulting in resource commitments and management decisions. It is more holistic and captures a more nuanced understanding of strategy which is intertwined in both the cognitive and practice aspects. Greater breath in the cognitive aspects combined with a more diverse toolkit of resources could provide an organization with greater horizons of possibility (Giorgi et al, 2015) due to possessing of a wide array of repertoires of action (Small et al,2010). This combination may have a role to play in the strategic decision making of firms in their response to a new institutional logic.

METHODS

Empirical Context: Automotive Component Manufacturing Industry in Jamshedpur, India

The automotive industry in Jamshedpur provides a unique setting for researchers, given the various similarities across the firms that operate in the area. Jamshedpur, also called Tatanagar, is named after the founder of the global conglomerate Tata Group, Jamsetji Nusserwanji Tata. The city was built by the Tata Group in 1919 to facilitate the manufacturing opportunities that resulted from India's Industrial Revolution in the latter part of the nineteenth century. Easy access to ports and availability of cheap labor were identified as important advantages of the geographical region of Jharkhand (then still known as Bihar). The automotive wing of the Tata Group, Tata Motors, was founded in Jamshedpur in 1945 and led to the birth of several other small firms in the automotive parts manufacturing industry. These firms benefited from the outsourcing opportunities that came from Tata Motors' manufacturing requirements and became bigger players over time.

The firms in this study, Investa and Novista, belong to the group of firms that were founded in the late 1990's as a result of favorable economic policies by the government that promoted entrepreneurship. These family-firms, founded in 1996, enjoyed success over time and at the time of the study, had similar positioning and structure (Greenwood et al, 2011). They are also similar in the products they make and the customers they serve, including Tata Motors. Despite these various similarities, their contrasting decisions with respect to investing in innovative technologies related to I4.0 provides a research setting worthy of deeper examination.

The primary activity they are involved with is called "machining". The process of machining refers to the removal of unwanted raw material from a work piece to produce the desired shape. Cutting tools are used to perform these removals and technologies related to this process have evolved over time. Developed nations such as Germany and Japan have developed and invested in these technologies to offset the high costs of human labor. However, in India, where the availability of cheap labor is plentiful, the adoption of these technologies has not been uniform. This has caused a divide in the industry, where some firms invest heavily but others do not. During the time of the study, Investa was engaging heavily with I4.0 technologies whereas Novista was maintaining its manual manufacturing processes.

I4.0 is a new concept for the manufacturing process. This concept incorporates the advantages of automated machines that are able to convey data to other automated machines using

the internet. This potential ability of a manufacturing process to operate without the need for human assistance has generated considerable interest and uncertainty. Originated in Germany, as an attempt to compete with low-cost markets such as China and India, I4.0 has taken on a number of different names such as “High Tech Strategy” in The United States and “La Nouvelle France Industrielle” in France. However, the high costs related with investing in technology that is in its early stages of development, coupled with cheap labor prices has caused irregular adoption patterns among firms in India. The abstractness of this concept and the resulting ambiguity causes challenges in its interpretation and resulting investment decision-making. This variety of different investment decisions can have a significant long term impact on the Indian economy, given that 16.75% of the country’s GDP comes from the manufacturing sector (CII, 2011). Despite their various similarities and observed difference related to I4.0, both firms are successful and provided a compelling empirical setting to examine why, in times of uncertainty, similar firms make contrasting strategic decisions.

Data Collection

Grounded theory (Corbin & Strauss, 1990; Glaser, 1978) was chosen as the qualitative methodology. Following Gersick (1988) and Pettigrew (1988), I followed a deliberate, theoretical sampling plan (Eisenhardt, 1989). This sampling selection was done purely on the basis of free access to the production sites and an agreement with the top managers that allowed for the collection of qualitative data, attendance in weekly board meetings and one-on-one semi-structured interviews with top management. This access was promoted by the fact that I grew up in the city of Jamshedpur and had indirect ties with members of the automotive industry. The sampling did not affect the results obtained in the study, since the primary purpose of this inductive research was to look at the phenomenon and produce theory. Generalizability was not of concern at this stage. For the purposes of the rest of the study, we will refer to the firm with no investment as Firm Novista (pseudonym) and the firm with some investment as Firm Investa (pseudonym). The cases selected were two extremes of investment since this allowed for transparent observation of the phenomenon of interest.

I use primary data from qualitative fieldwork comprised of immersion into daily routines, semi-structured interviews and attendance at board meetings. To collect data, I traveled to Jamshedpur, India in December 2018 to do a pre-study analysis of the firms in the automotive

component manufacturing industry. The directors of ten firms were interviewed in a casual manner and asked about their firm's investments related to I4.0 technologies. This represented a good sample of firms out of the 45 firms in Jamshedpur that engaged in auto-component manufacturing. Based on interview data, it was found that 5 firms had no investment, 4 firms had some investment and 1 firm had a lot of investment. To assist with building theory about similar firms and their contrasting investment decisions, one firm with minimal investment and the firm with maximum investment were chosen.

One of the challenges identified early on was information-processing bias and in order to counter this, multiple sources of data were considered. Following Eisenhardt (1989), interviews, observations, archival data and qualitative data were combined to provide triangulation and stronger substantiation. To compare and contrast the micro-practices of the firms, the data was used to create their cultural repertoires. In order to do so, the following sources of data were used: 1. Qualitative data during field observations; 2. Interviews with Top Managers

Qualitative data during field observations. In order to better understand the daily routines and practices of the firms, I spent three weeks with the firms, observing their daily practices and interacting with the workers on the shop-floor. I did this to better understand their cultural repertoire and develop deeper knowledge about the activities of the firm. The ability to access the sites without restriction meant that I could make observations at different times of the day and week. This provided confidence in the emerging data since it was supported by multiple instances of occurrence. There were also some very interesting single occurrences that provided invaluable data on the firm's responses to internal and external changes. Some of these included the external auditing process, the hiring and training of new employees, the installation of new equipment and both firms' response to an industry downturn.

At the end of each day of data collection, the notes taken would be transferred to a master notebook in an organized manner and all data collected was included at this stage. In the same page as the notes, a column was built to pose questions for future enquiry. This served as a reminder about the research question: why do similar firms respond differently to the emergence of a new institutional logic? The abundance of data available was challenging to streamline and this daily practice ensured the accountability to the research objectives and an iterative process

that provided rich, first hand data about the daily practices of the firms. The data collected was textual and proved to be the primary source of knowledge.

Interviews with Top Managers. The top management at both firms comprised of members in the founding family. At Investa, the father and son interviewees were the chairman and managing director respectively. At Novista, the father and son were the managing director and executive director respectively. They are referred to by their work designation since all of them requested for anonymity. The interviews were conducted at the conference rooms of the firms and were semi-structured. As a qualitative researcher, I wanted to have an open conversation about various topics related to the firm since that was better suited to receiving atypical answers to interview questions. The challenge was to go beyond the initial formality surrounding interviews and facilitate a discussion that would provide insight into the mindset of the founder, the historical trajectory of the firm related to investing and the plans for the future since these were not available in the data collected during the qualitative fieldwork. The aim was to collect data that would help paint a picture of the orientation of the firm in the eyes of their founders, since the decision-making power of the founders in family-based firms is often very high.

The interview was audio-recorded and transcribed into verbatim data. To capture more data, I took additional notes as and when I could, especially during lengthy answers. There were some challenges that were faced during this process since the meetings were sometimes interrupted by members of the staff or noise from the operations in an around the meeting room. In such situations, I transcribed the data to the best of my ability and marked it as an unsure line of data during the data analysis. For the purposes of this study, I did not use the data in those lines which may have resulted in the loss of some valuable data that could have provided additional insight.

Permission for the interviews was granted on the back of an email requesting participation and the terms and conditions were explained before the start of the interview. The managers were informed that the interview would be recorded and transcribed and they had the option to opt out of the interview at any stage. Once the interview was completed and data analysis began in March, 2019, the data could not be revoked for a period of 5 years. At the end of this period, the files would be destroyed. The process went smoothly for both firms and their managers and no such measures had to be taken. I informed them that a copy of the result would be shared with them upon completion so that they could benefit from insights produces during the course of this study.

Data Analysis

In investigating the reasons why two firms, similar in structure and positioning, made different decisions regarding their recent investments in innovative technology, my initial analysis was guided by the practice theory perspective in general, and the culture as toolkit perspective, in particular. The primary source of data was field-notes collected during multiple trips to Jamshedpur, India and the instruments used were qualitative notes taken during shop-floor observations and semi-structured interviews. The two firms were studied in parallel and in contrast and hence, the analytical method can be described as an qualitative cross-comparison case study. (Eisenhardt, 1989). The examination was grounded in theory (Strauss & Corbin, 1990) and focused on the daily mundane practice and rituals of actors and their interpretation. It was, in addition, guided by and adds to previous literature that looked at firm responses to institutional complexity. (Greenwood et al, 2011).

The data were analyzed in stages. During the time between the first (interviews with top management of the sample of 10 firms) and second trip (observations and interviews at Investa and Novista), I identified the similarity between the firms and pondered reasons why they would react so differently. While this sample of 10 firms was small, it was adequate to notice a variety of responses to the newly emerging logic of I4.0. Since the variation in investment decisions in the sample of firms was clear, in order to go deeper into the field in the role of a qualitative researcher, I decided that it would be best to choose two firms out of the sample. Since the idea was to understand the reasons behind why similar firms make different investment decisions, I chose the firm with the maximum investment (Investa) and the firm with the minimum investment (Novista). After the second visit comprising qualitative fieldwork, I created a case-archive and a description of data from both firms, following the prescriptions of case-based research (Yin, 1998). I established a timeline of the main similarities and differences in their strategy and the historical, social and organizational contexts within which the changes took place (Harrison & Corley, 2011). It also served to reinforce the earlier reported similarities of Investa and Novista in terms of positioning, structure and governance. 2006 was identified as the initial point of the change process since the initial investments in innovative technology were made by Firm Investa. After identifying this inflection point, I mapped out a brief roadmap of the path that the study would take henceforth. This whole process of analysis was facilitated by intensive discussions with my thesis supervisor and this process provided confidence that the interpretations were not biased.

Next, I compared and contrasted the cultural repertoire of the two firms: the primary aim of this qualitative work. Following recent work on the analysis of the cultural repertoire (Weber, 2005), changes in the toolkit between 1996 (founding year for both firms) and 2019 (year of data collection) were observed. The text from qualitative data was coded using line-by-line coding (Charmaz, 2005). This process was beneficial in reducing the large volume of textual data into comprehensible pieces. Next, direct quotes from the interviews were classified into various categories, to be used as supplemental data to the notes from the field. Using multiple sources of data provided stronger belief in the emerging findings. During this final process, there was an ongoing discussion between my supervisor and me. This back-and-forth helped reduce information bias and provided a more neutral understanding of the data collected. This process was important since immersing in the field in the role of a qualitative researcher might result in bias, leading to the formation of less convincing results and resulting theory.

FINDINGS

I begin by comparing the cultural repertoire of the two firms and display their various similarities. I then examine the differences in their repertoire and show that Investa's characteristics of risk-taking and growth orientation facilitated the investments in innovative technology between the periods of 2006-2019. Next, I observed and inferred that the decision to make investments related to I4.0 are closely linked to the impact that investment in C.N.C.s and associated materials (C.N.C Bundle *hereafter*) in the late 1990's. Using both interview and qualitative data, I describe how the C.N.C. impacted the daily mundane practices and mindset of management, constituents of Investa's cultural repertoire. Findings suggest that the C.N.C. has had an agentic role to play in the strategic choices of the top management & influenced their investment heavy response to I4.0. I discuss this finding linking with the concept of materiality.

Similarities and Differences of the two firms in Cultural Repertoire

The examination of daily mundane practices, comprising of routines, rituals and actions, led to the forming of the cultural repertoire of the firms (Swidler, 1986). The applicability of this model both at the level of the individual and the firm allowed for comprehensive observations during qualitative collection. The firms, as identified during the first visit to Jamshedpur, were found to be similar along the various attributes of market position, end customer, organizational structure

and governance. Both these firms were second-generation family businesses that manufactured brake and engine assembly parts. Greater than three-fourths of their businesses catered to their primary customer in Tata Motors. The active involvement of family members in the day to day activities led to a structure without concrete middle management. I summarize their similarities in several key aspects in Table 1.

Table 1: Similarities between Investa and Novista

Category	Investa	Novista
Year founded	1996	1996
No of employees	220	250
Generations in Business	2	2
Customer	Tata Motors (>75%)	Tata Motors (>75%)
Position in Market	Top 5%	Top 5%
Style of Ownership	Family Members	Family Members
Quality Certifications	ISO 14001	ISO 14001
Other certifications	IATF and TS	IATF and TS
Joint Ventures/M&A	no	painting sometimes by undisclosed 3rd party
0 PPM goal	Yes	Yes
Auditing-Internal	Yes	Yes
Auditing-External	Yes	Yes
Internship Program	No	No

Table 2 lists notable differences that I observed:

Table 2: Differences between Investa and Novista

Category	Investa	Novista
Collaborative Robots	6	0
Hiring Process	Indo-Danish Tool Room	Staff Recommendation
Supply Chain	EPR+ Print	chalk board logs, note books
Common area	separate room in office building	area close to machining part
Women in Workplace	Yes	No
Management Communication	Enterprise Resource Planning system	Whatsapp + Weekly meeting
Access to Extra Labor	No	Yes
C.N.C. machines(New)	48	3
Lathe Machines(Old)	5	56
Early entry	Yes	No
Probation period new employees	3 weeks	1 week
Background of TMT	Finance and Advertising	Engineering and Metallurgy
Old Staff in New Process	Yes	No
More Pay in Automation Jobs	Yes	No
Response to downturn	Keeping Staff	Laying off staff

As shown in the Table 2, my analysis suggests that the primary difference between the two firms was that of investments related to 14.0 technologies. Investa had built a strategy around investing in innovative technology to achieve economies of scale, and Novista was focused on developing the cheapest possible product with good quality. However, both firms continued to be successful with contrasting approaches to the machining process. In the sub-sections below, firstly, I discuss the aforementioned features with regards to Investa and, secondly, provide contrasting examples with regards to Novista below.

Investa's Orientation: Risk-Taking and Growth. Risk-Taking and Growth Orientation emerged as a central theme during the observation data collection, interview and data analysis phases. It was facilitated by top management identifying strongly with an approach that involved investing in technologies that were emergent and not adopted widely in their local environment yet. They implemented technology over the years not only as a unique response to environmental uncertainty but also because they believed that it was essential to success in the local automotive industry. During the semi-structured interviews with the top management at Investa, this characteristic stood out. Performing a simple word-count on the data transcribed, the word risk and associated terms such as "risk-taking", "risk-takers" and "risk of implementation" were, by far, the most frequent. The following quote from an interview illustrates such an orientation:

Sometimes we take the risk of implement-implementing you know even if we are not sure about it. But that's the risk that you have to take in business, right, that is the reward that you get of taking the risk in business. So, yeah, so I think we are, we, I consider ourselves to be you know high risk takers, that is why the reward for us is also high.

In addition to risk-taking, the mindset of top management was that of growth. Their response to crisis and attitude toward innovation was highlighted when, during the observation data collection phase, there was a downturn in the economy due to the upcoming Indian elections. The uncertainty surrounding the future of the country's governmental policies led to a reduction in demand for new automobiles. Novista, the other firm in the study, had reduced the number of shifts of operations to adjust for the financial losses caused by the downturn. However, the management at Investa decided to use this time to install a new innovation, an oiling robotic arm based on the dual purpose of improving its processes and educating the employees about the new technology & its impact on their work practices. In fact, the installation of this robotic arm was turned into a day of celebration, and bonding as employees helped themselves to a free buffet lunch and learnt about the new machine. Discourses about the new innovation were handed out in the form of prints, talks with the top management and the external engineer responsible for installation.

In addition, the existing machines were used in unconventional ways. The C.N.C., designed to tackle heavier components in manufacturing, was used for smaller components. It was regarded by industry informants as a mistake. However, at Investa, such a seeming mistake

has worked as a source of competitive advantage. The management's confidence behind this counterintuitive approach is summed up well below:

You will generally not find anyone you know buying even a single C.N.C. machines for the small components... We started investing in C.N.C.s and you know it's just changed the game for us, you know we could manufacture a lot lot more, a lot more than we could think of manufacturing in conventional machines. We could make different components, right. You have conventional machines, that machine, it will do a-a particular job and that's about it.

This approach seemed to take on a philosophical role with the management. In the discussion about the impact of large investments on small enterprises, the director emphasized that the differentiating factor lay in the ability of a firm to take risk and this ability emanated from the thought process. The firm continued to invest in innovative technology since investments were equated with continued growth. It was seen by the management as the primary way to continue their success in the industry. The director noted:

Its' just the-it's just how you think, it's, the-there is absolutely no difference, you know we also started with very less money, we also started with absolutely no money. It's the, how much aptitude, how much hunger do you have and how much risk can you take. You know do you have the risk taking abilities or not? Right, that itself you know differentiates you, differentiates a, an actual businessman from an average businessman, right. A good businessman will take risks at every stages in his life, you know it's when you stop taking that, you become comfortable, you say, why do I have to invest or you know this much is enough for me, that you start going down.

The trajectory of innovation of the firm from its founding in 1996 to 2019 shows that these instances of risk-taking were not just isolated instances but a part of the company strategy formulated in the philosophy of the founder and implemented in their responses to uncertainty over the years. This is shown in table 3. While the terminologies associated with the technologies are not important, it is interesting to note certain investments and the time they were made. For instance, the recession in 2008 had affected the global economy. Despite setbacks around that time and the severe downturn in the automotive industry, the management decided to implement C.N.C.s on a mass scale. At a time where most of its competitors were fighting for survival and

banks were going bankrupt, they managed to convince the banks to lend them money for this project. Speaking about this, the chairman noted:

The investments were pretty high, we had to invest like crores of rupees in this, we had to convince the bank a lot as to why we are doing it. It was-it was not an easy process to convince them because it requires a lot of money, right?

While other downturns were not as severe as the 2008 recession, 2014 was considered by many as a damaging time for the automotive industry due to changing laws and the upcoming elections. Fast forward to 2019, during the observation data collection phase, a similar downturn was observed. During both of these phases, as with the 2008 downturn, the firm decided to invest in more innovative technology. Table 3 shows a timeline of these investments.

Table 3: Timeline of investments in innovative technology

Computer Numerical Control	2006
Mass Implementation of C.N.C.	2010
Engagement with Automation	2013
Vertical Turret Lathe	2014
Vertical Machining Centre	2014
Engagement with Industry 4.0	2015
Gantry Systems	2016
Collaborative Robots	2017
Oiling Robotic Arm	2019

An unexpected yet interesting finding was the unconventional background of the top management at Investa. Originally a trader, the director lost his job in 1994 due to a split in the family business and embarked on the manufacturing path. From the original sample of 10 firms, he is the only top manager that does not have an engineering background. Lack of formal education, however, seemed to work in his favor as it allowed him to make bolder choices.

Explaining this, he said:

Common sense is a very big power. I am not an engineer, but being not an engineer I can understand how to work and what technology are in the market, and we participate in so many fairs, get information from there, and we utilize on it, and we are getting the benefits of that.

Novista's Orientation: Caution and Quality. Novista took a more traditional approach to manufacturing and made incremental changes with minimal risk. The managing director, responding to their investment strategy, noted:

We plan our strategy of investments in a very, very cautious manner. We are not very risk-taking or very, very flamboyant that way, so when we see that the market is okay and it has got some growth potential, then slowly and gradually we invest. We do not want our money to get wasted, so we are very, very cautious about our investments.

Limited financial resources at the disposal of the top management coupled with an expectation of a reasonable time for a return on their investment dictated the firm's risk avoidance strategy. The chairman, responding to the risks involved with innovative technology, noted:

No, that is not a risk, but innovative technology means a lot of money. And we have a small business and more of a traditional business, so that is why we don't take much of a risk in terms of putting innovative technology. We are also very cautious, and slowly and gradually if there is a low-cost innovation or automation, then we go about it. Otherwise, it becomes very, very costly, and the return on investment is very long.

Operating in a cautious manner was a strategy that had served the firm well over the years. In contrast to Investa's focus on growth and innovation, Novista's top management prioritized quality and just in time delivery. Speaking about the company vision, the director noted:

In the next 3 years, we want that our company should be regarded as one of the top 3 machining suppliers to Tata Motors in terms of quality and just-in-time delivery.

However, the priority on quality was also due to the fact that most machines that were operating used manual labor and hence, were subject to errors resulting from practice. Bringing in innovative technology that reduced the involvement of human labor would have been an effective way to deal with the problem but the cautious nature of the firm with regards to

finances facilitated continued usage of manual machines. Top management seemed to be aware of the drawbacks of conventional manufacturing processes. Speaking about this, the managing director noted:

We have limited funds with us, so we can't grow in a very big way. Had we invested in lots of C.N.C.s and robotics and all, we would have approached other customers but that is a drawback with us. Very sophisticated C.N.C.s which can give you good, good product and in-built qualities into the system. So, that definitely will help, but currently we are managing with the setup that we have, and we are able to achieve good quality by making precise control, by using good manpower, by using good tooling.

The limitation due to funds seems likely to continue into the future. During the discussion on future plans for innovative technology, he noted:

Not really because we don't have much funds, we are quite limited that way. But, having, if things are good then we will invest in some more C.N.C.s, so that we can get a bigger volume.

However, he added that this strategy was unlikely to continue past the near future since the abundance of workers would reduce as other avenues for would open for these people. The narrative around innovation revolved around the availability of cheap labor and not the direct manufacturing benefits that innovation brought.

Time is coming that people slowly and gradually will not like to work in the manufacturing industry because lots of other avenues are open for them, so we will have to go in for some automation, maybe robotics or some automation.

It is important to note here, that Novista had continued to enjoy success using their conventional strategy. This could be attributed to close relationships and good communication with its customer, Tata Motors, which allowed the firm to receive consistent orders and streamline its operations over time with a limited budget.

Source of the difference in cultural repertoire: Materiality of C.N.C. at Investa

I observed that the C.N.C. played a significant agentic role in enabling and constraining strategic investment decisions related to I4.0 technologies. This finding is consistent with previous scholars' discussion on materiality in the practice literature (Orlikowski, 2007, 2009; Orlikowski & Scott, 2008, 2014; Vaara & Whittington, 2012; Jarzabkowski et al, 2016). Materials, in its various forms, constitute a major component of many industries. In this paper, the automotive firms used non-human agents such as documents, technologies and displays (Varra & Whittington, 2012). In strategy literature, more obvious materials such as PowerPoint have been shown to influence strategy making (Kaplan, 2011). However, despite the prevalence of material artifacts in daily organizational practices, the literature on their role in strategy making is, for the most part, missing (Orlikowski & Scott, 2008). In this context too, for instance, the role of the C.N.C. was a surprising finding.

Henceforth, I focus on the firm, Investa, and discuss the changes that resulted from the materiality of this particular machine. The initial installation of C.N.C. in 2006 followed by mass implementation in 2010 altered Investa's supply chain practices, organizational practices and mindset of top management in a manner that was favorable to and aligned with investing in innovative technologies related to I4.0. In combination with other materials such as Enterprise Resource Planning and other Machines, the C.N.C formed a bundle of resources (C.N.C bundle *hereafter*) that exerted powerful agency over the organization.

Below, I discuss the industry-wide impact of the C.N.C. bundle (field-level) since it paints a picture of the general responses of the firms in the global and local automotive industry to the complexity in the last twenty years of the twentieth century. Next, using qualitative and interview data, I discuss that Investa's recent investment decisions (firm-level) can be traced back to the historical and continued changes in processes that resulted from the attributes of the C.N.C. bundle.

The Industry-wide Impact of The C.N.C.

The C.N.C. was a breakthrough technology that allowed for automation in a manufacturing process called machining: the primary activity that the firms in this study engaged in. In this industry, the lathe (traditional) machine has been used for millennia: the earliest evidence dating back to ancient Egypt in 1300 BC. The lathe was very important to the Industrial Revolution and

is referred to as the *mother of all machine tools*. In the second half of the twentieth century, the addition of numerical control and subsequent advent of computers led to the development of the C.N.C.

By the late 1980's, it had become widely used in the developed manufacturing nations, However, in India, its usage was not widespread in small and medium enterprises until the 1990's, when favorable government policies encouraged investments in expensive technologies. In Jamshedpur, favorable policies for innovation contrasted with access to the cheapest power labor in the country meant that, some firms invested in these machines whereas others did not. Entrepreneurial firms, like Investa, decided to take the risk of implementing it into their processes whereas the majority, like Novista, chose to wait. The first instance of automation and computing for the machining process, these expensive machines had a role to play not only in the scale of operations that a firm could develop but also in the development of work practices and workmanship.

This created two distinct types of firms in the industry: C.N.C. and non-C.N.C. firms. The reliability in quality that the C.N.C. had over the lathe machine meant that some buyers would not even consider working with a non C.N.C. firm. However, Tata Motors, the primary buyer for Investa and Novista, had a different philosophy. They emphasized quality and just-in-time delivery and whilst the C.N.C.s facilitated those tenets, they were not deemed necessary for business. Firms, like Novista, that maintained high quality, continued to receive business from Tata Motors and did so at a lower cost compared with their C.N.C.-enabled rivals. At the time of the study, both Investa and Novista generated revenues that placed them in the top 5% of the machining industry in Jamshedpur. They made similar products for the same customer, despite their contrasting decisions with respect to their investments. Despite their many similarities, there were significant differences in the manner in which Investa and Novista went about their business practices. The following sub-sections provide a combination of data from the interviews and qualitative observations to show that the recent investment decisions are tightly linked to the work processes and the mindset that have been developed by the firm and its actors since the initial implementation of the machine, over a decade ago.

Impact on supply chain practices and subsequent investment decisions. The implementation of C.N.C.s required a sizeable change in the supply chain practices. The

traditional model of using logs and note-books to keep track of work processes was replaced by an Enterprise-Resource-Planning system. The new system kept track of the large volumes of data that the machine generated using an online system. The partial automation of the machining process meant that workers did not have to spend all their time loading and unloading heavy components. They could instead focus on making sure that the process that they were individually responsible for was working efficiently. Subsequent investments in more machines until “mass implementation” by 2010 were laden with risk, especially with the global recession in 2008. Table 4 shows the changes made to supply chain practices from the traditional model of manufacturing to the more recent one, triggered by the implementation of the C.N.C. bundle.

Table 4: Changes to the supply chain practices due to the implementation of the C.N.C. bundle

Table 4	Before Implementation	Post Implementation
Planning	Order requests from customer were printed out and distributed to the supervisors on paper	Orders were directly placed by the customer on the online systems
Information	Stored in logs and note-books and usually kept on tables next to the individual process. The supervisors were responsible for keeping them updated.	The machine generated and kept track of the work it had done and the data was easily accessible, online or by print.
Inventory	Components were left in a surrounding shed and were counted as and when needed.	Information was available on the ERP system
Production	Quality was impacted by human error and quantity depended on the efficiency of the workforce	Quality and Quantity both increased since the machine could operate for a full 24 hours.
Return of Goods	The item number was used to decode the day of manufacturing, but no additional data was available.	Scanning the barcode on the returned item could trace the exact time of work and person responsible for it.

In the years that followed, more machines and innovations were added, shown in Table 3. These innovations allowed the firm to continue to develop its supply chain practices and made

the C.N.C. bundle a more dominant player. The investment heavy engagement with I4.0 started in 2016 with the installations of Gantry Systems: robotic installations that could operate on a horizontal plane and be used to move components between C.N.C.s. Collaborative robots, or “cobots”, were brought in 2017 to facilitate 3-dimensional movement. These worked alongside the human workforce and automated some of the more mundane practices such as loading and unloading components. The combination of Gantry Systems and Cobots meant that the machine could operate with reduced dependence on the operator and this was a stepping stone towards I4.0. Speaking about this, the managing director noted:

We have also put gantry systems, we've put two gantry systems you know each gantry system is on top of three C.N.C.s, so six C.N.C.s are taken care like that. Plus we have two robots that take care of four machines. So we have done a lot of automation.

Impact on Organizational Practices. The implementation of the C.N.C. bundle brought about some interesting changes to the organizational practices. These changes complimented the modified supply chain practices and created an environment where I4.0 investments could be rationalized. The workplace no longer needed strong workers to load and unload heavy parts and instead became an ecosystem of inclusivity and learning. I provide more detailed discussions below:

More inclusivity in the workforce. The automation of lifting and loading heavy equipment by the C.N.C. bundle allowed for more inclusivity in the workforce. Traditionally seen as a workplace for men, due to the heavy weighted products involved, the automotive industry lacked women workers in large parts of the shop floor. Tasks such as cleaning, transporting sand and cement and other supporting roles were the norm for women workers and still are, in a large number of firms. A combination of the attributes of the C.N.C. bundle and conscious effort on the part of management to include more women led to more inclusivity and a larger pool of workers to choose from. Speaking about this, the director noted:

I saw that we didn't have any women workforce in our company, right and I said, why can't women work in my company? They don't have to lift a lot. Right, So, I can easily have a good women workforce you know in the company.

Upskilling the current workforce. Training programs were also offered to the existing workforce and everyone was given an equal opportunity to learn about the technologies that were implemented. It was important to “upskill” the workforce since the technologies related to I4.0 would require an advanced understanding of computers and associated technologies. Their previous task of loading and unloading the components onto the machine was replaced by automation. In the time between the first C.N.C. (2006) and the time this study was conducted (2019), the staff had learnt how to use computers and related systems and gradually become more equipped to handle complex internet-based programs that were needed for the more advanced robotic-based functions. By learning about these systems, they also moved into the class of skilled workers and hence, increased their salaries over time. The members of the staff that were uninterested or lacked the cognitive capacity to learn continued to work with the partially defunct processes involving manual operations. Speaking about the changing role of the workforce, the chairman noted:

We have got a people, we don't want to make unemployment, we want to make them important in other work, because for the tending operation we were using so many laborers. So, we want to put them in quality, in other systems, so they can use their ability as human being, not as a tending operation.

Attracting a younger, more educated workforce. The innovative technologies attracted a younger workforce to the firm since the opportunity to work with robots and advanced computer systems was lucrative to the educated youth. Firms with traditional practices found it difficult to them since manual operations were classified as unskilled and paid a lower wage than skilled labor. Speaking about this, the director noted:

Yeah, yeah there is a minimum wage you know which is decided by the state government and you know so there are minimum wages for unskilled laborers, semi-skilled laborers, and skilled laborers.

The costs associated with investing in the machines and secondly, paying the skilled workforce increased the overhead costs of Investa a lot but top management seemed certain that the trade-offs would pay off, since the advanced manufacturing technologies related to I 4.0

would require a skilled workforce that was capable of handling them. Building internal capabilities was important to maximize the potential of the new technologies and internal training programs were used to accelerate the learning process. Speaking about recruitment and training, the manager noted:

I generally recruit from IDTR which is Indo Danish Tool Room, which is a central government's college. You know we work with hydraulic fixtures, we don't work in manual fixtures, we have Cobots, we have robots. So, if you don't have the basic sense then you might not be able to fit in my company, right. So, what we do is, we really train our people, we are involved ourselves and I have a training program you know that I run for all of these people.

Mindset of Top Management. The distinct separation of the facilities that used manual machines from those that used the C.N.C. bundle was a clear indication from the management that the two styles of manufacturing would not be used interchangeably. During the initial investments in 2006, the C.N.C. was placed and operated under the same roof as the manual lathe machines. Once mass implementation was complete in 2010, the manufacturing set-up was divided into Zone 1 and Zone 2. Zone 1 continued to operate in the traditional ways and utilized workers that either did not enjoy the innovations or were deemed incapable of learning. Zone 2 had the innovative machines and members of the workforce that were interested learnt about this new style of manufacturing. From 2010 to 2019, the percentage of business conducted in the traditional way slowly decreased and at the time of observation data collection, less than 10% of the overall volume was manufactured using manual machines. At the time of the study, the firm had 4 Zones and Zone 4 contained the latest investments in technologies related to I 4.0. It seemed clear that the management wanted to separate the two styles of manufacturing and that any new investments would be along the lines of the new processes related to advanced C.N.C. Machining and the concept of I4.0. The director, speaking about the impact the machine has had on their success, said:

C.N.C. has changed the game for us. We have bought 6 cobots that work with our existing manpower. We are market leaders because we invested in C.N.C.s.

Secondly, the top management had little option but to stick with their decision of working with the C.N.C.s. These machines were financed by the local banks who wanted to see continued growth. A move back to the manual operations was not financially feasible since the lenders had the ability to seize their investments if the profitability showed signs of weakness. A key way to improve the efficiency and resulting profitability was to continue to add incremental technologies to the existing set-up, which they did using the gantry systems and collaborative robots.

DISCUSSION

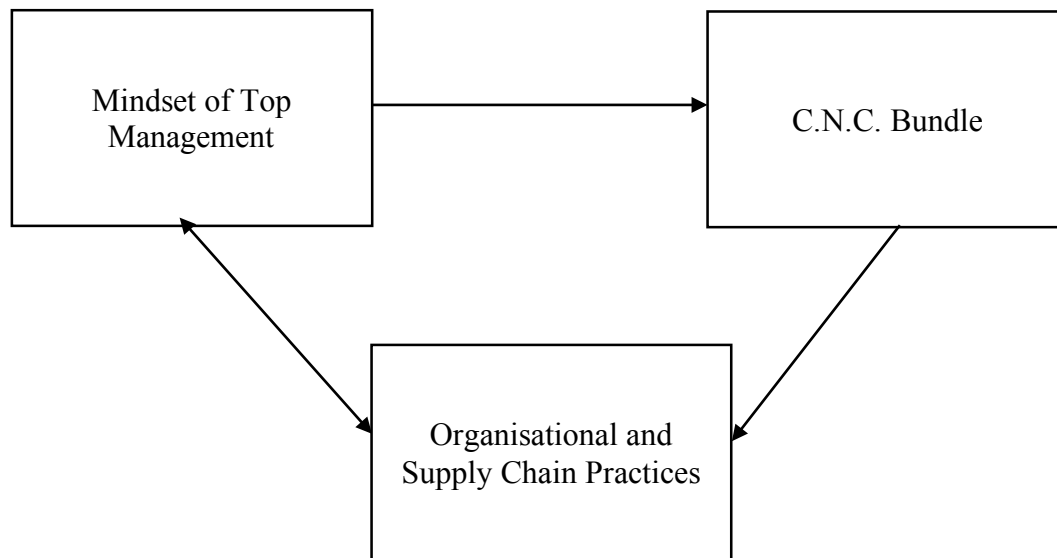
The aim of this research was to understand why similar firms make contrasting investment decisions when faced with a new institutional logic. Findings suggest that the primary difference between the two firms, in similar field positioning and structural arrangements, is a particular material artifact, the C.N.C. These machines, in combination with the other materials that enhanced and constrained its attributes, exerted a powerful agentic role over firm Investa. Figure 5 displays an empirically grounded theoretical model that shows the impact that the materiality of a particular response, the implementation of C.N.C. bundle, had and continues to have on Investa.

The Centrality of the C.N.C. Bundle's Materiality at Investa

The centrality of the C.N.C. bundle in the cultural repertoire of Investa was evident during several instances of data collection and analysis. During cross-comparison of the cultural repertoire of the two firms, it became clear that the primary differentiator between the firms was the C.N.C. bundle. Figure 5 shows the agentic role of the C.N.C. bundle and associated technologies in affecting the supply chain and organizational practices of Investa. While previous literature has discussed the impact on mindset on strategy-making, this paper adds to those learnings. The following sections showcase that Investa's response to the emerging complexity of I4.0 is a manifestation of not only the mindset of the top management but also the

impact of the materiality of the C.N.C. bundle on the organizational & supply chain practices and the reverse-impact that these practices had on the mindset of the top management.

Figure 5: The Centrality of Materiality



Impact of Mindset on C.N.C. Investment. There was a strong sense of technological leadership amongst the top management and the workforce. This mindset with regards to innovative technology was a major contributing factor in the investments in C.N.C Machine in 2006. The cognitive reasons that facilitate such decision-making has been studied in depth in micro-institutional literature (Schilke, 2018).

Impact of Mindset on Practices. Over the next decade, many of Investa's competitors started discussions on possibly investing in C.N.C. By this time, however, the top management at Investa had developed sophisticated supply chain & organizational practices and a workforce that was capable of handling them. As discussed in the Findings section, there was an element of *intra-firm intentional work* by the top management that allowed for the attributes of the machines to be used effectively.

Agentic Role of C.N.C. Bundle In addition to the mindset of the top management, the C.N.C. bundle itself had an agentic role to play in transforming the organizational and supply chain practices, denoted by the dotted line. It is interesting that even though the decision to implement C.N.C., back in 2006, is attributed to the mindset of the top management team, the transformations in the processes were influenced by *both* human cognition and the materiality of the machine. The top management could use the attributes of the C.N.C. bundle to enhance their operations but were also bound by those same attributes. Heavy capital investments and a supply chain that was built around the machine meant that they could not revert back to traditional processes in a profitable manner. As they invested in more advanced technologies that worked in unison with the C.N.C., the centrality of the C.N.C bundle grew even further. In fact, almost every investment in innovative technology after the C.N.C., shown previously in Table 3, was made to further the attributes of the C.N.C. itself. Even at the time of the study, 13 years after its initial implementation, the machine continues to be an agent of change. Its most recent impact is the heavy investments in I4.0 technologies.

Reverse Impact of Practices on Mindset. The implementation of these technologies and development of resulting practices were a resource consuming process and over time, had their own impact on the mindset of the top management, from which they first arose. Top management attributed their ‘game-changing’ approach using a risk-taking and growth oriented strategy to the success that resulted from the C.N.C. Engaging in I4.0 technologies, then, became the continued response of the firm to tackle uncertainty with innovation.

The Social Context of Materiality

It is important to consider the social context in which the C.N.C. bundle exercised its agency. Firms in Jamshedpur had always operated using traditional, lathe machines and their simplicity of use meant that the workforce did not have to have formal education or a working knowledge of computers. This factor, in addition to the large capital needed, discouraged managers from investing in C.N.C. It was simpler to continue making steady income using traditional machines and utilize the abundance of cheap, unskilled labor. The industry provided jobs to a significant portion of the city’s population and concerns related to unemployment resulting from automating supply chains further dissuaded managers from investing in innovative technology. This is where the changes made by Investa provide interesting insights into the company’s unique approach.

Despite the advantages associated with holding onto traditional practices, the management at Investa saw an opportunity to achieve economies of scale by utilizing machines not at the expense of the current workforce but in a supporting role. The emphasis on ‘upskilling’ their employees created an environment of learning and over time, they became well-versed with computers and associated technologies. This environment was also attractive to fresh graduates since the opportunity to work with innovative technologies was exciting and reduced the physical exertion that was customary with traditional manufacturing practices. Hence, intra-firm intentional work on the part of the top management is an added element of agency that promoted the attributes of the machine and future research may examine the magnitude of this promotion.

Theoretical Contributions

The primary contribution of this model of the *centrality of materiality* is a complementary understanding to the micro-institutional research on identity (aspirations, values, beliefs and mindset) that explains the varied responses of firms to environmental complexity. While those attributes are important and influence strategic decisions, they are incomplete without an examination of the role of materiality. This research is in its nascent stages and may be combined with other theoretical perspectives in order to understand its impact. In this paper, I make an attempt at this and suggest that both the cognitive and material aspects of humans and machines must be considered in conjunction to develop a more sophisticated understanding of the entanglement of the social and the material (Orlikowski, 2005).

This paper furthers this understanding of materiality by suggesting that the introduction of C.N.C. bundle to the firm, comprising of identity, technologies and practices, modified it into a different entity altogether. This allowed the new entity to “acquire form, attributes and capabilities through their interpenetration” (Orlikowski & Scott, 2008, pg 455-456). While this finding serves to emphasize the importance of considering materiality in strategy literature, it also provides a novel differentiator between firms that have similar positioning and structure. It is no longer satisfactory to look at the resources a firm has as valuable, rare and inimitable (Barney, 1991) and research may consider that the repertoire a firm has at its disposal consists of identity, technologies and practices. This could be combined with entrepreneurship literature on bricolage and necessity entrepreneurship (Baker & Nelson, 2005).

Research on family firms will benefit from this model since family-owned firms place a greater emphasis on the cognitive aspects of top management. The lack of stable middle management in many of these firms leads to a majority of decisions being made by the owners, who also function as the top management team. The sample of firms in this study was especially unique due to their various similarities and researchers may keep an eye out for such interesting empirical settings since they provide a rich context for detailed qualitative work. Literature in practice theories benefits from this model since the repertoire of the firms may not just consist of the daily routines and practices of the members but also be affected by the attributes of the material artifacts.

Managerial Contributions

Materiality can be a unique way to achieve competitive advantage, especially in industries where similar technologies are adopted by a majority of firms. Understanding the attributes of a material and aligning work processes that maximize its utility will be crucial for managers, especially in industries like manufacturing. Doing so would not only help them maximize their return on investment but also improve their work processes and the skillset of their employees. It is not my intention to promote the idea that usage of innovative materials during times of uncertainty is a better response. There is more than one response that can lead to continued success as we see with both Investa and Novista, who committed to their own strategies and were successful over a period of time. It is convenient to invest in the latest technologies and build a business plan that uses innovation as a differentiator but there are learnings to be made from Novista's approach. They continue to provide employment for all their staff and do so in a profitable manner.

Limitations and Future Research

The major limitation of this study was the lack of concrete data on both firms' financial performance. Since these firms were privately owned and decided not to share their financial information, it was not certain whether Novista was indeed suffering from a lack of financial resources. While both firms occupied the top 5% market position, it is plausible that they had contrasting positions with regards to financial capital. The Behavioral Theory of the Firm (Cyert & March, 1963) could, in such a case, provide an alternate explanation on the reasons behind the

divergent decision making of the firms with regards to I4.0. A cornerstone of this theory is the concept of aspiration levels (Gavetti et. al, 2012) and one alternate explanation could be that Firm Investa had higher aspiration levels and hence searched for solutions, using innovative technology as a means to achieve it. The management at the firm were, in contrast Firm Investa, trained in finance and advertising and might have found it easier to look past traditional organizational processes. In alignment with their attributes of risk-taking and growth, they found it easier to invest in C.N.C and associated technologies, leading to the formation of the C.N.C Bundle. Firm Novista's management comprised of engineers and metallurgists and were, accordingly, more deeply entrenched in traditional manufacturing processes, by virtue of their education and past experience. Hence, they might have been hesitant to look past the organizational practices that served them well and reinforced their orientation of caution and quality. Behavioral Theory could also be combined with prospect theory (Kahneman and Tversky 1979) to explain variation in firm risk-taking (Argote & Greve, 2007; Bromiley, 1991). Both firms could have had different reference-points and hence chose to make strategic decisions in contrasting ways. Perhaps, despite their success, managers at Firm Investa felt that they lay below their reference points for growth. This, in combination with their aspiration levels, may have been a contributing factor to their positive engagement with I4.0.

This paper adds to the techno-centric literature that examines the agentic role that materials play, (Orlikowski, 2005) but the relationship of the material and social is more complex than that. Future research needs to look at, in greater depth than this study, the reverse-impact that humans have on materials and examine the constitutive entanglement of the social and material. It is plausible that, depending on the organization and its materials, the impact could be either techno-centric or human-centric. Hence, privileging the technology or the actor would depend on the specific context. In the firms studied in this paper, the agentic role of the machine was telling and the lens chosen was appropriately, techno-centric. This does not imply, however, that the workforce did not have an impact on the materiality and future research can build on the model above. The idea of intra-firm intentional work, mentioned briefly in the discussion, may be studied by future scholars to further piece-out the impact that the top management can have on the overall effect that a material may have on the firm. A second limitation of this paper is the size of the sample of firms chosen to be studied. The initial sample of ten firms is not substantial and, in an ideal case, a larger sample of firms needs to be

incorporated to make more informed calculations about industry-wide decisions. The second sample of two firms worked out well to provide contrast and interesting findings and selecting some firms with more investment than Novista and less investment than Investa may lead to further interesting research. Materiality needs to be studied in a variety of combinations and cross-comparative case analysis provides a useful starting point.

My analysis reveals that materiality is central to organizations. Research on materiality is not, however, central to organizational research. Future research, especially, in the case of small and medium enterprises, where the role of a material can be significant, needs to pay greater attention to their attributes and, resulting, materiality. A second direction that future researchers could take is examining the impact that the CNC Material had on the practices of a firm over time and if the changes made were gradual or forced by changes in the local and global economy. A third, unexplored, way to study materiality is to understand its role as an agent of social change. At Investa, the C.N.C. material facilitated education of the employees and an increase in their salaries and standards of living. In developing nations, where many people are not able to either afford or access higher education, machines can play a critical role in creating an environment of in-situ learning. There is a promising space where research could be carried out. Lastly, materials such as software used for virtual collaboration, augmented reality and other non-physical need to be studied to understand the role that their increasing presence will have on an organizations and its workforce. The field of materiality is now no longer new but research has been sporadic and non-incremental. Herein lies an opportunity for management scholars to work on a topic that is both relevant and helpful to researchers and managers alike.

Conclusion

Julius Caesar, before crossing the tiny Rubicon River in 49 B.C.E, said “*anerriphtho kybos!*” or “let the die be cast” in Greek. To “Cross the Rubicon” is a metaphor referring to that quote and means to take a step that is irrevocable and commits one in a specific direction. We may have crossed the Rubicon with our commitment to using innovative materials, both physical and non-physical. The advances and rapid onset of material technologies that operate on artificial intelligence might increase the impact that materials, bolstered by a cognition of their own, will

have on humans and organizations. Research needs to be proactive in examining and explaining the current and potential impacts this will have on organizations so that managers can be more aware of the impacts of their strategic decisions, especially in unforeseen circumstances.

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APPENDIX

QUESTION BANK

Day by Day Schedule

Strategy Related Questions- Day 1

(90 mins)

- What do you think is important to success in the automobile industry?
- How would you define your company's strategy related to investing in the future?
- What does Industry 4.0 mean to you? How did you learn about this?
- Do you think you have access to enough information in order to make informed investment decisions?
- How confident do you feel about your investment decisions?
- As a company, how are you different from others?
- How, if at all, has your company strategy changed over the years?
- Do you see Industry 4.0 as an opportunity for firms in Jamshedpur to compete with the global market?
- Did any recent investment fail to impress you with its working? Has this discouraged you from further investing in similar technology?
- Do you have a company vision and mission?
- What changes would you recommend to your company's strategy? Why?

Background- Day 2

(60+30 mins)

A) Firm level

- When was the firm created? Who started it? (year, Employees, investment)
- What was the motivation behind the starting of the firm?
- Did you receive any mentorship during the early years? What sources of learning did you have?
- What was your knowledge about the machining process before entering the industry?

- What was your vision and mission at the time?
- Did you have a similar company culture to what you have now?
- How did you differentiate yourself from the competition then?

B) Founder level

- Please tell me something about yourself
- What are your core beliefs about the way in which business should be conducted?
- Do you have established routines in your daily life?
- Why did you start the company?
- Where do you see yourself in five year's time?

Economic /Market Performance- Day 3

(60 mins)

- How you see yourself positioned in the local, national and international market?
- Does your geographical location assist you?
- In the recent years, have there been times when the wider economy has impacted your performance?
- Which subsection of your business is the most profitable? Is investing in new technology going to make other sections more profitable?
- Are you outperforming your competitors post investment?
- Have your KPI's changed since investment? What impact do you think this will have?

Investment Related- Day 3(part 2)

- What technologies have you invested in recently?
- Do you have plans to invest in further technology in the upcoming times? How do you learn about these upcoming innovations?
- What does the process of learning look like? Do you have colleagues you rely on or do you research on this yourself?

- How do you think investing in CNC's has separated you from those that didn't?
- Why do you think that some firms invested and some didn't?

Political Related- Day 4(Part 1)

- *Does the government impact your decision making process?*
- *Has the government change helped or hindered?*
- *How will the future changes impact your current investments?*
- *Do you think that there is enough incentive from the government to move towards more innovative technology?*
- *Are there any political hurdles you face when conducting your work?*
- *What about within your work force? Is that impacted by the government?*
- *Is there a minimum wage for workers here? Has it changed recently? Do you foresee any further change?*
- *How important is labor to your functioning? Do you see a time in the near future when you can reduce the manpower efficiently?*

Social Related- Day 4(Part 2)

- How many family members are involved in this business?
- Are there any pressures you face from the people around you?
- Are you careful about your investments due to people and what they think?
- Do you have close relationships with your competitors?
- What about the customers? How do they impact your investment decisions?
- Do you try and emulate other successful companies?

LETTER OF PERMISSION

December 2nd, 2018

Subject: Request for your help

Dear _____

I am writing to request your help to conduct my research. I am a Graduate Student at The John Molson School of Business in Canada pursuing my Masters in Management Degree. As part of my graduation requirements, I have to write and successfully defend my thesis. The purpose of this study is to understand how and why firms in the Automotive Component Manufacturing Industry make their investment decisions.

The information gathered will be coded. If you would like, I can share the results of the study with you since that might be beneficial to your strategic decision making in the future. I will destroy the data gathered five years after the publication of the study. During those five years, only I will have access to that data.

If you require any other information, please feel free to contact me. I look forward to hearing from you soon.

Sincerely,
Harshil Dokania

COMPANY ACCEPTANCE LETTER1st February, 2019**Subject: Company Approval Letter****Title: “What Makes Variation in Investment Decisions in Similar Firms? A Cultural Toolkit Perspective”**Name: *Harshil Dokania*

Affiliation: Graduate Research Student from the John Molson School of Business, Montreal

We approve Harshil Dokania to come into our company for the purposes of this master’s thesis research. Harshil sent us a letter of permission and we have agreed to let him do the following tasks

- To observe and speak with shop floor workers in order to collect his data
- Interview the top management for up to a maximum of 4 occasions, to be scheduled as per the availability of the manager.
- To take pictures of the daily routines and workings within the company
- To sit in a maximum of 2 company meetings in the role of a qualitative researcher

We wish Harshil the best of luck for his thesis.

Regards,

ETHICS CERTIFICATE

CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING
HUMAN SUBJECTS

Name of Applicant: Harshil Dokania
Department: JohnMolsonSchoolofBusinessManagement
Agency: N/A
Title of Project: What makes variation in Investment Decisions in Similar Firms?ACulturalToolkitPerspective
Certification Number: 30010684

ValidFrom: February22,2019 To: February 21, 2020

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

A handwritten signature in black ink that reads "Richard DeMont".

Dr. Richard DeMont, Chair, University Human Research Ethics Committee

