

Innovating by Behaving: How to Adopt the Startup Culture in Large Companies

by

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B.S., Mechanical Engineering, University of Maryland (2012)

Submitted to the Department of Engineering and Management
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Abstract

Increasingly, large company leaders want their organizations to act like startups! They want to take action against the threat of disruption by startups. They see many industries disrupted by startups, as evident by the rise of Airbnb and SpaceX. Rather than waiting to be disrupted, business leaders want their research & development divisions to act like startups. Yet, many companies with their attempts to build an internal startup innovation environment report challenges. These challenges are the symptoms of innovation tensions, tensions that business leaders should manage to foster a startup culture within the corporate innovation culture.

This work identifies a set of eleven innovation management rules for business leaders to manage these tensions experienced by individual intrapreneurs and innovation teams. In developing these rules, each startup and corporate innovation mentality is categorized using the Affective, Behavioral and Cognitive (ABC) model of attitude and the Galbraith Star Model. With these categorizations, the negative psychological effects of these mentalities are analyzed further to understand the brutal side of the innovation culture. Based on innovative behaviors collected in the literature research and a set of eleven interviews, startup and corporate innovation cultures are modeled as a system of interdependent behaviors in causal loop diagrams to expose unknown and undesirable tensions. These tensions expose a set of root causes of the challenges in fostering a startup culture in large companies. In addition to managing these tensions, business leaders are forced to make compromised strategic choices given the innovation paradoxes in intrapreneurs' risk versus reward profile and the willingness to fire incompetent intrapreneurs.

These tensions and paradoxes confirm that the corporate-startup innovation culture is paradoxical, and it is not sustainable from a psychological perspective. Yet, with these mental models of the innovation culture and these eleven innovation management rules, business leaders are better prepared to manage the brutal side of the innovation culture while leading the next disruption in their industries.

Thesis Supervisor: Dr. Bruce G. Cameron
Title: Director, System Architecture Group

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Chapter 1

Introduction

Increasingly, many business leaders are finding out that startups are coming to eat their lunch. Hence, business leaders have responded. They want large companies to act like startups! They want innovation! Yet, many of their innovative efforts are failing. Innovation is tough. Innovation is inconsistent. Innovation is not all fun.

Innovation is nothing new. We have been “innovating for millennia” [6]. We have been researching innovation studies in the past century. Schumpeter introduced the concept of commercialization in his definition of innovation [50]. Building on Schumpeter’s work, Cole paved the way for the theory of entrepreneurial change in his work advancing the study of corporate innovation [25]. Taking a step back and reflecting on prior innovation studies, Rothwell developed five generations of innovation processes [77]. For each generation, Rothwell explained how innovation changes business behavior over the years. A few years later, Christensen introduced his definition of disruptive innovation [23]. In recent decades, startup innovation, including its innovative culture, has become the subject of many innovation and management science studies. More specifically, many scholars have studied entrepreneurship. For instance, Cunningham and Lischeron compared six different schools of thought on entrepreneurship [29]. Sarasvathy studied the behavioral theory of effectuation, an innovation process starting with "a set of means as given and focus on selecting between possible effects that can be created with that set of means" in the startup setting [81]. Later, Brettel and others explored Saravathy’s effectuation in the corporate setting [20]. Agreeing

with Saravathy that limited resources constrain entrepreneurship, Baker and Nelson studied the entrepreneurial bricolage, under which the entrepreneurs make do by exploiting the existing means [12]. Expanding on prior entrepreneurship studies, Freeman and Engel detailed two innovation models - the Corporate Model and the Entrepreneur Model - and concluded that successful innovation depends on both models, not exclusively on one model [43]. And in 2011, Ries developed the Lean Startup Methodology to institutionalize the startup innovation process [74]. Yet, in 2019, Pisano pointed out that innovation is paradoxical [71].

Pisano particularly pointed out that innovative culture is paradoxical [71]. In supporting this characterization, he listed five innovation tensions. For example, he underscored that the innovation culture with a tolerance for failure "requires an intolerance of incompetence" [71]. In 2016, *Innovation Leader* investigated how large companies with over \$1 billion in revenue deploy the Lean Startup Methodology by fielding a survey among 165 executives at large companies [3]. This study revealed that large organizations are facing several endogenous and exogenous challenges while pursuing their innovation goals. And Blank and Euchner further confirmed the limited success of large companies adopting the Lean Startup Methodology [16]. To successfully create an innovative culture that any successful innovation depends on, Pisano emphasizes that large company leaders should manage the tensions embedded in the paradoxical innovative culture [71]. Understanding these tensions requires an understanding of the interconnectedness of individual and team behaviors in an innovative environment. And this observation is shared by Steve Jobs that innovation is "about the people you have, how you're led and how much you get it" [85]. Most importantly, understanding the interconnectedness of these behaviors requires categorizing individual and team mentalities, also known as attitudes in psychology, in the startup environment versus those in the corporate environment. It also requires an in-depth understanding of known and unknown emergent properties of these mentalities.

By thoroughly exploring these mentalities in both the startup environment and the corporate environment, this thesis aims to provide a set of actionable strategies to mitigate the undesirable consequences of these mentalities in large companies. This

set of strategies enables large company leaders to create and nurture a startup culture successfully. In achieving this aim, this thesis will not be developing a framework on how to develop a lean enterprise and how to organize a corporate startup team. It will not focus on large companies that grow from startups founded within the last two decades. And it will not focus on studying hybrid or selected applications of startup mentalities in large companies. It will also exclude any innovation mentality or research and development mentality that does not take place inside an internal corporate team. That being said, this thesis will focus on contemporary startup mentalities and adoption challenges of such mentalities in large companies with annual revenue over \$1 billion. It will also focus on startup mentalities in the context of disruptive innovation that is known to have high exogenous market and technology uncertainties. And it will focus on the identification, categorization, and interaction of these mentalities. Furthermore, it will rely on a cross-sectional study from the selected mid-career innovators in interview format to identify a set of practical insights into the corporate innovation mentality. Such insights include the balancing and reinforcing loops among these mentalities and the potential interactions of these mentalities with the startup mentalities.

One intended outcome of this thesis, on a practical level, is to develop a holistic view of these innovative mentalities in the startup and corporate environments. This outcome aligns with Pisano's assertion that "innovative cultures are systems of interdependent behaviors," and these behaviors "cannot be implemented in a piecemeal fashion" [71]. Furthermore, this holistic view can expose both known and unknown implementation limitations of the startup mentalities in the corporate environment. This exposure, complemented with Ries's Lean Startup Methodology [74], advances the applicability of the startup culture in the corporate environment. More specifically, this exposure enables business leaders to develop a preliminary yet holistic understanding of different dynamics and tradeoffs explicitly and implicitly embedded in the innovative culture.

To better understand these dynamics and tradeoffs in the innovative culture, this thesis consists of six following sections:

- Section two is the literature review section. This section includes a discussion on the motivation behind internal startup initiative, an overview of past and present innovation studies, a focused review of the organizational behavioral study, a review of the startup culture and its implementation in the corporate setting, and a review of past research on innovation tensions.
- Section three is the research method section. This section includes the research problem formulation, current practices used by other research scholars to address similar research questions, a justification of selected methods used in this thesis, an introduction of each chosen method, and the overall research methodology and argument definitions.
- Section four focuses on the exploration of startup mentalities to identify startup innovation tensions. This section includes the startup mentality categorizations, the development of the startup innovation causal loop diagrams, and a discussion on the interdependence of these mentalities in the startup setting. It also includes a discussion on the startup mentality emergence and the categorizations of known and published corporate mentalities in conflict with startup mentalities.
- Section five focuses on the exploration of a corporate innovation culture to identify corporate innovation tensions. This section includes the cross-sectional study result on the corporate innovation culture from different exceptional intrapreneurs at the selected large companies. Similar to the exploration of the startup mentality, this section includes the corporate innovation mentality categorization, the development of the corporate innovation causal loop diagrams, and a discussion on the corporate innovation emergence.
- Section six is the discussion section. This section includes an exploration of innovation tensions and paradoxes when the large company adopts the startup mentality in the corporate innovation culture based on the previously identified startup and corporate innovation tensions, the development of preliminary

innovation management rules in large companies, and the limitations of this thesis.

- Section seven is the conclusion section. This section includes a summary of key findings on three levels of innovation tensions, a revisit to the main research question, a summary of innovation management rules, a discussion on the accomplished research aims, and recommendations on future work.

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Chapter 2

Background

Innovation is paradoxical. So is the startup culture. The startup is recognized for its high probability of failing but also recognized for its innovation pace, a relentless pursuit of disruptive yet profitable solutions challenging the status quo today. For instance, Uber disrupted the taxi industry; Tesla disrupted the car industry; SpaceX disrupted the space industry; Airbnb disrupted the hotel industry. There are countless examples of startup successes. Each disruption forces large companies to adapt. Some survive, and some do not. As a result, the average large company lifespan is getting shorter, according to Figure 2-1. Afraid of being known as another Kodak or Blockbuster leader, large company leaders pursue an offensive strategy. They envision their companies to be at least as innovative as the startups. More specifically, they want an ambidextrous organization; they seek to excel in future opportunity exploration while maintaining their market position in the existing business exploitation. Hence, they are seeking to adopt startup mentalities despite many known challenges and failures.

2.1 Motivation Behind Internal Startup Initiative

Embracing startup culture within the existing organization is not the only option to innovate, but it is the most capital efficient option over time among the three options of acquiring, investing, or incubating [70]. In supporting this claim, Owens and others

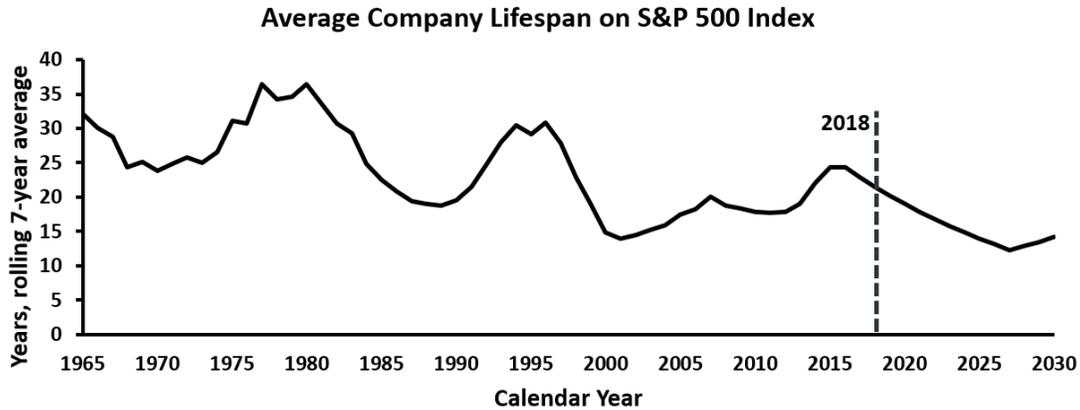


Figure 2-1: Average Company Lifespan on S&P 500 Index. Adapted from *Innosight's* Report "2018 Corporate Longevity Forecast: Creative Destruction is Accelerating" [11]

explained that the main cost of incubating in-house is the innovators' salaries, and projects could become self-sustaining once they begin to generate profits [70]. Large companies have enough financial and human capital to pursue mergers and acquisitions (M&As) of high-potential startups. But such business transactions come with business integration challenges, further increasing the overall M&A cost. They can also pursue an open or collaborative innovation model in which they either invest in or collaborate with startups. But such strategies do not give the large company total ownership of the innovation under development. That being said, innovation challenges faced by large companies cannot be tackled with one strategy alone. It requires a holistic approach. As part of this approach, cultivating an internal startup culture is just as imperative as other innovation strategies, such as M&As, open innovation, and collaborative innovation, etc. In addition, embracing an internal startup culture is a means to achieve a competitive organizational advantage. Large companies can gain a competitive advantage, and they are mainly in two forms: a competitive product or a competitive business process. Of these two forms, a competitive business process is the most difficult to achieve and replicate by competitors. One example of a competitive business process is Skunkworks. However, Skunkworks is different from an internal startup. Owens and Fernandez acknowledge that Skunkworks is "an effective

way to accomplish specific goals, but insufficient to ensure corporate survival amid unpredictable market shifts and rapidly mounting competition” [70]. Although there are differences, both Skunkworks and the internal startup share many mentalities, the individual and team mentalities toward innovation.

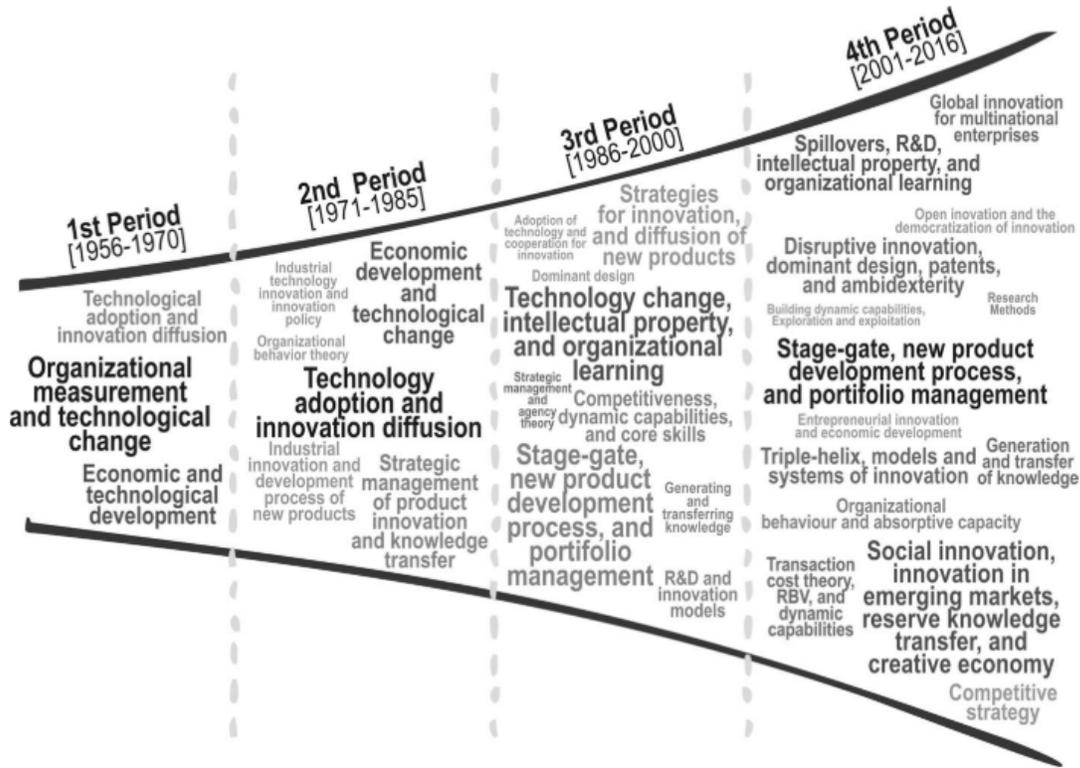


Figure 2-2: Evolution of Innovation Studies. Reprinted from the Article "Structure and evolution of innovation research in the last 60 years: review and future trends in the field of business through the citations and co-citations analysis" [76]

Studying innovation through this behavioral lens has been done before in the field of innovation studies. Although innovation studies are fragmented, it has continued to evolve due to many scholars’ works. Among many clusters of the research shown in Figure 2-2, organizational behavior and absorptive capacity started to gain traction in recent periods between 2001 and 2016. Under this research branch, this thesis aims to achieve a holistic understanding of the paradoxical startup culture and its implementation in the startup and corporate settings. In reaching this holistic understanding, this literature review starts with understanding the past works

in organizational behaviors at individual, team, and organization levels. With this background understanding, this review then examines startup culture and its implementation barriers in large companies. Lastly, based on these barriers, this review further examines past works on innovation tensions, setting up the context for this thesis's research.

2.2 Organizational Behaviors

The study of organizational behaviors is a multidisciplinary field that investigates interactions among psychology, sociology, and business management, etc. More specifically, the organizational behavioral study focuses on the understanding of behaviors at individual, team, and organization levels in a workplace setting. Given the breadth of the study, this review focuses on few relevant topics to the scope of this thesis: the ABC model of attitudes, the Big-5 model and motivation theories on the individual level; work teams, such as X-team, Skunkworks team, and startup team, and managerial roles on the team level; the organizational leadership and the Galbraith Star Model on the organization level.

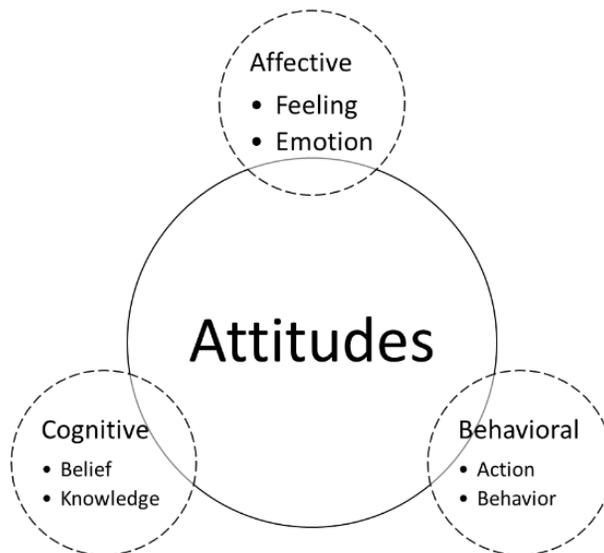


Figure 2-3: The Taxonomy of Attitudes

On the individual level, individual attitudes influence his or her behaviors and vice versa. In fact, research scholars have different definitions and models of attitudes. After reviewing these definitions and models, Jain defines that “attitude represents the positive or negative mental and neural readiness towards a person, place, thing or event” [49]. This definition aligns with the ABC model of attitudes, shown in Figure 2-3, in psychology. In this model, attitudes can be decomposed into three parts: the affective component, behavioral component, and cognitive component. The affective component focuses on a person’s feelings and emotions; the behavioral component focuses on a person’s actions; the cognitive component focuses on a person’s belief and knowledge [49]. From this model, one can discern that behaviors are dependent on a person’s affection, belief, and knowledge toward an event. And Darya shares a similar characterization that the mentality has two parts – emotional and rational spheres [30]. Thus, deciphering an individual or collective body’s mentality or attitude requires close observation of these three components.

In addition to examining each behavior independently, it is essential to investigate patterns of behaviors. In psychology, scholars sometimes use the five-factor model to understand the human personality. In this model, personality can be decomposed into five traits: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism, as detailed in Table 2.1. Although the model is popular, Stangor points out that this model does not capture every dimension of a person’s personality, and it assumes that personality does not evolve [82]. In practice, Judge and Bono used this model to investigate transformational leadership personalities [51]. In this work, the revised NEO (Neuroticism-Extraversion-Openness) Personality Inventory is utilized to classify each participant’s behaviors. With this classification system, they successfully validated a strong correlation between transformational leadership and agreeableness personality.

Furthermore, behaviors and patterns of behaviors are strongly associated with one’s motivation. In the organizational behavioral study, there are many motivation theories in the workplace setting. Among these theories, Maslow’s Hierarchy of Needs, Herzberg’s Motivation-Hygiene Theory, and Locke’s Goal Setting Theory

Table 2.1: The Five-Factor Model of Personality
 Adapted from the Book *Introduction to Psychology*[82].

Factor	Description
Openness to Experience	A general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience
Conscientiousness	A tendency to show self-discipline, act dutifully, and aim for achievement
Extraversion	The tendency to experience positive emotions and to seek out stimulation and the company of others
Agreeableness	A tendency to be compassionate and cooperative rather than suspicious and antagonistic toward others; reflects individual differences in general concern for social harmony
Neuroticism	The tendency to experience negative emotions, such as anger, anxiety, or depression; sometimes called “emotional instability”

are reviewed further to understand employee motivation [26]. Maslow prioritizes five layers of general human needs, starting from physiological needs, safety and security needs, social belonging needs, needs for self-esteem, and needs for self-actualization [65]. Focusing on human needs in the workplace setting, Herzberg categorized work satisfaction and no-satisfaction factors into two groups: motivation factors and hygiene factors. And he concluded that motivation factors have a considerable impact on the employee’s performance than hygiene factors [47]. Furthermore, Locke simplified the employee’s motivation and concluded that employees are motivated when they are emotionally attached to the goal they seek to achieve [63].

On the team level, past research has focused on teamwork and its coordinating mechanisms. Shown in Table 2.2, Salas and others summarized past teamwork research in the following categories: team leadership, mutual performance monitoring, backup behavior, adaptability, team orientation, shared mental models, mutual trust, and closed-loop communication.

To further expand on the above understanding of teamwork, this review would briefly discuss three examples of work teams: X-team, Skunkworks team, and startup team. X-team is a term coined by Ancona and Bresman [8]. It is different from tradi-

Table 2.2: The Attributes of Teamworks Adapted from the Article "Is There a 'Big Five' in Teamwork?" [79]

Attributes	Definition
Team Leadership	Ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, develop team knowledge, skills and abilities, motivate team members, plan and organize, and establish a positive atmosphere
Mutual Performance Monitoring	The ability to develop common understandings of the team environment and apply appropriate task strategies to accurately monitor teammate performance
Backup Behavior	Ability to anticipate other team members' needs through accurate knowledge about their responsibilities
Adaptability	Ability to adjust strategies based on information gathered from the environment through the use of backup behaviors and reallocation of intrateam resources
Team Orientation	Propensity to take other's behavior into account during group interaction and the belief in the importance of team's goals over individual members' goals
Shared Mental Models	An organizing knowledge structure of the relationships among the task the team is engaged in and how the team members will interact
Mutual Trust	The shared belief that team members will perform their roles and protect the interests of their teammates
Closed-loop Communication	The exchange of information between a sender and a receiver irrespective of the medium

tional teams in the following five areas: "external activity, extensive ties, expandable structures, flexible membership and internal mechanism for execution" [9]. Under this X-team structure, the team prioritizes reliable information over speed [8]. It also values a permeable work team boundary that enables inflows and outflows of internal and external resources [8]. Another team structure is Skunkworks, popularized by Lockheed Martin's Skunk Works division. This structure values project secrecy and separation from the company's core businesses. Owens and Fernandez believe that the Skunkworks team still follows a waterfall development approach and

is thus ineffective in responding to unforeseen changes under the extreme market uncertainty [70]. Different from the Skunkworks team, the startup team can overcome such extreme market uncertainty [74]. Hence, the startup team values uncertainty reduction at speed. Behaviorally, it engages with stakeholders frequently and conducts iterative experimentation leading to successive validated learning. Given these different team attitudes, each team structure would exhibit different sets of teamwork characteristics.

In addition to the team structure, team leadership affects team effectiveness. To understand this influence, Mintzberg observed managers' behaviors for one week and redefined managerial roles in three: the status role, the information processing role, and the strategy-making role [67]. Interestingly, Mintzberg believes that managers play the role of entrepreneurs because of their roles as an activator and a resource allocator [67]. This belief contrasts with Klotz and Blank's understanding that large company leaders are executors, not innovators [55]. Hence, not every manager can be effective in carrying out an entrepreneurship role.

At the organization level, over 80% of contemporary leadership theory research can be categorized into six: transformational leadership, leader-member exchange (LMX) theory, implicit leadership theories, charismatic leadership, and complexity leadership [59]. Among these six, Ancona, Backman, and Isaacs have advocated for the nimble leadership [7]. This new form of transformational leadership aims at addressing innovation challenges faced by large company leaders today. For the organization to be nimbler and more innovative, its leader should pursue a distributed leadership, a leadership favoring distributed power, decision making, and resource allocation [7]. In addition to the distributed leadership, nimble leadership requires three types of functional leaders: entrepreneurial leaders, enabling leaders, and architecting leaders [7]. Specifically, entrepreneurial leaders are frontline leaders who can act on new opportunities. Enabling leaders are mid-level managers who can effectively navigate the organization for support. Architecting leaders are senior leaders whose roles enable them to have a holistic view of the organization, thus making them effective in strategizing and architecting an organizational change due to internal and external

cues [7]. And these leaderships are imperative for the X-team [8].

In addition to the leadership theory, scholars have studied the organization design to shape organizational behaviors. Of these works, Galbraith Star Model, shown in Figure 2-4, depicts organization design in five areas: strategy, structure, process, rewards, and people. More importantly, this model shows that strategy, structure, processes, and rewards can influence individual and team attitudes. Thereby, this model can be utilized to understand and uncover innovation tensions within the organization.

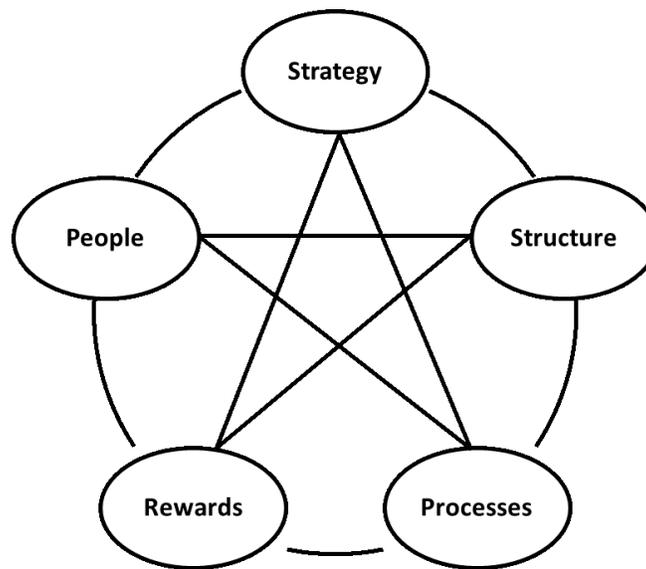


Figure 2-4: The Star Model Adapted from the Report "The Star Model" [44]

2.3 Startup Culture

We have many definitions of the startup. We still do not have a universally accepted definition of the startup [19]. Leppänen views the startup as a temporary organization [61]. Edison and others view the startup as a learning process [32]. Ross views the startup as an experiment [75]. Chesbrough and others view the startup as a single-project organization [22]. And Blank realizes that “startups are not just smaller versions of large companies” [16]. Furthermore, Ries introduces that startups exist with extreme uncertainties: uncertainty about the market, uncertainty about

customers' emerging needs, uncertainty about the technology, and uncertainty about costs, etc [74]. A noticeable aspect of these definitions is that startups are different from large companies in many ways. Blank summarizes this difference as follows: startups are exploring the business model while large companies are exploiting the existing business model [15]. Recognizing this difference, both Blank and Ries play a critical role in the Lean Startup movement in which they popularized the Lean Startup Methodology (LSM). In achieving a better understanding of the startup and its culture, the following review focuses on the historical review of the LSM.

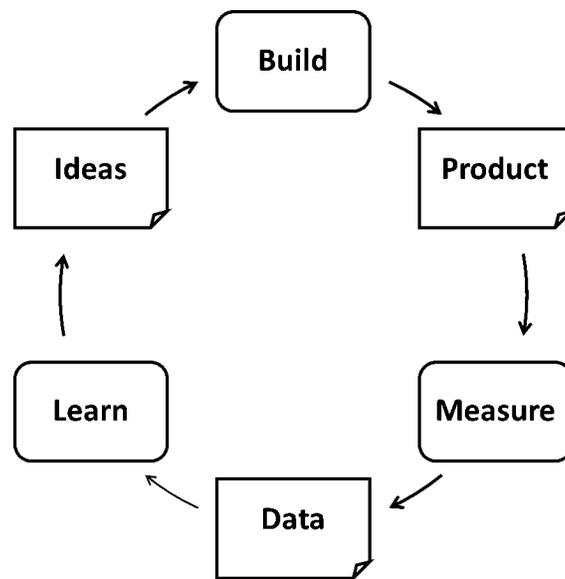


Figure 2-5: The Lean Startup Methodology by Eric Ries Adapted from the Book *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* [74]

Ries, in 2011, introduced the Lean Startup Methodology to the startup world. This methodology is shown in Figure 2-5. Under this methodology, the startup team is encouraged to take an idea and build a minimum viable product (MVP), then engage customers with such MVP and a hypothesis, and then measure and learn from the collected data. This validated learning inspires new ideas, leading to an iterative process until a product-market fit is found [74]. Throughout this iterative cycle, Ries values speed and waste reduction: this hypothesis-driven experimentation process shall be done in the quickest manner while maintaining a low overall cost [33].

Bortolini and others characterized that the LSM is “explicit in the Lean philosophy of management and implicit in the implementation of principles of the Learning School of strategy and implicit in the emerging stream of effectuation and bricolage” [19]. More specifically, applicable past research to the LSM is summarized in Table 2.3. Interestingly, the LSM embodies many theories or thinking in academics.

Table 2.3: Past Research Topics Related to Ries’s Lean Startup Methodology Adapted from the Article "Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research" [40]

Research Topics	Main Concepts
Milestone Planning	Planning based on “milestones”
Critical assumption planning	Business uncertainty reduction through experiments prioritized by the associated cost
Discovery-driven planning	Planning based on learning and release of resources based on achieving checkpoints
Probe and learn	Releasing “immature products” into the market in order to get feedback from customers and reduce risk
Effectuation	Experimenting with a set of means given, targeting affordable loss rather than expected return and leveraging contingencies and feedback from customers
Disciplined entrepreneurship	Reducing risk by making assumptions about the business and running experiments to test them
Entrepreneurial bricolage	Making do with the resources at hand when tackling new problems and opportunities
Customer development	Product development based on the evolution of knowledge and understanding customer needs
Journey to Plan B	Framework and monitoring panel to validate assumptions about the business

Another perspective is to examine the Lean Startup Methodology through three entrepreneurial theories: causation, effectuation, and entrepreneurial bricolage [40]. Sarasvathy developed a rudimentary understanding of effectuation and contrasted it with causation [81]. Baker and Nelson accepted the resource-based view of the firm and validated Lévi-Strauss’s concept of bricolage through a field study of 29 firms [12]. Based on Sarasvathy, Baker and Nelson’s works, Fisher summarized attributes of these three theories in Table 2.4. In summary, the LSM embodies all three theories. It embodies the causation theory in that the LSM is developed under the understanding

that the product-market fit is not there, and the startup’s existence is to search for this fit iteratively. Before a fit is found, it biases toward the idea execution rather than the idea theorization. It embodies the effectuation theory in that the LSM is developed under the understanding that the only way to achieve the product-market fit is through customer engagements; thus, the methodology advocates for continuous customer engagement. Lastly, it embodies the bricolage theory in that the startup has limited resources, such as funding, time, and human capital, and the LSM advocates for the MVP to effectively and efficiently utilize such limited resources to achieve a product-market fit before the startup runs out of its runway.

Table 2.4: Causation, Effectuation and Bricolage Summary Adapted from the Article "Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research" [40]

	Causation	Effectuation	Entrepreneurial Bricolage
What factors are part of the explanation?	Outcome is given	Set of means are given	Make do with what is on hand
How are the factors identified related to outcome of interest?	Opportunities exist with low level of uncertainty	Opportunities exist with high level of uncertainty	Ignoring the opportunity to engage in bricolage
Why can we expect the proposed relationships to exist?	Learning from exploitation of available information	Learning from exploration and experimentation	Creating something from nothing
Who, Where, When? (Theory’s boundary conditions)	Opportunities are objective	Opportunities are subjective	Making do with significant resource constraint

A third perspective is to examine the Lean Startup Methodology in the framework of hypothesis-driven entrepreneurship [36]. Eisenmann and others contrasted the LSM with three other startup approaches, such as the Build-It-And-They-Will-Come, the Waterfall Planning, and the Just Do It. Among these approaches, a key differentiator is the embodiment of the principle of falsifiability [36, 19]. Ries defines falsifiability as follows: if you cannot fail, you cannot learn [74]. Thereby, the LSM is not advocating for experimenting at all costs but imposing that experiments must

meet the falsifiability principle to achieve the validated learning.

2.4 Startup Culture Barriers in Large Companies

Innovation is imperative to the large company's survival today. To survive, large company leaders start to embrace the startup culture and create internal startups in the corporate setting. This review begins with a juxtaposition between startups and large companies and then examines past studies on Lean Startup implementation or intrapreneurship in large companies.

Blank realizes that "startups are not just smaller versions of large companies" [16]. This understanding is exemplified by Accenture's work contrasting the startup culture with the large company culture, shown in Figure 2-6. And these differences are the effects of the organizational structure: the startup is generally unstructured and agile due to its small size and a single focus; the large company is generally structured and disciplined due to its large and complex organizational structure and multiple business objectives.

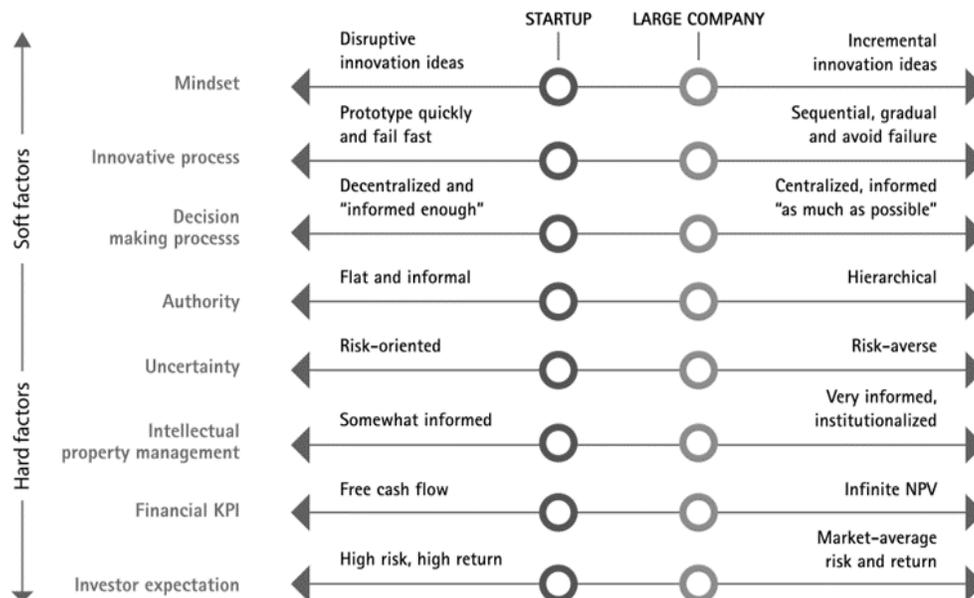


Figure 2-6: Generalized Juxtaposition of the Startup and the Large Company Reprinted from the Report "Harnessing the Power of Entrepreneurs to Open Innovation" [2]

Due to these mismatches between the startup culture and the large company culture, several past studies examine the limitations and barriers of implementing the Lean Startup mentality or intrapreneurship in large companies. In 2006, Eesley and others surveyed 179 managers from US manufacturing and service organizations to identify barriers that large companies experienced with intrapreneurship [35]. Their results, shown in Table 2.5, revealed that the most significant barrier is not resources but cultural differences. Interestingly, the top barrier is the collective attitude toward uncertainty and risk. Similarly, in 2016, *Innovation Leader* reviewed survey results from 165 executives on their experience with Lean Startup Methodology deployment in their organizations [3]. In this survey, shown in Table 2.6, the top barrier is the collective attitude toward a firm’s reputation.

Table 2.5: Top Ten Barriers to Intrapreneurship Adapted from the Article "Gateways to Intrapreneurship"[35]

Barriers	Percentage of Responses
Pushing risk taking, new ideas, and mistakes	57%
Ideas with nowhere to go for follow-up or action	44%
Failing to sanction, promote, and encourage intrapreneurship	38%
Unhealthy politics: infighting and lack of cooperation	35%
Poor communications and organizational silos	31%
People not encouraged to think about opportunities	28%
Unclear organizational mission, priorities, and objectives	26%
Lack of real management support	23%
Improvement and risk taking activity not rewarded	21%
Inadequate time or resources	18%

Rather than surveying C-suite executives, Casselman surveyed 32 frontline engineers and managers from 11 industries on their experiences with the Lean Startup Methodology deployment [83]. Although the study sample size was small, respondents identified several barriers: problems accessing customers, risk of disclosing confidential information, risk of brand damage, and difficulty in implementing the MVP [83]. Rather than focusing on effects, Casselman’s work revealed several practical limits on team-level startup mentality.

Table 2.6: The Lean Startup Implementation Challenges in Large Companies Adapted from the Article "Lean Startup: Making It Work in Large Organizations"[3]

Barriers	Percentage of Responses
Concerns about showing products to customers before they are “baked” or “polished”	50%
Hard to create minimum viable products in our industry	36%
Don’t have necessary resources (people or funding)	33%
Current business model is inflexible	32%
Marketing or sales feel like they own customers relationships	29%
Threatens executives’ decision-making authority	27%
Regulatory issues	24%
Competitive concerns	12%
Other	24%

Rather than studying a collection of behaviors across several industries, Edison and others studied the Lean Startup Methodology deployment in a single case study on F-Secure, a software company [32]. By focusing on a single case, the mentalities of frontline engineers, frontline managers, mid-level managers, and senior managers were studied. Based on the interview result, this work identifies the challenge of overcoming organizational inertia, the risk of cannibalizing existing products, and the challenge of measuring customers’ real purchasing behaviors, not their intentions to purchase. In addition, Hwang and Shin studied the Lean Startup Methodology deployment in Samsung [48]. This case study identifies several barriers: the large company mentalities inhibiting the adoption of startup mentalities, the risk of returning to home business units distracting employees working on the breakthrough project, and the business units holding onto the scarce talented human resource [48]. This particular finding is valuable because a large organization is expected to have plenty of talented human resources. In the Samsung case, this is not true, leading to the frontline manager’s resistance.

Interestingly, these barriers only represent a small set of individual and team attitudes toward startup culture and its impacts. There is a limited number of studies on patterns of individual and team attitudes toward startup culture and its impacts.

Furthermore, there is a limited number of studies of the Lean Startup Methodology deployment in the hardware industry, even though General Electric (GE) had deployed the Lean Startup Methodology involving Ries directly.

2.5 Innovation Tensions

Innovation is paradoxical. More specifically, Pisano concludes that the innovative culture is paradoxical [71]. He explains that like the coin, innovation has two sides; everyone is paying attention to easy-to-like attitudes; yet, everyone forgets the tougher and unpopular attitudes needed to reinforce easy-to-like attitudes [71]. In his work, he explores five tensions that exist in an innovative culture. Interestingly, these tensions exist at both individual and team levels.

Similar to Pisano's view that tensions in an innovative culture must be managed, Bledow and others postulated that innovation is full of "conflicting demands and conflicting activities" [17]. They recognized that paradoxical characterization of the innovation is pervasive in the field of innovation studies [68, 62]. Expanding on those tensions noted in the ambidextrous organization, Bledow and others investigated tensions at the micro and meso levels. They concluded that the conflicting demands and activities are conducive to innovation [17]. Thus, they advocated for an integrated approach, rather than a well-accepted dichotomous approach, in fostering an innovative culture in an organization.

Yet, the proposed dialectic innovation management approach can be complemented with a study focusing on the psychological tensions of innovation. Examining innovation through the psychology lens, Crompton and others explore contradictions in creativity [28]. Specifically, they explored individual feelings and motivations at different phases of the innovation. And they identified a set of contradictory individual feelings and motivations between the early and late stages of the innovation.

In academics, scholars study the dichotomous and dialectic approaches in resolving innovation paradoxes [17]. This thesis agrees with a dialectic approach toward innovation. Similar to prior studies, this work continues to examine innovation through

the psychology lens. But it is unique in that it focuses on the mental models of individual and team attitudes in startup and corporate innovation environments. In doing so, the next chapter will define a research method, including research questions and hypotheses.

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Chapter 3

Research Method

Startup culture is challenging. It is often known for its agility and innovativeness. Yet, it has a dark side, a side that is often forgotten or unexpected by many business leaders wanting their organizations to act like startups. The previous chapter concludes that scholars in organizational behavioral study recognize innovation tensions. Yet, it also concludes that a holistic psychological view of the startup culture at the individual and team levels within the large company is necessary. Such a view provides a mental model into how intrapreneurs think and act in the contradictory innovative environment. This mental model also illustrates startup culture tradeoffs and dynamics, enabling business leaders to pursue the right strategies to address the right challenges.

3.1 Problem Formulation

At the highest level, a grand innovation challenge faced by large company leaders today is summarized as follows:

To capture values of the ambidextrous organization **by** developing a mental model of the innovative culture in startup and corporate settings and a set of actionable organizational design strategies **using** the causal loop diagram of individual and team's innovation attitudes in startup and corporate settings and a cross-sectional study of the corporate mentality experienced by intrapreneurs in the corporate setting.

This thesis evaluates this grand challenge in two dimensions: startup mentality and its implementation in large companies. Hence, the following research question and hypothesis, framed in the systems thinking perspective, are aimed to explore these two dimensions.

Main Research Question: Are the large company's efforts to create a research and development (R&D) startup mentality inside the organization truly successful or not?

Hypothesis: R&D startup mentality inside the large company, the software or hardware company, is rarely entirely successful in developing and sustaining its innovative capacity due to the known and unknown emergence of such mentality in practice.

Given the above hypothesis, this thesis focuses on exploring the following research sub-questions:

- What are contemporary American startup mentalities at the individual and team levels?
- What are the known challenges of creating R&D startup mentality in large companies with annual revenue over \$1 billion?
- What are the unknown innovation mentalities in large companies?
- What are the unknown challenges in developing or sustaining the startup mentalities in large companies?
- How should large company leaders manage innovation tensions while fostering a startup culture in the corporate innovation environment?

Also, this thesis is based on the following definitions of innovation and mentality. The literature review concludes that scholars do not have a universal definition of innovation. At MIT Sloan School of Business, Murray defined innovation as the end-to-end process by which an organization follows in the inception and commercialization of a new idea to create new impacts [69]. Given this definition of innovation,

this thesis focuses only on the application of this definition to disruptive innovation, an innovation that is known to have high exogenous market and technology uncertainties. This refocus aligns with Ries's description of the startup that it exists under extreme uncertainties [74]. Hence, this thesis studies the startup and corporate innovation culture under this context of uncertainty to ensure a comparable study.

In fact, innovation, as a process, can be assessed in five dimensions. Murray's dimensions include processes, structures, incentives, boundaries, and culture [69]. Yet, in these dimensions, the role of people is not explicitly identified. Given this thesis focuses on individual and team mentalities in an innovative culture, this thesis, instead, adopts the Galbraith Star Model that includes people as one of its five dimensions [44]. Hence, this thesis follows this Star Model framework to study the innovative culture in startup and corporate settings.

This thesis also explores categorizations of individual and team mentalities for each dimension under the Star Model framework. Yet, the term, mentality, is undefined. For this thesis, mentality is defined as attitudes. More specifically, startup mentality is defined as individual and team attitudes toward innovation. Under this definition, Stangor would decompose individual and team mentality into three components: affective, behavioral, and cognitive [49]. After the categorization of individual and team mentalities, the dark individual and team mentalities can be identified to better illustrate the brutal side of the innovation culture. Such dark mentalities have direct negative effects on individual's and team's willingness to engage in the innovation process.

With the above definitions of innovation and mentality, the startup mentality in any setting is defined according to Table 3.1 given this thesis's scope. Besides, this table provides a benchmark to assess the completeness of the startup mentality exploration by ensuring each dimension of the organization design and the individual and team mentalities are fully captured. This completeness requirement is crucial because each organizational design dimension depends on the other dimension, as shown in the Star Model [44]. Hence, an exploration of each dimension is required to uncover the emergence of the innovation culture fully.

Table 3.1: Mentality to Innovation Mapping

	People	Process	Strategy	Structure	Rewards
Individual Level	Affective	Startup Menalities Toward Innovation In Any Setting			
	Behavioral				
	Cognitive				
Team Level	Affective				
	Behavioral				
	Cognitive				

3.2 Current Practices

In academics, scholars typically study individual and team behaviors with either direct observations or self-reports. Interestingly, many scholars have chosen self-report as the core data collection approach [52]. Although direct observations can yield unbiased insights, its impracticality to many studies leads many scholars to leverage self-reports with a set of bias mitigation strategies to balance method practicality and credible results. Hence, this section reviews past research methods – self-reports – that could be used in this thesis.

Of selective past research practices reviewed, many scholars used self-reports, such as questionnaires and interviews, in conjunction with other information sources to achieve data triangulation. Still, they reported the following limitations:

- Sampling bias, such as participant-to-participant influence, selection bias, response bias and participant’s affiliation [51, 33, 80, 83]
- Limited applicability of the findings [32, 48, 31]
- Participant’s incomplete knowledge of the subject under study [52, 51]
- Low response rate [83]

To address these limitations, scholars recommended few strategies as follows:

- Pilot test the questionnaire or survey [83]
- Solicit support from a well-known authority to increase response rate [83]
- Use data triangulation [33, 80]
- Solicit multiple sources from one company to ensure data consistency [83]

3.3 Method Selection Rationale

3.3.1 Selection Premises

Behavioral analysis of the entrepreneurial mentality is nothing new. In fact, current practices confirm that many past works focus on the characteristics of such mentality [52]. Yet, such mentality has a function, a function to reduce extreme uncertainty. Hence, Gartner advocated for a reorientation toward studying function [45]. Based on this understanding, this thesis is structured to research individual and team's emotions, actions, and beliefs in the entrepreneurial environment. And the research method is selected with the stated premises below:

- The mentality is not static in time; thus, this thesis will focus on the contemporary startup culture shaped by the recent Lean Startup movement.
- The sample size will be insufficient, and one research method is inadequate; thus, this thesis requires data triangulation.
- The mentality is a collection of emotions, actions, and beliefs; thus, system thinking is required.

Of these three premises, the review of current practices confirms that the application of system thinking in the behavioral study is not commonly used by other scholars. More specifically, this thesis would adopt two key concepts of system thinking: system and emergence. Crawley, Cameron and Selva defined a system as “a set of interrelated entities” [27]. Under this definition, startup mentality can be analyzed as a system in which individual and team's emotions, actions, and beliefs are such interrelated entities. In fact, Pisano shared this view [71]. In addition, a system shall exhibit emergence, an emerged systematic function that is greater than the sum of the individual entities within the system [27]. Based on this concept, this thesis views that the startup mentality has an emerged function of reducing extreme uncertainty of disruptive innovation, and this reduction cannot be achieved by a particular emotion, action, or belief. Furthermore, there are different types of emergence: known,

unknown, desirable, and undesirable emergence. With this categorization approach, this thesis aims to identify innovation tensions in startup and corporate environments.

3.3.2 Casual Loop Diagram

The causal loop diagram is a tool to identify such innovation tensions. System dynamists commonly use this technique [78]. It is particularly useful in detailing a visual mental model of a complex system [78]. Also, it requires researchers to input all essential entities of the system and crucial interdependencies among these entities. Interestingly, with proper inputs from the data collection phase, this modeling technique can be used qualitatively and quantitatively. For the qualitative application of this technique, the technique provides a visual tool to identify direct, indirect, balancing, and reinforcing interdependencies among different entities within the system [78]. Such a qualitative understanding of the system enables researchers to identify and predict possible system emergence. For the quantitative application of this technique, a mathematical equation is used to define each interdependency, and computational software, such as Vensim, can be used to compute time series system responses, depicting in a typical line plot [58]. Of these two applications, this thesis uses the qualitative application of the technique.

A causal loop diagram is a graphical mapping of either positive or negative causal interactions among different system elements. Figure 3-1 shows an example of the diagram [54]. Here, five system elements are shown. For each pair of these elements, either a positive causal link or a negative causal link is shown based on the observed interaction. For example, a positive (+) causal link is shown between sales and incoming opportunities. It means that an increase in sales can lead to more future opportunities and vice versa. Similarly, a negative (-) causal link is shown between niche market saturation and sales. It means that an increase in niche market saturation can lead to a decrease in sales and vice versa. In practice, the effect induced by one element on another element could lag. In the diagram, a delay, shown in Figure 3-1, can be added to indicate such behavior between two elements. In general, positive (+) and negative (-) causal links with or without delay are defined as follows

[54]:

Positive (+) Casual Link from Element A to Element B:

- Element A adds to B
- OR a change in A leads to a change in Element B in the same direction

Negative (-) Casual Link from Element A to Element B:

- Element A subtracts from B
- OR a change in A leads to a change in Element B in the opposite direction

In addition, when a loop is identified in the diagram, it is either a balancing loop or a reinforcing loop. A balancing loop can be thought of as a goal-seeking loop, and elements within the loop are typically in tension. A reinforcing loop can be thought of as a growth loop, and elements within the loop are complementary. In a typical causal loop diagram, there are many loops. These loops can be identified according to the following definitions [54]: 1) The reinforcing loop contains an even number of negative causal links. Figure 3-1 shows that a reinforcing loop has zero negative causal links. 2) The balancing loop contains an odd number of negative causal links. Figure 3-1 shows that a balancing loop has one negative causal link.

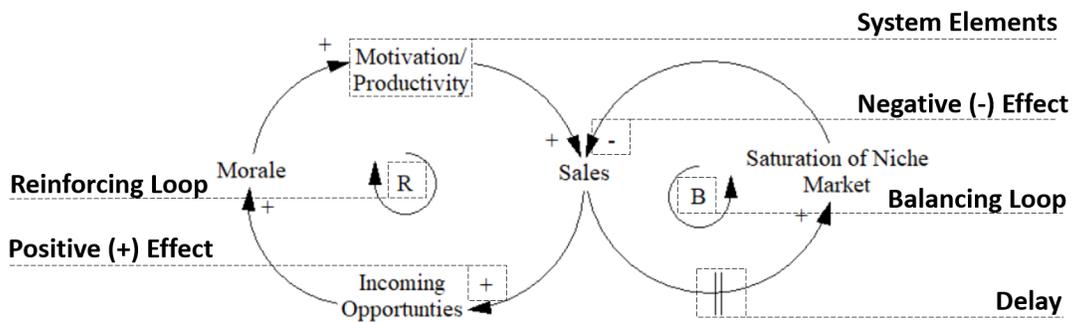


Figure 3-1: An Example of Causal Loop Diagram, Adapted from the Book *System Dynamics Methods: A Quick Introduction* [54]

For this thesis, the causal loop diagram is particularly useful in capturing the dynamics among different startup and corporate mentalities. This causal loop diagram represents a mental model of how innovators and innovation teams behave in startup

and corporate innovation culture. Given that this thesis focuses on both individual and team mentalities, two mental models are necessary. Each model has three main areas based on Table 3.1. These three areas correspond to three components of the attitude – affective, behavioral, and cognitive. In this mental model, variables, consist of stocks, flows, or endogenous variables, represent different quantifiable elements linked by their causal relationships, either implicitly or explicitly described in each mentality’s behavioral component. The cognitive component of each mentality is captured in each loop identification. The affective component of each mentality captures each innovator’s motivation and innovation team’s engagement. The affective component represents the drive behind innovators and innovation team’s innovative behaviors. Hence, it represents the psychological emergence of the innovation culture.

In addition to exposing the causal links among different mentalities and the psychological emergence of the innovation culture, this causal loop diagram, with the main loop identified and the desirable states of each variable in the main loop identified, can be used to identify any reinforcing and balancing loop that either enhance or counteract the desirable states of the main loop. Hence, the contradictory startup mentalities are exposed. After the resulting state of all variables is identified, the innovator’s motivation and the innovation team engagement can be assessed. This assessment is an indirect measurement of the sustainability of the innovation culture. Furthermore, the causal loop diagram is effective in evaluating the local and systematic effects of the innovation mentalities to develop insights into the tensions between the startup and corporate innovation mentalities and to develop a set of innovation management rules to manage the innovation tensions after implementing the R&D startup mentality in large companies.

3.4 Cross-sectional Study Definition

To effectively explore both known and unknown emergence of the R&D startup mentality in large companies, a cross-section study is conducted to assess any unknown corporate innovation mentalities and any limitations of implementing the R&D

startup mentalities in large companies exploring the next disruptive innovation. In doing so, this study will target intrapreneurs or innovation leaders in large companies. This exploration of the unknown corporate innovation mentalities or implementation of the startup mentalities, especially the resulting innovation tensions, will be done in interview format. The interview will consist of open-end questions, exploring any unknown corporate innovation mentalities according to the Mentality to Innovation Table as shown in Table 3.1. In other words, this interview component will guide interviewees through the process, structure, strategy, and reward parts of their organizations and gather their reflections on their past innovation experience at the individual and team levels. Given the above specific outputs of this cross-sectional study, three key inputs are implemented in this study. First, bias is unavoidable; however, its effect can be managed. There are two main relevant bias categories: respondent bias and researcher bias. For example, response bias and reaction bias are a few examples of respondent bias. Selection bias and confirmation bias are a few examples of researcher bias. For this cross-sectional study, question randomization, question design, and cross-sectional study piloting are exploited to mitigate the effects of respondent bias and researcher bias. Secondly, the interview design requires the outputs from exploring the contemporary startup mentalities at the individual and team levels. These outputs are essential for productive and insightful exchanges during the interview. Lastly, the participant group is selected strategically to ensure the participants' readiness, given their professional experience and their organization reputation, to engage in this interview. At this step, this study will target at least ten individual intrapreneurs from large, innovative hardware and software companies with annual revenue over \$1 billion. More specifically, prospective participants are graduate students or alumni from the MIT System Design and Management, Leaders for Global Operations, or Master of Business Administration.

3.5 Method Definition

Data triangulation is the heart of the approach, shown Figures 3-2 and 3-3, this thesis follows to develop a systematic view of these innovative mentalities in the startup and corporate environments. The first part of this approach focuses on initial data gathering on contemporary American startup mentalities and their limitations in large companies. According to the adopted definition of innovation and mentality, shown in Table 3.1, these initial data are analyzed. In the end, the causal loop diagrams of the startup mentality in the startup setting, after a completeness check, are created to understand interdependencies among different innovation mentalities in a typical thriving startup culture and to explore startup mentality emergence. The second part of the approach focuses on exploring the unknown innovation mentalities in large companies and any limitations of the startup mentality implementation in large companies. At this step, the selected large companies, according to the participants' readiness at the time of the study, are studied to complete the causal loop diagrams of the corporate innovation culture, given both known and unknown corporate innovation mentalities. The last part of the approach focuses on synthesis and interpretation. Based on the completed startup and corporate causal loop diagrams, positive interactions, negative interactions, reinforcing loops, and balancing loops among different beliefs, actions and emotions are identified. These interactions and loops are used to identify any known and unknown emergence of the startup culture in the corporate setting. With the emergence identified, this thesis explores a set of targeted, actionable management rules to manage undesirable emergence.

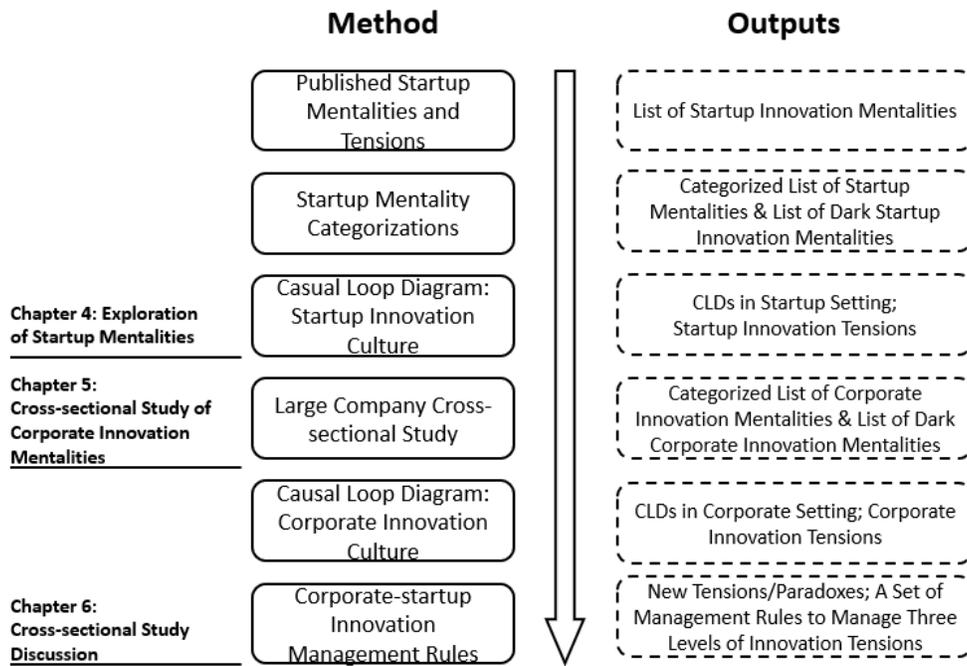


Figure 3-2: Argument Development Outline

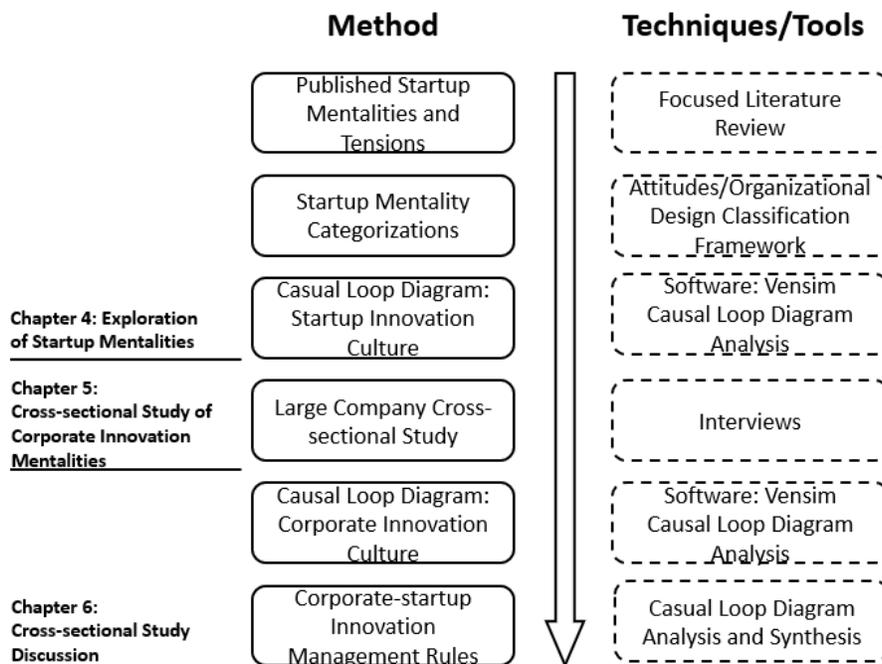


Figure 3-3: Research Method

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Chapter 4

Exploration of Startup Mentalities

Startup culture is a system of interdependent behaviors [71]. Given that the startup's typical organizational structure often consists of one team, the startup culture will be defined by both individual and team behaviors. These behaviors are studied and characterized in the field of organizational studies. Hence, this section explores different startup mentalities reported by various researchers and categorizes these mentalities according to the Mentality to Innovation Table shown in Table 3.1. After the categorization of individual and team mentalities, the dark individual and team mentalities can be identified to better illustrate the brutal side of each innovation culture. Such dark mentalities have direct negative effects on individual's and team's willingness to engage in the innovation process. In this case, these dark mentalities have direct negative effects on the innovator's self-fulfillment level and the innovation team's engagement level. After the exploration of these dark innovation mentalities, the individual-level and team-level causal loop diagrams are created and checked to ensure that the Lean Startup Methodology is captured in these diagrams. In these diagrams, the interactions among these mentalities are explored to expose known, unknown, desirable, and undesirable emergent contradictory behaviors in the startup culture to better understand the contemporary startup mentalities at the individual and team levels. Lastly, the published individual and team behaviors of the corporate mentalities in conflict with these startup mentalities are explored and categorized to better understand the known challenges of implementing R&D startup mentality in

large companies.

4.1 Research Results

The focused review on the startup mentalities includes a literature review of 43 publications related to the Lean Startup Methodology, including theses, journals, articles, research reports, and technical reports. A particular set of 75 startup mentalities shown in Appendix C is identified. These mentalities are not explicitly listed or stated in these publications. Instead, the specific aspect, such as the affective, behavioral, and cognitive components, are described. Hence, each mentality identification starts with a particular quote extracted from these 43 publications. These quotes are analyzed according to the taxonomy of attitude shown in Figure 2-3 and categorized against the Star Model shown in Figure 2-4. The four categorizations of the Star Model, process, strategy, structure, and reward, are defined as follow: the startup workflows define the process; the startup core values define the strategy; the internal and external influences within the startup environment, including its environment, define the structure; both positive and negative outcomes experienced by individuals and teams define the reward. For individual and team mentality categorizations, individual mentalities describe any affective, behavioral, and cognitive components of a typical innovator's attitudes. In other words, these mentalities capture the effect of the startup mentalities on the individual or the individual behaviors in the startup setting. Team mentalities describe any affective, behavioral, and cognitive components of a typical startup team's attitudes. They capture the team's actions and strategies in pursuing productivity and efficiency.

4.1.1 Individual Startup Mentalities

In the startup culture, pursuing a high level of self-fulfillment is the motivator for any innovator. Any effects on the individual's self-fulfillment level can be considered as the results of the brutal side of the startup culture. Exploring these dark individual mentalities can be done by analyzing three individual mentality categories: process,

Table 4.1: Dark Individual Startup Mentalities: Process Category

Process
Adhere to a disciplined experimentation process in which all decisions are driven by data, not politics.
Affective: n/a
Behavioral: "need to model discipline by, for example, terminating a personally championed project or willing to change their minds" given experimental data [71]
Cognitive: for disciplined experimentation
To achieve a fast learning cycle by failing fast even though this fast failure rate can lead to a wrongful innovation rejection
Affective: afraid of failure or terrified that "the vision might be deemed wrong without having been given a real chance to prove itself" [74]
Affective: fear of job loss due to failures [66]
Behavioral: unwillingness to carry out MVP that opens up innovation for wrongful rejection [74]
Cognitive: for failures
To achieve a fast learning cycle by failing fast and celebrating any failures resulting in new learning
Affective: n/a
Behavioral: celebrating failures even while doing so results in a "loss of status or perhaps even job" [71]
Cognitive: for fast validated learning

structure, and reward. In doing so, nine dark mentalities among all individual-level startup mentalities shown in Appendix C are discovered and discussed in detail in this subsection. As shown in Table 4.1, three process mentalities result in negative behaviors affecting the innovator’s motivation. For example, the strict experimentation discipline mandates that the innovators terminate their personally championed project based on the unfavorable experimentation data. Besides, the for-failures mentality decreases innovator’s fear tolerance since failures can lead to job loss or wrongful rejection of one’s vision. Also, the for-fast-validated-learning mentality requires a counter-intuitive behavior to celebrate failures that result in reputation or job losses. These three mentalities illustrate how these mentalities meant for extreme uncertain reduction can lead to a brutal experience in the startup culture.

For the individual mentality in the structure category shown in Table 4.2, the increasing emphasis on personal accountability can lead to a local behavior to protect

Table 4.2: Dark Individual Startup Mentalities: Structure Category

Structure
Drive collaboration by promoting accountability. But doing so leads ones to prioritize their responsible projects over others
Affective: jealousy
Behavioral: Innovator accountability unintentionally encourages can lead everyone to "jealously protect his or her own interests" [71]
Cognitive: for individual accountability

one’s interests for his or her projects. As a result, individual accountability leads to self-centered behaviors and behaviors of taking actions at others’ expense. Thus, this mentality can either raise or lower the innovator’s fulfillment level in the startup culture.

For the individual mentality in the reward category shown in Table 4.3, five startup mentalities can also result in a brutal startup experience. For example, the startup business proposition rests on the mentality that the innovator takes on significant risks for big expected gains. When this risk profile is balanced, the innovator can be motivated and develops a willingness to tolerate the risk of losing everything for a chance of an enormous expected payoff. However, when this risk profile is imbalanced, the innovator can become demotivated, resulting in lower job satisfaction and performance. Also, the startup culture aims to foster a safe environment for anyone to speak up. Yet, this encouragement of feedback can lead to the devastating critique of one’s idea, discouraging the recipient of the criticism from speaking up again. Besides, the accountability mentality could lead to personal risks. An example of such personal risks includes risks of others’ sabotages or betrayals. Also, the pivoting mentality can lead to excessive pivoting. These incessant pivots can bring about negative experiences, such as fatigue, unsettling feeling, and disheartenment. Despite these negative experiences, recognizing the entrepreneur status can motivate one to tolerate such negative experiences. A typical motivation for becoming an entrepreneur is that such leadership experience is valued by many private and public institutions. Lastly, a strong emotional attachment can exacerbate the innovator’s negative feelings, who is emotionally attached to the innovation. To maximize the

Table 4.3: Dark Individual Startup Mentalities: Reward Category

Reward
Balance the innovator’s risks and rewards by promoting a balanced risk profile
Affective: n/a
Behavioral: accepts the risk of losing everything for a chance of winning a huge payoff [70]
Behavioral: motivated by the chance to win a huge payoff [21]
Cognitive: for big gains over big risks
Test innovation ideas before implementation by encouraging everyone to offer timely and critical feedback
Affective: n/a
Behavioral: "accepting a devastating critique of your idea" [71]
Cognitive: for safety to speak up
Encourage innovator accountability by holding innovators accountable for their decisions regardless of the outcomes
Affective: n/a
Behavioral: "publicly holding themselves accountable, even when that creates personal risks" [71]
Cognitive: for accountability
Pivot from failed ideas at all costs despite excessive pivoting is unsettling
Affective: experiencing "weariness or fatigue" [22]
Behavioral: pivoting after negative experiment results [22]
Affective: unsettling feeling [38]
Behavioral: constant and rapid changes [38]
Affective: "become disheartened" [57]
Behavioral: too much customer feedback resulting in frequent idea changes [57]
Cognitive: for pivot-induced stress tolerance
Encourage Founder’s mentality by creating a strong emotional attachment to the startup mission
Affective: depression - inferred from personal disaster experience
Behavioral: inventors experience personal disaster when technology program is cancelled [18]
Behavioral: attached to the startup mission, "they are five times more likely to invest significant personal time" [4]
Cognitive: for a strong emotional attachment

innovation's success, an innovator is often emotionally attached and made a significant personal investment. Hence, a motivated innovator, often sought by the startups, can increase odds of innovation succeeding at the risk of enormous disappointment when they fail.

These mentalities and their resulting consequences exemplify the brutal side of innovation and the limitation of startup mentality experienced by the individual innovator. Given that the innovation happens in teamwork, a similar exploration of the dark team mentalities can be carried out to understand the brutal side of the innovation culture experienced by a team of innovators.

4.1.2 Team Startup Mentalities

In the startup culture, achieving a high level of team engagement is a crucial indicator of a highly efficient and effective team in reducing the extreme uncertainty associated with disruptive innovation. Yet, startup mentalities can have undesirable impacts on team performance. In the process category of the startup mentalities, as shown in Table 4.4, both disciplined experimentation and celebration of failures can lead to a low team engagement level. More specifically, if it is too strict, disciplined experimentation can kill a highly valued innovation with ill-formed experimentation hypotheses. In such a case, experimentation flaws or limitations can promote premature cancellation of an innovation that could achieve high value to its stakeholders if given more resources. Moreover, when a team with a high-performance standard embraces the celebration of failure, the team's attitude toward avoidable mistakes or careless failures could be aggressive, resulting in the mistreatment of its team members.

For the team mentality in the structure category shown in Table 4.5, the intolerance of incompetence can lead to firing or job rotation. These two disciplinary actions increase the team members' fear that their failures can have a career consequence either internally or externally. This increased fear of failure can impede the effectiveness of other startup mentalities, such as the celebration of failures, etc., since this increased fear counteracts the desirable behavior of learning from failures.

Table 4.4: Dark Team Startup Mentalities: Process Category

Process
Follow disciplined experimentation to ensure that every experimentation leads to a new learning. This includes rejecting innovative ideas for not meeting the required experiment guidelines
Affective: n/a
Behavioral: inadvertently killing good but ill-formed ideas with strict discipline [71]
Cognitive: for disciplined experimentation
Foster a competent innovation team by setting harsh high-performance standards
Affective: n/a
Behavioral: high-performance standards result in not treating employees with respect and dignity [71]
Cognitive: for high-performance standards

Table 4.5: Dark Team Startup Mentalities: Structure Category

Structure
Foster a competent innovation team by disciplining incompetent innovators
Affective: n/a
Behavioral: firing or rotating into a different role [71]
Cognitive: for intolerance of incompetence

Similar to the dark individual startup mentalities, these dark team mentalities have known direct consequences on team engagement, which is essential in driving the inception and commercialization of any disruptive idea collectively. Yet, these mentalities can have second causal links, either reinforcing or balancing the undesirable consequences on an individual's self-fulfillment level and the team engagement, with other known startup mentalities. Hence, the interactions and interdependencies of the startup mentalities at the individual and team levels can reveal further insights into startup innovation tensions.

4.2 Startup Mentality Casual Loop Diagram

In the previous section, only contemporary startup mentalities at the individual and team levels that have known direct consequences on individual and team performances were explored. In this section, the upstream and downstream of these mentalities are explored in the causal loop diagram, a common technique used in system dynamists to trace both positive and negative causal links among different variables. Furthermore, this diagram can expose any causal loops among these variables and any tensions among these loops. Given that all identified mentalities shown in Appendix C from the focused literature review are not necessarily complete and thorough, the developed causal loop diagrams, shown in Appendix D, are based only on these identified mentalities, including all identified affective, behavioral, and cognitive components. Nevertheless, these causal loop diagrams pass a completeness test of fully capturing the essence of the Lean Startup Methodology. Hence, they are good illustrations of the startup innovation tension at the individual and team levels.

4.2.1 Individual Level Startup Mentality Causal Loop Diagram

At the individual level, the causal loop diagram, shown in Figure D-1 , consists of more than 30 identified individual behaviors or loops. One of these individual behaviors

directly addresses the known emergence of the startup culture – reducing the problem uncertainty – at the individual level. As shown in Figures 4-1 and D-2, this known emergent behavior can be drawn as a reinforcing loop with 12 variables. This loop captures the essence of the Lean Startup Methodology proposed by Eric Ries [74] but with additional layers to better understand its interactions with other individual startup mentalities.

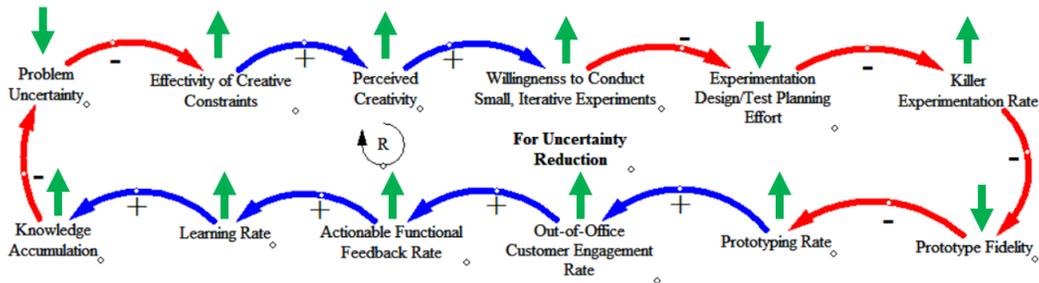


Figure 4-1: Typical Startup Causal Loop at the Individual Level; the green arrow indicating the desirable state of each variable. The up arrow indicates an increased state; the down arrow indicates a decreased state.

Given each variable’s desirable states shown in Figure 4-1, any behavior shown in the causal loop diagram can be categorized into reinforcing or balancing behavior. Reinforcing behavior reinforces the desirable state of these 12 variables. And balancing behavior counteracts the desirable state of these 12 variables. Table 4.6 shows the categorized behaviors shown in the individual level causal loop diagram, Figure D-3.

Given that these behaviors consist of other variables with unknown states, determining the resulting states of these variables can be done by tracing variable states from 12 variables with desirable states and repeatedly branching out similarly to all other variables with unknown states. With the states of these variables identified, the causes and effects of each behavior can be explored. Table 4.7 shows the causes and effects of each balancing behavior. Of these seven behaviors, three behaviors result in a change in an individual’s fear of failure and knowledge accumulation, two of nine variables affecting the individual’s self-fulfillment level. More specifically, the individual’s self-fulfillment level is decreased by these three balancing behaviors. Table

4.8 shows the causes and effects of each reinforcing behavior. Interestingly, none of these reinforcing behaviors affects the individual’s self-fulfillment level.

Given that the individual’s self-fulfillment level is the primary motivator of his or her behaviors, and three balancing behaviors decrease self-fulfillment level, a detailed exploration of all variables that affect the self-fulfillment level can be done to estimate the overall net change of the self-fulfillment level. Figure 4-2 shows the close-up view of the variable, Level of Self-Fulfillment, and its nine input variables. Table 4.9 and Figure D-4 show the resulting state of these nine input variables. Given that the magnitude of each impact from each input variable is unknown in this analysis, it is certain that the innovator experiences conflicting emotions resulting from the startup experience. And one’s overall level of self-fulfillment is likely negatively affected because five out of nine input variables have negative effect on level of self-fulfillment. Besides, startup strategies, such as innovation with extreme uncertainty, exploration mindset, and a learning organization, would exacerbate these conflicting emotions due to these individual contradictory behaviors in the startup culture.

Table 4.6: Two Separate Lists of Behaviors Identified in the Individual Level Causal Loop Diagram

Balancing Behaviors	Reinforcing Behaviors
Asking Probing Question	Sunk Cost Fallacy
Self-Serving	For Minimal Documentation
Information Filtering	Learning from Physical Model Building
For Surprises/Pivoting	Accelerating Decision Making Cycle with Individual Accountability
Going Too Slow	Expectation Setting by Early Prototype
For Jump Starting	For Prototyping
Tolerating Fear	

Table 4.7: Causes and Effects of the Identified Balancing Behaviors in the Individual Causal Loop Diagram

Balancing Behaviors	Causes	Variables Affecting Level of Self-Fulfillment	Effects
Asking Probing Question	Increased Actionable Function Feedback Rate	Increased Fear of Failure	Increased Experimentation Design/Testing Planning Effort
Self-Serving	Increased Knowledge Accumulation	n/a	Decreased Learning Rate
Information Filtering	Increased Knowledge Accumulation	n/a	Decreased Learning Rate
For Surprises/ Pivoting	Increased Actionable Function Feedback Rate	Decreased Knowledge Accumulation	Decreased Knowledge Accumulation
Going Too Slow	Increased Killer Experimentation Rate	n/a	Decreased Willingness to Conduct Small, Iterative Experiments
For Jump Starting	Decreased Problem Uncertainty	n/a	Increased Prototype Fidelity
Tolerating Fear	Increased Actionable Function Feedback Rate	Increased Fear of Failure	Decreased Killer Experimentation Rate

Table 4.8: Causes and Effects of the Identified Reinforcing Behaviors in the Individual Causal Loop Diagram

Reinforcing Behaviors	Causes	Variables Affecting Level of Self-Fulfillment	Effects
Sunk Cost Fallacy	Decreased Prototype Fidelity	n/a	Increased Learning Rate
For Minimal Documentation	Increased Actionable Function Feedback Rate	n/a	Increased Learning Rate
Learning from Physical Model Building	Increased Prototype Rate	n/a	Increased Learning Rate
Accelerating Decision Making Cycle with Individual Accountability	Increased Knowledge Accumulation	n/a	Increased Killer Experimentation Rate
Expectation setting by early prototype	Increased Prototype Rate	n/a	Increased Actionable Function Feedback Rate
For prototyping	Increased Knowledge Accumulation	n/a	Increased Perceived Creativity

Table 4.9: States of Input Variables Affecting Individual's Level of Self-Fulfillment

Input Variables	Resulting States	Effects on Level of Self-Fulfillment
Individual Achievement	Increased	Increased
Fear of Failure	Increased	Decreased
Perceived Personal Disaster Rate, including job loss or reputation loss	Increased	Decreased
Weariness or Fatigue	Increased	Decreased
Knowledge Accumulation	Increased	Increased
Willingness to Accept Personal Risks Publicly	Increased	Decreased
Devastating Idea Criticism Rate	Increased	Decreased
Entrepreneur Recognition	Increased	Increased
Expected Payoff	Increased	Increased

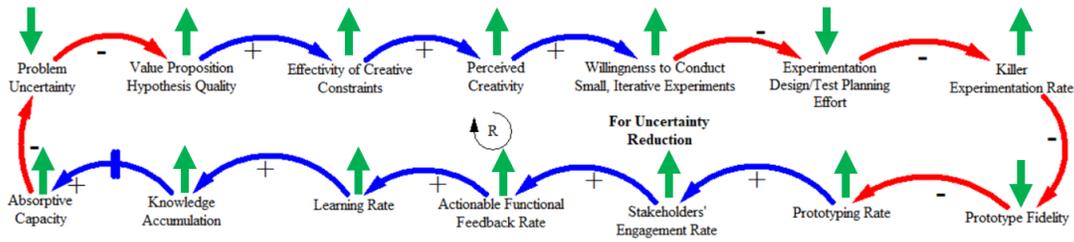


Figure 4-3: Typical Startup Causal Loop at the Team Level; the green arrow indicating the desirable state of each variable. The up arrow indicates an increased state; the down arrow indicates a decreased state.

Table 4.10: Two Separate Lists of Selected Behaviors Identified in the Team Level Causal Loop Diagram

Selected Balancing Behaviors	Selected Reinforcing Behaviors
Incorporating Previous Learning	Engaging with Incomplete Products
False Impression	For Low Fidelity Prototype
Alienating Stakeholder	For Technical Debts to Gain Speed
For Durability	Expectation Setting by Early Prototype
Exploring Feature-to-Feature Dependencies	Sunk Cost Fallacy
Monitoring Customer Behavioral Activation Rate	Exposing Idea's Flaws
Against Customer Uniqueness	Setting Failure Tolerance
For Jump Starting	For Minimal Documentation
Unwilling to Accept Poorly Conceived Risk	Timely Error Correcting
Targeting High Standard of Performance	Mistake Penalizing
For Less Experiment	For More Experiment
Unwilling to Pivot Quickly	
For Accountability	

tertiary loops in the team level causal loop diagram, shown in Figure D-5.

Table 4.11 shows the causes and effects of each selected balancing behavior. Of these behaviors, four behaviors result in a change in the team's fear of failure and killing good but ill-formed ideas, two of eleven variables affecting the team engagement level. More specifically, the team engagement level is decreased by these four balancing behaviors. Table 4.12 shows the causes and effects of each reinforcing behavior. Of these behaviors, only one behavior lowers the team's fear of failure because the more disruptive or creative the idea is, the more likely it will fail. Hence, the team's failure expectation or tolerance increases initially.

Table 4.11: Causes and Effects of the Selected Balancing Behaviors in the Team Causal Loop Diagram

Selected Balancing Behaviors	Causes	Variables Affecting Level of Team Engagement	Effects
Incorporating Previous Learning	Increased Knowledge Accumulation	n/a	Increased Experimentation Design/Testing Planning Effort
False Impression	Increased Prototyping Rate	n/a	
Alienating Stakeholder	Increased Stakeholders' Engagement Rate	n/a	Decreased Actionable Functional Feedback Rate
For Durability	Decreased Prototype Fidelity	n/a	Decreased Stakeholders' Engagement
Exploring Feature-to-Feature Dependencies	Decreased Prototype Fidelity	n/a	Decreased Actionable Functional Feedback Rate
Monitoring Behavioral Changes	Decreased Prototype Fidelity	n/a	
Against Customer Uniqueness	Decreased Prototype Fidelity	n/a	
For Jump Starting	Decreased Problem Uncertainty	n/a	Increased Prototype Fidelity
Unwilling to Accept Poorly Conceived Risk	Increased Actionable Functional Feedback Rate	Increased Fear of Failure	Increased Experimentation Design/Testing Planning Effort
Targeting High Standard of Performance	Decreased Experimentation Design/Testing Planning Effort	Increased Fear of Failure	
For Fewer Experiments	Increased Actionable Functional Feedback Rate	n/a	
Unwilling to Pivot Quickly	Decreased Experimentation Design/Testing Planning Effort	Increased Fear of Killing Good but Ill-formed Ideas	Decreased Killer Experimentation Rate
For Accountability	Decreased Experimentation Design/Testing Planning Effort	Increased Fear of Killing Good but Ill-formed Ideas	Decreased Learning Rate

Table 4.12: Causes and Effects of the Selected Reinforcing Behaviors in the Team Causal Loop Diagram

Selected Reinforcing Behaviors	Causes	Variables Affecting Level of Team Engagement	Effects
Engaging with Incomplete Products	Increased Perceived Creativity	n/a	Decreased Prototype Fidelity
For Low Fidelity Prototype	Decreased Experimentation Design/Testing Planning Effort	n/a	Decreased Prototype Fidelity
For Technical Debts to Gain Speed	Decreased Experimentation Design/Testing Planning Effort	n/a	Decreased Prototype Fidelity
Expectation Setting by Early Prototype	Increased Prototype Rate	n/a	Increased Actionable Functional Feedback Rate
Sunk Cost Fallacy	Decreased Prototype Fidelity	n/a	Increased Learning Rate
Exposing Idea's Flaws	Increased Actionable Functional Feedback Rate	n/a	Increased Learning Rate
Setting Failure Tolerance	Increased Perceived Creativity	Decreased Fear of Failure	Decreased Experimentation Design/Testing Planning Effort
For Minimal Documentation	Increased Actionable Functional Feedback Rate	n/a	Increased Learning Rate
Timely Error Correcting	Increased Actionable Functional Feedback Rate	n/a	Increased Learning Rate
Mistake Penalizing	Increased Perceived Creativity	n/a	Increased Learning Rate
For More Experiment	Increased Actionable Functional Feedback Rate	n/a	Decreased Experimentation Design/Testing Planning Effort

Given that a high team engagement level drives the team's behaviors, and four balancing behaviors decrease team engagement level, a detailed exploration of all variables that affect team engagement level can be done to estimate the overall net change in team engagement level. Figure 4-4 shows the close-up view of the variable, Team Engagement Level, and its eleven input variables. Table 4.13 and Figure D-8 show the resulting state of these eleven input variables. Similar to the individual level analysis, although the magnitude of each impact from each input variable is unknown in this analysis, the team certainly experiences conflicting emotions resulting from the startup experience. And the team's overall engagement level is likely negatively affected. Besides, startup strategies, such as building faster, measuring faster and learning faster, etc., would exacerbate these conflicting emotions due to these contradictory team behaviors in the startup culture. These conflicting emotions are further intensified when the team is working on a hardware project, which requires ones to incur technical debts to maintain a proper development pace. These technical debts lead to additional challenges at the later stage of the development.

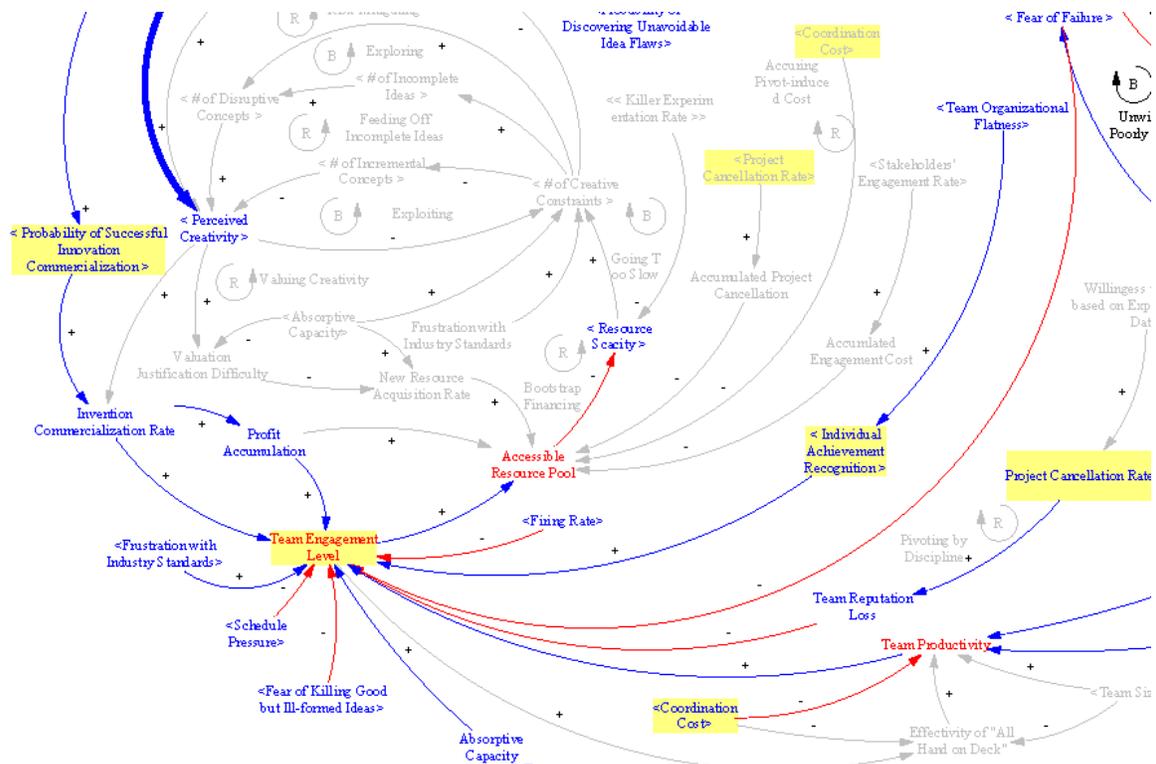


Figure 4-4: A Close-up View of the Variable, Team Engagement Level, at Team Level

Table 4.13: States of Input Variables Affecting Team’s Engagement Level

Input Variables	Resulting States	Effects on Level of Team Engagement
Firing Rate	Increased	Decreased
Individual Achievement Recognition	Increased	Increased
Fear of Failure	Increased	Decreased
Team Reputation Loss	Increased	Decreased
Team Productivity	Decreased	Decreased
Absorptive Capacity, the team’s ability to digest and apply new learning [24]	Increased	Increased
Fear of Killing Good but Ill-formed Ideas	Increased	Decreased
Frustration with Industry Standard	Increased	Increased
Invention Commercialization Rate	Increased	Increased
Profit Accumulation	Increased	Increased
Schedule Pressure	Increased	Decreased

4.3 Startup Mentality Emergence

Although startup culture’s primary emergence is to reduce innovation’s extreme uncertainty, causal loop diagrams at the individual and team levels expose many other unknown or undesirable tensions among these innovative behaviors. These tensions can be discussed in three groups: learning, prototyping, and team structuring, as shown below.

1. Learning

- (a) Fast learning requires fast information generation, yet fast information generation does not necessarily lead to fast learning.
- (b) Learning requires unlearning yet unlearning is an unwelcome experience
- (c) Learning can lead to unintentional information filtering, yet this information filtering leads to overlooking other learning opportunities

2. Prototyping

- (a) Hardware and software prototypes are not the same. Compare to the software prototyping process, the hardware prototyping process is typically slow and costly.

- (b) Low-fidelity prototyping is typically fast and low cost at the cost of the prototype durability.
- (c) Not all customer engagements are the same. Customer verbal feedback and behavioral feedback are different and could be contradictory.
- (d) Pivoting fast is necessary to deliver the innovation faster, yet excessive pivoting can unintentionally increase customers' impatience level, resulting in the customer alienation of the innovative idea.

3. Team Structuring

- (a) Accountability can increase innovator's willingness to collaborate to ensure the success of the multidisciplinary innovation project, yet it can lead to scarce resource competition, raising the risk of internal conflicts and effectively killing the collaboration.

As for learning, three key tensions are the mismatch between information generation rate and learning rate, the experience of learning versus unlearning, and the unintentional consequence of learning resulting in information filtering. Typically, there is an inherent delay between the information generation rate and learning rate. For example, excessive information can exceed an individual's cognitive load. For a team, the team's absorptive capacity depends on the efficient diffusion of new knowledge within the team. Typically, this diffusion is not instant, and each team member requires additional delay to understand the information properly. In the startup culture, one of the main strategies is to go fast. However, individual or team information processing or learning rate would likely dictate the experimentation speed. In other words, it is better to slow down to speed up learning. Another aspect of learning is between learning and unlearning. Given that the two possible outcomes of any startup experimentation are to pivot or not pivot. When a pivot takes place, it would likely lead to unlearning. This unlearning can be a challenging experience in that it challenges the already validated heuristics one follows up to that unlearning moment. Lastly, learning can lead to unintentional information filtering. When an entity accumulates knowledge, one begins to focus on a certain aspect of the new information.

This selectionism can result in an accidental information filter. For example, suppose one always systematically processes information in a specific way. In that case, they could overlook other signals being filtered out by the systematic method, which is implemented with a specific set of assumptions.

As for the prototyping, the four tensions are hardware versus software prototypes, durability versus low-fidelity, customer feedback versus customer behavioral changes, and pivoting rate versus customer alienation. The exploration of contemporary startup mentalities reveals that the hardware company has difficulty implementing the Lean Startup Methodology due to the need to incur technical debts or the inability to produce a low-fidelity prototype with minimum effort and cost. Hence, software-related disruptive innovation is more suitable for the Lean Startup Methodology. One could implement the Lean Startup Methodology in hardware-related disruptive innovation, but the pace will be slower, and the effort will be more expensive. As a result, two different lean standards in the startup culture are required for hardware and software-related disruptive innovations. Another aspect of the prototyping is the tension between durability and low-fidelity. Typically, a low-fidelity prototype serves several benefits, such as its low cost and fast fabrication. However, such a low-fidelity prototype could be less durable. Durability becomes essential when the prototype is damaged or broken easily during the customer engagement event, or the prototype has a limited life, thus limiting the number of customer engagements. Hence, durable yet low-fidelity should be the target for prototyping. Furthermore, the customer provides two sources of information: verbal feedback and behavioral feedback. For an innovation with a human-machine interface, behavioral feedback indicates the customer's true impression of the innovative prototype. However, for certain type of innovation, verbal feedback will be more indicative. Hence, monitoring customer behavioral change is not universal. In addition, customers can give contradictory feedback. One way to resolve this contradictory feedback is to prioritize the behavioral change feedback over the verbal feedback to reduce the risk of customer's cognitive bias in this feedback process. Lastly, startup culture encourages pivoting until one cannot or does not need to pivot. However, excessive pivoting can lead

to customer alienation toward the innovative concept. Hence, the value of customer feedback deteriorates over time. In such a case, going fast can slow ones down.

As for team structuring, accountability can drive and kill collaboration. As shown in the individual causal loop diagram shown in Figure D-1, individual accountability can lead self-serving mentality resulting in a lower interest in collaboration with others. However, in the team causal loop diagram shown in Figure D-5, accountability can drive collaboration because one wants to maximize their accountable projects' probability of success. Hence, they are more willing to reach out to others or collaborate with others to achieve their project goals. In the startup culture, when individuals are working on one mission and their successes are intertwined, accountability can drive collaboration. However, in an organization with multiple projects and a fixed pool of resources, accountability can kill collaboration because of the resource competition. Lastly, although accountability can drive collaboration, it can also implicitly drive the consensus decision-making in certain conditions slowing down the decision-making process.

In addition to the above tensions, the startup culture has four other aspects: risk structure, time valuation, unavoidable failures, and team's cross-functionality. The startup innovative cycle is driven by the individual level of self-fulfillment and team engagement. In ensuring a high level of innovators' self-fulfillment and team engagement, the entity should avoid having a heterogeneous risk profile among all innovators working together. This heterogeneous risk can negatively affect one's motivation and team engagement level. In the startup culture, each innovator's risk profile against disruptive innovation is similar. However, in a large company, the organizational structure is built on a heterogeneous risk structure. Also, time is a resource in the startup culture. Hence, speed is essential in the startup by maximizing the number of experiments seeking a product-market fit before time runs out. However, in a large company, time is prioritized lower when working on the disruptive innovation because corporate intrapreneur's employment is not solely dependent on the outcome of the innovation. This difference in time valuation leads to lower motivation to overcome challenges encountered throughout the innovation cycle. Besides, both individual and

team causal loop diagrams reveal that failure has a consequence. This consequence could be emotional, and it can unconsciously affect individual and team's behaviors in the startup culture. Furthermore, a cross-functional team is not just a group of team members who are diverse in disciplines. A team is truly cross-functional when it can own the whole innovation process from the inception to the commercialization, as illustrated in the team causal loop diagram. Lastly, given that there are many intertwined balancing and reinforcing behaviors identified in exploring the startup mentality, unknown startup systematic emergence can result from different local behaviors, hence the difficulty of cultivating an effective, innovative entity.

4.4 Challenges of Startup Mentality in Large Companies

The previous few sections explored contemporary startup mentalities at the individual and team levels. This exploration details many examples of contradictory innovative behaviors in the startup culture. Despite these contradictory behaviors, many business leaders value the startup culture's emergence to develop disruptive innovation quickly. Hence, many large companies want to embrace startup culture either internally by implementing startup mentalities to accelerate innovation pace in large companies or externally by engaging in an open, collaborative innovation ecosystem. Yet, implementing startup mentalities in the corporate setting is challenging. This section will explore a set of known challenges in implementing startup mentalities in large companies at the individual and team levels.

4.4.1 Individual Corporate Mentalities in Conflict with Startup Mentalities

In large companies, individual corporate mentalities in conflict with startup mentalities can also be analyzed according to the Innovation to Mentality Mapping, Table 3.1. The results of the focused literature review on the challenges of implementing

the startup mentality can be analyzed in three categories: structure, strategy, and reward.

As shown in Table 4.14, four individual mentalities are working against the adoption of the Lean Startup Methodology in the structure category. For example, the sales department cannot accept delayed sales when the customers delay their purchase orders upon learning the upcoming product innovation. Hence, this practice inhibits corporate intrapreneurs from direct customer engagements due to the potential impact on the core business revenue. This core business cannibalization risk is one of the critical reasons large companies resist embracing startup mentalities even if business leaders want to. This reason is also evident in the strategy category, shown in Table 4.14. Also, the mentality of seeking the business innovation model but not owning it fundamentally is an accountability issue. In the startup culture, the founder is accountable for the innovation; they are responsible for all innovative activities from the beginning to the end. Yet, the corporate environment allows for employment mobility. Hence, it is possible to escape accountability leading to the lack of motivation to ensure the project's success. Lastly, the remaining two mentalities are related to customer engagement limitations in the corporate setting. The free flow of information from the customers to the intrapreneurs is crucial for determining the product-market fit. Without this flow of information or a limited flow of information, customer feedback becomes less useful. Hence, the Lean Startup Methodology will not work effectively in such a setting.

The fear of failure, heterogeneous risk profile, and resource scarcity summarize the five specific mentalities in the reward category, shown in Table 4.15. In large companies, employees often prioritize careers over disruptive innovation. In other words, they value in-company reputation over high-risk innovation endeavors. Hence, they resist the learning-by-failing mentality. Also, the large company has a heterogeneous risk structure for its employees, reflecting the organizational hierarchy. This differing risk profile against disruptive innovation leads to resistances. For example, an individual's career success could be tied to a specific technology. In that case, technology obsolescence or replacement by disruptive technology can lead to self-serving behav-

Table 4.14: Individual Corporate Mentalities Toward the Startup Mentality: Structure and Strategy Categories

Structure
Avoid revenue cannibalization by preventing intrapreneurs from changing customer purchasing behaviors
Affective: n/a
Behavioral: "blocking access to customers, and not distracting them with pie-in-the-sky prototypes that may never be built in volume, and worse, may give the customer a reason to delay current purchases" [22]
Cognitive: Against any sales distraction that could result in revenue cannibalization
Promote responsible corporate governance by putting general managers on rotation. In doing so, this rotation policy creates a tenure that is too short for them to hold any accountability.
Affective: n/a
Behavioral: GMs are responsible for the ongoing business model innovation to reconfigure the existing business scope and strategy. Yet, they are on a 2 or 3-year rotation period, too short for them to hold any accountability. [22]
Cognitive: For corporate governance over individual accountability
Avoid potential legal risk exposure by respecting customer rights at all times. In doing so, necessary legal risk mitigation, including getting permissions, is required
Affective: n/a
Behavioral: need more paperwork or permissions for customer feedback collection and utilization [80]
Cognitive: For customer's rights
Protect customer relationships and avoid customer alienation by enforcing customer engagement rules
Affective: n/a
Behavioral: Following customer interaction rules [80]
Cognitive: Against rule breaking
Strategy
Meet investors' business target expectations by protecting business cash cows over innovation
Affective: n/a
Behavioral: n/a
Cognitive: Against existing product cannibalization [43]

Table 4.15: Individual Corporate Mentalities Toward the Startup Mentality: Reward Category

Reward
Protect one's career by avoiding any failure whenever possible
Affective: n/a
Behavioral: pay "lip-service" to failure-celebration sentiment [13]
Cognitive: "Failure is not a good thing for their career." [13]
Avoid any threat to one's career by rejecting any competence-destroying innovation
Affective: n/a
Behavioral: new technology generates threats that could obsolete the basis for power structures [43]
Cognitive: Against competence destroying
Avoid overstaffing and wasteful budgeting by having a fixed, lean pool of resources. In doing so, teams are competing for resource access
Affective: Jealousy
Behavioral: cannot use internal startup talent resources for core business operations [61]
Behavioral: fighting for a larger share of the budget and internal talents [43, 38]
Cognitive: For a "constant sum game"
Protect one's career by avoiding any pivoting whenever possible
Affective: n/a
Behavioral: viewing "pivoting as indecisive and undisciplined" [70]
Cognitive: Against pivoting
Encourage value creation by structuring the compensation to match one's roles & responsibilities. As a result, different teams/innovators have different financial interests in the project
Affective: "feeling of unfairness" [21]
Behavioral: discouraging teamwork [21]
Cognitive: For imbalanced compensation structure

iors, such as against competence destroying and discouraging teamwork, as shown in Table 4.15. Lastly, resource scarcity can lead to competition, which can result in internal conflicts. This competition is related to the differing interests within the large company. New disruptive technology exploration requires funding, yet the same financing can help further operationalize the existing core business. Hence, exploring new disruptive technology divides, rather than unites, intrapreneurs from the core business. As a result, this divide leads to a reduced collaboration, resulting in the eventual demise of yet another attempt at disruptive innovation.

4.4.2 Team Corporate Mentalities in Conflict with Startup Mentalities

In addition to the individual mentalities, there are team mentalities in conflict with startup mentalities. More specifically, there are seven team mentalities in the process category, as shown in Table 4.16. These seven mentalities can be summarized into three groups: disciplined experimentation, core business cannibalization risk, and heterogeneous risk profile. For disciplined experimentation, large companies can experience difficulty implementing the minimum viable product (MVP) concept and avoiding design fixation. The development of a minimum viable product can be challenging if the idea is disruptive in multiple dimensions. In such a case, the intrapreneur would need to develop the underlying technology to create a minimum viable product. Even if one succeeds in creating the MVP, prototype design fixation can happen in some instances. According to the startup mentalities explored in the previous sections, design fixation can occur when the prototype fidelity is high or when one needs to incur intentional technical debts for a hardware prototype. Another challenge is the core business cannibalization risk. In managing this risk, any threat to the existing brand from engaging customers with a sloppy MVP is resisted. Current business agreements or arrangements limit direct access to the customer. Lastly, the large company's heterogeneous risk structure results in a willingness to take on ill-conceived risks, such as committing resources prematurely or deciding

based on incomplete information, or avoiding risks altogether when the failure is not tolerated in the organization.

As shown in Table 4.17, mitigating core business cannibalization risk is a key business strategy in the strategy category. Under this strategy, the large company essentially prioritizes the core business over disruptive innovation exploration. Given that the Lean Startup Methodology is for disruptive innovation with extreme uncertainty, this prioritization toward non-disruptive innovation inhibits the large company from deriving any meaningful value from the Lean Startup Methodology, hence further increase its resistance to the startup mentality adoption.

In the structure category shown in Table 4.18, these five mentalities can be summarized in four groups: disciplined experimentation, silo effect, core business cannibalization risk, and business structures. Disciplined experimentation values customer feedback over the customer relationship. Yet, when the customer is another institution, the large company prioritizes customer relationships over customer feedback. Another challenge is encountering silo effects from the existing organizational structure. Yet, disruptive innovation requires a cross-functional team, trespassing different disciplinary boundaries. As a result, disruptive innovation can lead to internal conflict, as noted in Table 4.18. Moreover, adopting the Lean Startup Methodology can be viewed as a cultural change and resisted by the implicit social contracts among employees because employees in leadership roles have benefited from these social contracts. The large company is also against making changes to the published plan because of the potential brand damage. Hence, this mentality prevents the intrapreneur from pivoting. Lastly, to separate the inception process from the commercialization process, business leaders advocate setting up the Lockheed Skunkworks structure to facilitate the adoption of the startup mentality. Although such a team structure can deliver on disruptive innovation, it could present technology transfer challenges leading to commercialization challenges.

Lastly, as shown in Table 4.19, the mentalities in the reward categories show the challenges of receiving management support, having a heterogeneous risk structure, and valuing validated learning. Due to the management attention competition from

Table 4.16: Team Corporate Mentalities in Conflict with Startup Mentalities: Process Category

Process
Follow disciplined experimentation by creating the right MVP to cut prototyping and testing costs, not any MVP
Affective: n/a
Behavioral: "inability to craft the right MVP and to properly prioritize the MVP test" [46]
Cognitive: For the right viable product (MVP)
Meet investors' business target expectations by protecting brand value and business cash cows
Affective: n/a
Behavioral: using a fake brand [61]
Behavioral: resisting "putting products in front of customers of poorer quality" [83]
Behavioral: refusing "to risk the brand on an unproven MVP" [22]
Cognitive: Against brand damage
Avoid intellectual property risk exposure by avoiding end user engagement at all costs
Affective: n/a
Behavioral: forcing "to use internal employees as customers" [83]
Cognitive: For confidentiality requirements
Avoid rework costs by tweaking, rather than pivoting, the design to address customer feedback
Affective: n/a
Behavioral: making "small iterations to accommodate feedback from customers, but tend to keep the key product design requirements intact" [83]
Cognitive: For design fixation
Avoid schedule delays by occasionally making uninformed material procurement decisions
Affective: n/a
Behavioral: making decisions on long-lead items with incomplete information [83]
Cognitive: For on-time completion
Gain a first mover's advantage by scaling up innovation prematurely before any competitors
Affective: n/a
Behavioral: committing resources prematurely [83]
Cognitive: For the first to market
Protect one's career by avoiding risks and mistakes at all costs
Affective: n/a
Behavioral: stifling new idea and innovation activities [35]
Cognitive: For intolerance of risk takings and mistakes

Table 4.17: Team Corporate Mentalities in Conflict with Startup Mentalities: Strategy Category

Strategy
Protect core businesses by avoiding the unknown future brought on by new innovation
Affective: fear of losing control of the future business direction [38]
Behavioral: advocating the growth hypothesis [38]
Cognitive: For innovation-driven business development

different individuals or groups within the large company, intrapreneurs are left without direct and unwavering management support. This increased distance between intrapreneurs and decision-makers leads to the lack of funding to conduct disciplined experimentation. In such a setting, the value from the Lean Startup Methodology is minimal. Secondly, the risk profile in the organization is heterogeneous, leading to unfair risk versus reward structures. This unfairness can discourage intrapreneurs from adopting the Lean Startup Methodology to pursue the high-risk endeavor because the potential reward does not offset this high risk. Thirdly, learning is the pillar of the Lean Startup Methodology. Yet, the large company seeks liquidable assets. Hence, the validated learning process, necessary to tackle the challenge of disruptive innovation, is sidelined for any direct profit-generating activity. Lastly, the adoption of validated learning can lead to a drop in productivity, as shown in Table 4.19. This drop could discourage business leaders from adopting the startup mentality fully or starting to second-guess themselves.

In summary, the analysis of both individual and team mentalities in conflict with the startup mentality reveals that the main challenges in implementing the startup mentality in the large company are: the core business cannibalization risk, heterogeneous risk structure, fear of failure, and difficulty in the implementation of the disciplined experimentation. And these challenges explain the top barriers, shown in Tables 2.5 and 2.6, of the large company’s lean startup implementations.

Table 4.18: Team Corporate Mentalities in Conflict with Startup Mentalities: Structure Category

Structure
Protect key customer relationships by avoiding engaging them for prototype testing
Affective: n/a
Behavioral: avoid testing that could compromise potential B2B business relationships [46]
Cognitive: For B2B business relations
Respecting others' roles & responsibility by avoiding trespassing one another's roles whenever possible. Yet, one sometimes needs to trespass to avoid procedural delays due to this mentality
Affective: n/a
Behavioral: trespassing departmental boundaries leading to internal conflicts [32]
Cognitive: Against rule breaking
Protect brand value by avoiding pivoting on the published plan at all costs
Affective: n/a
Behavioral: resisting "to perform major pivots or perishing an MVP" [83]
Cognitive: For the published plan and against plan changes
Protect mutually beneficial social contracts among employees by resisting any changes affecting these contracts
Affective: n/a
Behavioral: resisting changes, especially cultural changes [71]
Cognitive: For social contracts
Avoid innovators' conflicts of interest by separating commercialization entities from invention entities. In doing so, innovators can experience invention transferring difficulty.
Affective: n/a
Behavioral: "separating the creative process from the commercialization process" [43]
Behavioral: losing "contact and influence with line managers" [43]
Behavioral: encountering "difficulty in transferring new technology out of such geographically and organizationally isolated center" [43]
Cognitive: For "skunk works"

Table 4.19: Team Corporate Mentalities in Conflict with Startup Mentalities: Reward Category

Reward
Protect core businesses by avoiding any risk of cannibalization
Affective: n/a
Behavioral: new technology could obsolete the basis for the existing business model [43]
Cognitive: for core business model
Increase management attention and visibility on projects by competing for management’s attention. As a result, the one who failed to compete receives no management attention.
Affective: Jealousy for management attention on innovation projects [43]
Behavioral: Increasing distance between intrapreneurs and senior management [43]
Cognitive: For management attention to maintain continuous support
Encourage value creation by structuring the compensation to match one’s roles & responsibilities. As a result, different stakeholders have different financial interests/risks in the projects
Affective: n/a
Behavioral: "[Innovators], higher-level managers, and owners of equity benefit from the innovation process in different ways and take different risks" [43]
Cognitive: For heterogeneous risk profile
Maximize revenue generation by prioritizing revenue generating activities over any learning activities
Affective: n/a
Behavioral: discouraging learning and encouraging liquidable asset accumulation [74]
Cognitive: learning is not an liquidable asset
Avoid productivity decline by resisting any change that leads to short-term switch costs
Affective: feel worse before it feels better [74]
Behavioral: productivity declines during the transition to validated learning [74]
Cognitive: for validated learning

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Chapter 5

Cross-Sectional Study of Corporate Innovation Mentalities

Similar to the startup innovation culture, corporate innovation culture is paradoxical. For example, corporate innovation culture tolerates failures. At the same time, it does not tolerate any regulation, security, safety, compliance, or contractual failures. The previous section exposes the startup's contradictory innovation behaviors at the individual and team levels. It also highlights dark innovation behaviors leading to the erosion of individual motivation and team engagement. Moreover, the previous section explores published corporate mentalities preventing the large companies from fully capturing the value of acting like startups, especially in the new product development. Yet, the previous section does not fully expose any unknown corporate innovation mentalities, especially any unknown dark corporate innovation mentalities. Hence, a cross-sectional study of the intrapreneurs at the large, innovative companies is conducted to understand any unknown innovation mentalities and challenges in developing or sustaining the startup mentality in large companies. Hence, similar to the approach detailed in exploring startup mentalities, this section starts with corporate innovation mentality categorizations at the individual and team levels, explores any tensions among these corporate mentalities, and concludes with any discovered unknown corporate innovation tensions in large companies. These challenges address how these corporate innovation mentalities reinforce or balance the paradoxical in-

novation behaviors and affect individual intrapreneurs' motivation and innovation teams' engagement level.

5.1 Large Companies Interview Results

This cross-sectional study focuses on the behavioral dimension of the corporate innovation culture. It targeted eleven mid-career professionals from the 2019 and 2020 MIT System Design and Management cohorts. The structure of this semi-structural interview is included in Appendix A. A total of eleven individuals, shown in B.1, were interviewed. In this interview, each interviewee was guided to reflect on the corporate definition of innovation and the innovation strategy in his or her company. Also, they were guided to reflect on corporate intrapreneurs' and innovation teams' behaviors, mindsets, motivations, interactions with others, and risk vs. reward profiles. After this study, a set of 138 corporate innovation mentalities observed in the interview, shown in Appendix B, is identified. Many of these mentalities are not included in the prior literature research into the corporate innovation mentality. Similar to the startup mentality analysis, these mentalities are analyzed according to the taxonomy of attitude shown in Figure 2-3 and categorized against the Star Model shown in Figure 2-4. The detailed results of this analysis are presented in the following subsections.

5.1.1 Individual Corporate Mentalities

At the individual level, the key motivator for any corporate intrapreneur is his or her level of self-fulfillment. However, the cross-sectional study confirms that there is a dark side of the corporate innovation culture, a side that is not readily examined in the corporate innovation literature review. In this subsection, three dark individual corporate innovation mentality categories, specifically process, structure, and reward, are explored to understand the underlying beliefs and the resulting behaviors that can erode an individual's level of self-fulfillment.

From the individual work process perspective, four corporate process mentali-

ties, as shown in Table 5.1, can discourage individual intrapreneurs over time. For example, innovation crowdsourcing from individual intrapreneurs is common in the corporate innovation culture. Yet, this practice is most beneficial when individual intrapreneurs are fully engaged. As a result, individual intrapreneurs are under incessant pressure to come up with each innovation proposal. Yet, such expectation is not typically sustainable since the innovation becomes harder over time, amplifying the pressure of coming up with the next innovation proposal. Moreover, sometimes, these hard-fought innovation proposals are rejected due to the bad timing with market conditions or the misalignment with business goals. Each rejection, regardless of how well it is justified, frustrates the individual intrapreneur over time. The accumulation of a large number of rejections inevitably negatively affects the intrapreneur's self-fulfillment. Another source of frustration comes from the approval process typically implemented as part of the innovation crowdsourcing practice. This approval process can lead to an innovation rejection before the intrapreneur has a chance to prove it otherwise. Over time, the individual's hacking mentality is discouraged. Moreover, when one's proposal is approved, they need to balance the development documentation with the innovation speed. Typically, the value of documentation is conditioned on the successful outcome of the innovation. As a result, documentation is often an after-thought exercise. However, such behavior can lead to knowledge loss when the intrapreneur is reassigned or a significant documentation effort in the later stage of the innovation process. Each occurrence of the rework to recover the knowledge loss and a considerable documentation effort unintentionally discourage intrapreneurs, especially when intrapreneurs are asked to carry out the rework or the documentation effort for others.

From the individual structure perspective, four corporate structure mentalities, shown in Table 5.2, can unintentionally lower an individual intrapreneur's level of self-fulfillment. Of these four mentalities, different motivations behind individual intrapreneurs' job mobility can lead to a bad corporate innovation experience. For instance, individual intrapreneurs can pursue internal and external job opportunities to accelerate their career advancement and avoid career stagnation. As a result, the

Table 5.1: Dark Individual Corporate Innovation Mentalities: Process Category

Mentalities	Co.	Intra.
Co.: Company #; Intra.: Intrapreneurs #		
Process		
To source good ideas by requiring employees to propose new ideas regardless of the business proposition	A	1
Maximize return on investment by rejecting any innovation that does not serve existing business needs	D	5
Promote the hacking mentality to generate more disruptive ideas. Yet these ideas are subject to the approval process before the development can begin.	G	8
Maximize return on investment by focusing on valued-added innovation activities only. In doing so, experimentation is prioritized over documentation.	J	10

Note: This table shows a selected list of dark innovation mentalities from a more extensive set of innovation mentalities collected as part of the cross-sectional study. Given the unstructured nature of the interview, the interviewee's unique industry background, and unique behaviors of achieving a similar objective, in this list of dark mentalities, only interviewees with specific dark innovation mentalities are mapped. For other interviewees, no dark innovation mentalities can be categorized from their interviews.

remaining intrapreneurs in the team would need to endure an unstable team environment. Furthermore, this unstable team environment discourages intrapreneurs from assuming the accountability of ensuring the success of each innovation project since they are not necessarily affected by the project's negative outcomes. If the individual intrapreneur is accountable for the outcome of the project, he or she is willing to compromise up to a certain point. Yet, this willingness to compromise could be reduced to nonexistent when the projects experience challenges. This resulting unwillingness discourages any collaboration among intrapreneurs, resulting in a toxic, uncooperative working environment. Besides, there are instances of assigning unqualified intrapreneurs to be accountable for the project, resulting in unnecessary development setbacks or mistakes. Furthermore, individual intrapreneurs are against failure or risk-taking to protect their careers. In some instances, these intrapreneurs are often the leaders who review the high-risk, hard-fought innovation proposals. But their desire to protect their reputations results in their willingness to reject innovation proposals aggressively, unintentionally discouraging the proposal initiators from

Table 5.2: Dark Individual Corporate Innovation Mentalities: Structure Category

Mentalities	Co.	Intra.
Co.: Company #; Intra.: Intrapreneurs #		
Structure		
Protect one's career by avoiding failures at all costs because failures could compromise one's next job promotion	C	4
Avoid team performance stagnation by forming new teams frequently and structuring new teams with one rock star to carry the team	E	6
Protect one's career by only performing the job within one's roles & responsibility	E	6
Speed up one's career advancement by hopping jobs when one perceives that his or her salary or career is stagnating	G	8

Note: This table shows a selected list of dark innovation mentalities from a more extensive set of innovation mentalities collected as part of the cross-sectional study. Given the unstructured nature of the interview, the interviewee's unique industry background, and unique behaviors of achieving a similar objective, in this list of dark mentalities, only interviewees with specific dark innovation mentalities are mapped. For other interviewees, no dark innovation mentalities can be categorized from their interviews.

pursuing high-value and high-risk innovations. And this kind of leadership behavior is sometimes further encouraged because the opportunity cost of not doing the innovation is invisible. Lastly, to avoid performance stagnation, frequent team reorganizations are encouraged. However, the high performers in each team are expected to carry the team, and these high performers often experience high and constant stress from the incessant flow of support requests.

From the individual reward perspective, seven corporate reward mentalities, shown in Table 5.3, can unintentionally result in a bad corporate innovation experience. For instance, although individual recognition can afford the accomplished intrapreneurs the psychological safety of speaking up, this approach unintentionally encourages intrapreneurs to exhibit disrespectful verbal behaviors, a kind of workplace abuse that discourages others from voicing their opinions. Besides the individual recognition, corporate intrapreneurs are often discouraged by the negligible monetary reward received by above-average and below-average innovation performers. And they are further discouraged that their only path to the higher salary is the promotion, which is based on the years of service and the leadership performance, not solely on the

Table 5.3: Dark Individual Corporate Innovation Mentalities: Reward Category

Mentalities	Co.	Intra.
Co.: Company #; Intra.: Intrapreneurs #		
Reward		
Foster a safe culture of speaking up by affording intrapreneurs the freedom to speak up without fear of retribution	A	1
Value well-rounded employees by rewarding them based on many factors, not just on innovation excellence. Yet, individuals wanting the promotions game the system for self-interests	A	2
Improve the team’s agility by decomposing any task into chunks and having different sprints for each chunk. Yet, not all tasks can be decomposed and estimated, leading to task failures outside the innovator’s control	B	3
Protect one’s career by avoiding failures or negative exposure to the management at all costs	C	4
Avoid financial penalties by penalizing any failures in meeting regulations, contractual requirements or internal key policies	C	4
To achieve in-group alignment quickly by favoring intrapreneurs who share the same visions and work ethics	E	6
Protect core business operations by requiring intrapreneurs, while on the job, to support core business operations only	H	9

Note: This table shows a selected list of dark innovation mentalities from a more extensive set of innovation mentalities collected as part of the cross-sectional study. Given the unstructured nature of the interview, the interviewee’s unique industry background, and unique behaviors of achieving a similar objective, in this list of dark mentalities, only interviewees with specific dark innovation mentalities are mapped. For other interviewees, no dark innovation mentalities can be categorized from their interviews.

innovation excellence. Besides being not often promoted based on innovation excellence, intrapreneurs are often fearful of the negative management exposure and unforgiving regulatory or contractual compliance failures. This fear discourages them from accepting failures, and since failures are expected in the innovation project, this belief encourages them to reject innovation aggressively, eroding the confidence of affected intrapreneurs. Moreover, to minimize the failure exposure, certain intrapreneurs engage in individual favoritism in their team formation. This favoritism unfairly excludes other intrapreneurs from engaging or contributing to the projects. Also, the individual intrapreneur is expected to take on an additional workload to cover both the core business activity and the innovation activity if the innovation initiative proves to be successful. This additional workload can lead to a feeling of overwork and weariness or fatigue. Lastly, when the corporate adopt the agile methodology to improve the team's agility, intrapreneurs are frustrated when they fail to meet the task schedule and are being called out during daily meetings.

Overall, these negative individual behaviors exemplify a small set of brutal innovation experiences in the corporate innovation culture. Each occurrence of bad experience lowers the individual's level of self-fulfillment, leading to the intrapreneur's unwillingness to pursue innovation or overcome the expected challenges inherent in innovation activities. Ultimately, this resulting unwillingness reduces the overall innovation speed or return on the organization's innovation investment.

5.1.2 Team Corporate Mentalities

At the team level, a highly efficient and competent team typically exhibits a high level of engagement. Yet, corporate innovation mentalities can lower rather than raise its innovation team's level of engagement. In this subsection, two dark team corporate innovation mentality categories, specifically process and structure, are explored to understand the underlying beliefs and the resulting behaviors that can lead to a lower team performance over time.

From the teamwork process perspective, four corporate process mentalities, as shown in Table 5.4, can decrease the innovation team's level of engagement over

time. In the corporate innovation culture, especially when the customer base is made of just a few institutional customers, the team is only allowed to send prototypes out for customer validation after passing internal gate reviews. Yet, for those prototypes that passed these reviews, many still fail customer validations, effectively lengthening the development cycle. Despite this pattern of failures, the team is not empowered to deviate from this structured prototyping process. As a result, the team suffers preventable innovation failures and becomes frustrated with the burden of executing a failed process. Besides, to achieve market-driven innovation, the team is required to follow a data-driven decision-making process. When this process is followed strictly, it can unintentionally kill a high-value and high-risk innovation that lacks the immediate market impact data but would otherwise be very promising in future or emerging markets. Moreover, the team is fearful of causing any unknown disruption to the critical yet overdue legacy system when conducting the hypothesis-driven experimentation in its pursuit of innovation. This fear, especially when it is coupled with any regulation incompliance risk, leads to an aggressive rejection of the team's innovation proposal. As a result, these rejections incite negative feelings within the team, lowering the team engagement level over time.

From the team structure perspective, four corporate mentalities, as shown in Table 5.5, can incite negative feelings within the team. Given that a large company is not a single-project organization, teams are reorganized to align the talents' needs with the evolving business needs. These reorganizations afford many internal opportunities, leading to an unstable innovation team and causing the team to incur the recurring coordination cost that lowers the team's productivity. In addition, the encouragement of the team-level accountability to drive collaboration can lead to escalations when teams have two accountable objectives that are in conflict. Moreover, when the team experiences a failure, rather than accepting a team failure, an individual is often attributed to the team failure. As a result, the work environment becomes toxic. Lastly, the empowerment of leadership has a significant impact on the team's risk tolerance. When team leaders are toxic and unwilling to tolerate risks associated with the innovation, their values become the team's values. Hence, the intrapreneurs

Table 5.4: Dark Team Corporate Innovation Mentalities: Process Category

Mentalities	Co.	Intra.
Co.: Company #; Intra.: Intrapreneurs #		
Process		
Follow disciplined prototyping process by subjecting each prototype to a verification review before a validation review	A	2
Maximize return on investment by following a market-data-driven innovation down selection process	A	2
Avoid the risk of disrupting existing systems by avoiding doing anything that could disrupt the systems	C	4
Avoid unnecessary risks by rejecting innovations that invalidate well-understood technology	K	11

Note: This table shows a selected list of dark innovation mentalities from a more extensive set of innovation mentalities collected as part of the cross-sectional study. Given the unstructured nature of the interview, the interviewee’s unique industry background, and unique behaviors of achieving a similar objective, in this list of dark mentalities, only interviewees with specific dark innovation mentalities are mapped. For other interviewees, no dark innovation mentalities can be categorized from their interviews.

Table 5.5: Dark Team Corporate Innovation Mentalities: Structure Category

Mentalities	Co.	Intra.
Co.: Company #; Intra.: Intrapreneurs #		
Structure		
To align talent’s needs with business needs by restructuring the team frequently	A	2
Drive collaboration by promoting accountability. But doing so leads ones to prioritize their responsible projects over others	C	4
Empower leaders by concentrating power in the hands of leaders. As a result, leaders’ risk tolerance becomes teams’ risk tolerance	E	6
Speed up one’s career advancement by hopping jobs when one perceives that his or her salary or career is stagnating. As a result, teams suffer from incurring high coordination costs	G	8

Note: This table shows a selected list of dark innovation mentalities from a more extensive set of innovation mentalities collected as part of the cross-sectional study. Given the unstructured nature of the interview, the interviewee’s unique industry background, and unique behaviors of achieving a similar objective, in this list of dark mentalities, only interviewees with specific dark innovation mentalities are mapped. For other interviewees, no dark innovation mentalities can be categorized from their interviews.

under these leaders become powerless and frustrated.

Overall, these negative team behaviors illustrate the unknown dark side of the corporate innovation team. Many of these behaviors have a direct impact on team engagement. However, these behaviors are not independent of one another. There are interactions among their secondary causal links. These interactions and interdependencies can result in corporate innovation tensions, further explored in the following two subsections.

5.2 Corporate Innovation Mentality Causal Loop Diagram

Like the section 4.2 Startup Mentality Casual Loop Diagram, this section explores the upstream and downstream of the corporate innovation mentalities, especially those dark mentalities. The individual and team level causal loop diagrams, shown in Appendix E, are developed to visually represent the cross-sectional study results and map the interdependencies among these mentalities. It is essential to recognize that these causal loop diagrams highlight essential interactions identified in the interview process. It does not fully capture the complete corporate innovation culture. However, they are complete in that it captures an end-to-end corporate invention and commercialization process. Hence, they are good mental models illustrating selective corporate innovation tensions at the individual and team levels.

5.2.1 Individual Level Causal Loop Diagram

The main corporate innovation loop is a reinforcing loop at the individual level, as shown in Figure 5-1. This loop consists of 12 auxiliary variables with an emergent outcome of increasing the probability of successful innovation commercialization. Besides, this loop captures a typical disciplined innovation process experienced by an individual intrapreneur starting from one's interest in the innovation. Given the desirable states of these auxiliary variables and the causal links between these 12

Table 5.6: Two Separate Lists of Behaviors Identified in the Individual Level Corporate Innovation Causal Loop Diagram, Figure E-3

Balancing Behaviors	Reinforcing Behaviors
For a Personal Career Advancement	For the Promotion-based Employee Motivation
For the High Competence Intrapreneurs	For High Individual Performance
For Change Invitation	For the Agile Methodology
For One’s Reputation	For Internal Career Mobility
For Intrapreneur’s Empowerment	For Early innovation Recognition
For Minimal Documentation	For Owner’s Mindset
For Accountability	For Disciplined Experimentation
To Drive Knowledge Sharing	For a Fast, Costly Prototype Process
For the Market-driven Innovation	
Against the Technical Curiosity	

variables to other auxiliary variables in Figure E-1, the states of all other variables are identified and used to classify any reinforcing and balancing corporate innovation mentalities, as shown in Table 5.6. Overall, the main corporate innovation loop is not inherently sustainable in that there are many balancing behaviors and reinforcing behaviors acting on the main loop.

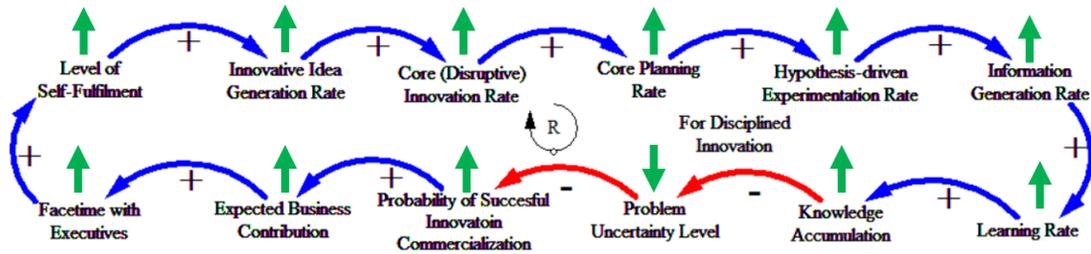


Figure 5-1: Typical Corporate Innovation Causal Loop at the Individual Level; the green arrow indicating the desirable state of each variable. The up arrow indicates an increased state; the down arrow indicates a decreased state

The further analysis of these balancing behaviors’ causes and effects reveals that the balancing behaviors are initiated by five of 12 auxiliary variables: increased level of self-fulfillment, increased failure rate, increased knowledge accumulation, increased hypothesis-driven experimentation rate, and decreased problem uncertainty. And only seven of these 12 auxiliary variables are affected negatively. Interestingly, core planning rate, information generation rate, learning rate, expected business contribu-

Table 5.7: Causes and Effects of the Identified Balancing Behaviors in the Individual Level Corporate Innovation Causal Loop Diagram, Figure E-3

Balancing Behaviors	Cause	Variable Affecting Level of Self-Fulfillment	Effect
For a Personal Career Advancement	Increased Level of Self-Fulfillment	Increased Perceived Probability of Career/Salary Stagnation	Decreased Level of Self-Fulfillment
For the Highly Competent Intrapreneurs	Increased Information Generation Rate	Decreased Level of Individual Recognition	Decreased Level of Self-Fulfillment
For the Highly Competent Intrapreneurs	Increased Knowledge Accumulation	Increased Level of Team Carrying Induced Stress	Decreased Level of Self-Fulfillment
For Change Invitation	Increased Information Generation Rate	Decreased Level of Individual Recognition	Decreased Innovative Idea Generation Rate
For One's Reputation	Increased Level of Self-Fulfillment	n/a	Decreased Core (Disruptive) Innovation Rate
For Intrapreneur's Empowerment	Increased Information Generation Rate	Decreased Level of Individual Recognition	Decreased Hypothesis-Driven Experimentation Rate
For Minimal Documentation	Increased Information Generation Rate	Increased Level of Documentation Effort in Later Stage of Innovation Process	Decreased Level of Self-Fulfillment
For Accountability	Increased Level of Self-Fulfillment	n/a	Decreased Hypothesis-Driven Experimentation Rate
To Drive Knowledge Sharing	Increased Hypothesis-Driven Experimentation Rate	n/a	Decreased Knowledge Accumulation
For the Market-driven Innovation	Decreased Problem Uncertainty Level	n/a	Increased Problem Uncertainty Level
Against the Technical Curiosity	Decreased Problem Uncertainty Level	n/a	Decreased Probability of Successful Innovation Commercialization

tion, and facetime with executives are not affected by these balancing loops. Hence, these five auxiliary variables are independent of other variables in the corporate innovation culture, and these variables can be managed independently. In other words, the other seven variables are affected by corporate innovation tensions, and they cannot be managed separately. Of these ten balancing behaviors, six of them lower the individual's level of self-fulfillment. Hence, Table 5.7 confirms that the corporate innovation process is not sustainable over time since these balancing behaviors negatively affect the corporate innovation process's efficiency and lower the individual's level of self-fulfillment.

Besides, the further analysis of the causes and effects of these reinforcing behaviors reveals that these behaviors are initiated by five of 12 auxiliary variables: increased level of self-fulfillment, decreased problem uncertainty level, increased innovative idea generation rate, increased information generation rate, and increased hypothesis-driven experimentation rate. Only three of these 12 auxiliary variables, level of self-fulfillment, hypothesis-driven experimentation rate, and learning rate, are reinforced by these behaviors. Of these eight reinforcing behaviors, only four increase the individual's level of self-fulfillment. Comparing to the effects of the balancing behaviors, the impact of these reinforcing behaviors is more limited. Given the large extent of the balancing behaviors compared to that of the reinforcing behaviors, Table 5.8 reaffirms that the corporate innovation process is not inherently sustainable over time. The individual's level of self-fulfillment will erode over time.

To better ascertain that the individual's level of self-fulfillment will erode over time in the corporate innovation culture, the resulting states of sixteen input variables, shown in Figure 5-2, to the individual's level of self-fulfillment are identified. Table 5.9 and Figure E-4 illustrate that the individual's self-fulfillment level would likely be lowered since nine of sixteen variables negatively affect the intrapreneur's self-fulfillment.

Table 5.8: Causes and Effects of the Identified Reinforcing Behaviors in the Individual Level Corporate Innovation Causal Loop Diagram, Figure E-3

Reinforcing Behaviors	Cause	Variable Affecting Level of Self-Fulfilment	Effect
For the Promotion-based Employee Motivation	Increased Level of Self-Fulfilment	Decreased Perceived Probability of Career/Salary Stagnation	Increased Level of Self-Fulfillment
For High Individual Performance	Increased Level of Self-Fulfilment	Decreased Perceived Probability of Career/Salary Stagnation	Increased Level of Self-Fulfillment
For the Agile Methodology	Decreased Problem Uncertainty Level	Decreased Rate of Bad Performance Accusation	Increased Level of Self-Fulfillment
For Internal Career Mobility	Increased Level of Self-Fulfilment	n/a	Increased Hypothesis-Driven Experimentation Rate
For Early Innovation Recognition	Increased Innovative Idea Generation Rate	Increased Early Innovation Ownership Rate	Increased Level of Self-Fulfillment
For Owner's Mindset	Increased Level of Self-Fulfilment	n/a	Increased Hypothesis-Driven Experimentation Rate
For Disciplined Experimentation	Increased Informational Generation Rate	n/a	Increased Learning Rate
For a Fast, Costly Prototype Process	Increased Hypothesis-Driven Experimentation Rate	n/a	Increased Hypothesis-Driven Experimentation Rate

Table 5.9: States of Input Variables Affecting Individual’s Level of Self-Fulfillment in Corporate Innovation Culture

Input Variables	Resulting State	Effect on Level of Self-Fulfillment
Rate of Bad Performance Accusation	Decreased	Increased
Level of Individual Recognition	Decreased	Decreased
Level of Team Carrying Induced Stress	Increased	Decreased
Facetime with Executive	Increased	Increased
Threat Level of Competence Destroying	Increased	Decreased
Pressure Induced by Expected Idea Commercialization	Decreased	Increased
Pressure Induced by Expected Idea Generation Rate	Increased	Decreased
Level of Frustration with Existing Process	Decreased	Increased
Rate of Innovation Discouragement for Lack of Immediate Business value	Decreased	Increased
Early Innovation Ownership Rate	Increased	Increased
Level of Documentation Effort in Later Stage of Innovation Process	Increased	Decreased
Involuntary Position Rotation Rate	Increased	Decreased
Firing Rate	Decreased	Increased
Risk of Being Called Out	Increased	Decreased
Perceived Probability of Career/Salary Stagnation	Increased	Decreased
Innovative Idea Rejection Rate	Increased	Decreased

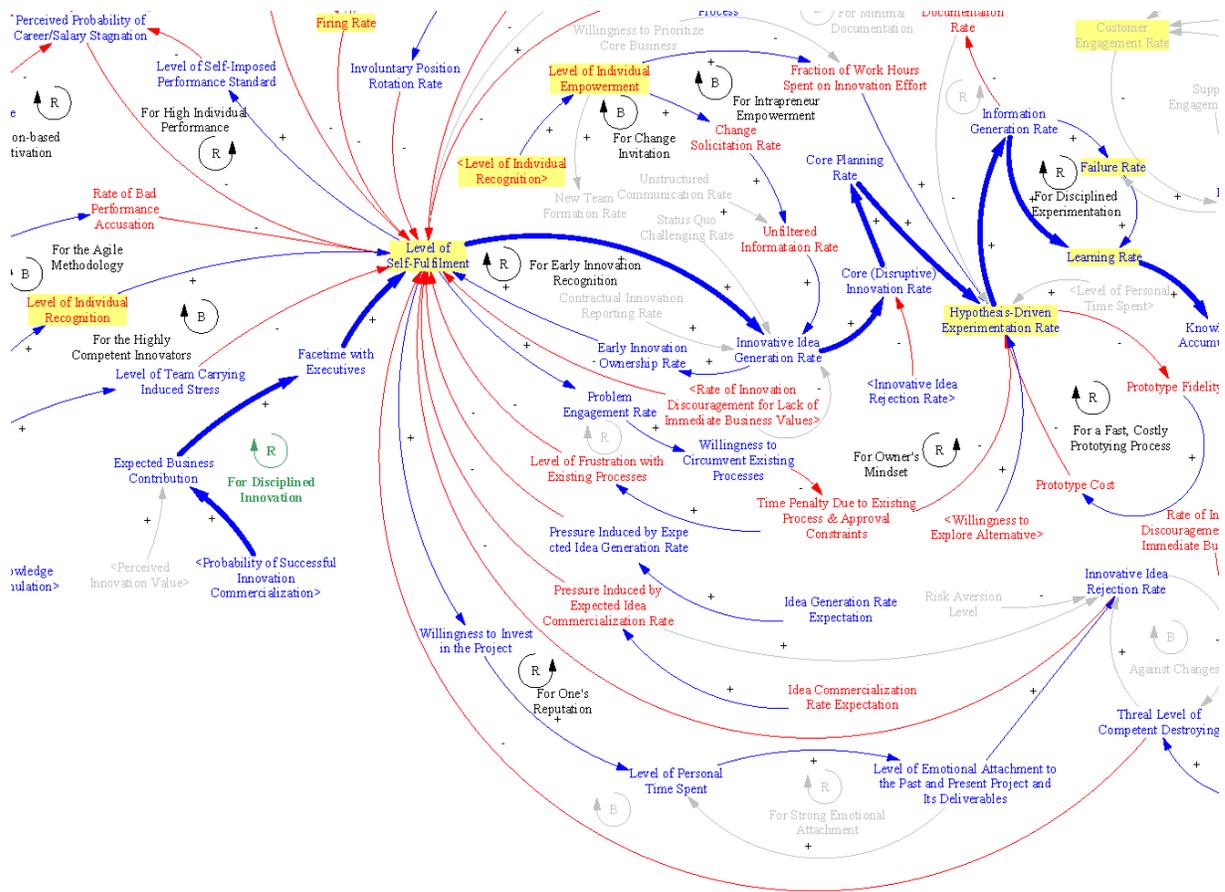


Figure 5-2: A Close-up View of the Variable, Level of Self-Fulfillment, at the Individual Level

5.2.2 Team Level Causal Loop Diagram

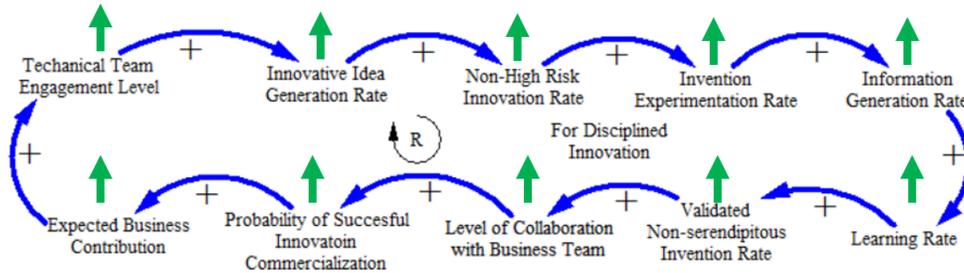


Figure 5-3: Typical Corporate Innovation Causal Loop at the Team Level; the green arrow indicating the desirable state of each variable. The up arrow indicates an increased state; the down arrow indicates a decreased state

The main corporate innovation loop is also a reinforcing loop at the team level, as shown in Figure 5-3. This loop consists of ten auxiliary variables with an emergent outcome of increasing the probability of successful innovation commercialization. Besides, this loop captures a typical disciplined innovation process experienced by the innovation team starting from its initial engagement level. Given the desirable states of these auxiliary variables and the causal links between these ten variables to other auxiliary variables in Figure D-5, the states of all other variables are identified and used to classify any reinforcing and balancing corporate innovation mentalities, as shown in Table 5.10. Overall, the main corporate innovation loop is also not inherently sustainable in that there are many balancing behaviors and reinforcing behaviors acting on the loop.

Table 5.10: Two Separate Lists of Behaviors Identified in the Team Level Corporate Innovation Causal Loop Diagram, Figure E-7

Balancing Behaviors	Reinforcing Behaviors
For Project Cancellation	For Serendipitous Innovation
For the Temporary Team Structure	For Asset Salvaging
For the "if it works, don't fix it" mentality	Against Technical Debt
For a Verification-before-Validation Process	For a Fast, Costly Prototype Process
For the Immediate Innovation Implementation	

Table 5.11 shows the analysis result on the causes and effects of the five balancing behaviors identified in Table 5.11. This analysis reveals that the balancing behaviors

Table 5.11: Causes and Effects of the Identified Balancing Behaviors in the Team Level Corporate Innovation Causal Loop Diagram, Figure E-7

Balancing Behaviors	Cause	Variable Affecting Level of Team Engagement	Effect
For Project Cancellation	Increased Information Generation Rate	Increased Level of Negative Executive Exposure	Decreased Team Engagement Level
For the Temporary Team Structure	Increased Non-High Risk Innovation Rate	Decreased Perceived Level of Team Stability	Decreased Team Engagement Level
For the "if it works, don't fix it" mentality	Increased Invention Experimentation Rate	Increased Fear of Disruption	Decreased Non-High Risk Innovation Rate
For a Verification-before-Validation Process	Increased Validated Non-serendipitous Invention Rate	Increased Rework Rate	Decreased Team Engagement Level
For the Immediate Innovation Implementation	Increased Learning Rate	Increased Level of Negative Executive Exposure	Decreased Team Engagement Level

are initiated by five of 10 auxiliary variables. And only two of these ten auxiliary variables, such as team engagement level and non-high-risk innovation rate, are affected negatively. In contrast with the analysis result of the individual level balancing behaviors, team engagement level, rather than the team level innovation process, is predominately affected by these balancing behaviors. Hence, the team-level corporate innovation loop is not inherently sustainable, not because of the inefficient innovation process but because of the detrimental effects on team engagement over time.

Interestingly, the analysis on the causes and effects of the four reinforcing behaviors, shown in Table 5.12, reveals that the dominant effect is the increased invention experimentation rate. These reinforcing behaviors mainly positively affect the corporate innovation process rather than the team engagement level. Considering both these reinforcing and balancing behaviors, the negative psychological effect from the balancing behaviors outweighs the positive effect from the reinforcing behaviors from the team psychological perspective. And Table 5.13 and Figure E-8 further validate this conclusion in that six out of ten input variables, shown in Figure 5-4, are lowering

Table 5.12: Causes and Effects of the Identified Reinforcing Behaviors in the Team Level Corporate Innovation Causal Loop Diagram, Figure E-7

Reinforcing Behaviors	Cause	Variable Affecting Level of Team Engagement	Effect
For Serendipitous Innovation	Increased Learning Rate	Decreased Level of Negative Executive Exposure	Increased Team Engagement Level
For Asset Salvaging	Increased Information Generation Rate	n/a	Increased Invention Experimentation Rate
Against Technical Debt	Increased Information Generation Rate	n/a	Increased Invention Experimentation Rate
For a Fast, Costly Prototype Process	Increased Invention Experimentation Rate	n/a	Increased Invention Experimentation Rate

Table 5.13: States of Input Variables Affecting Team's Level of Engagement in Corporate Innovation Culture

Input Variables	Resulting State	Effect on Level of Team Engagement
Level of Negative Executive Exposure	Increased	Decreased
High-Performance Reward	Decreased	Increased
Expected Business Contribution	Increased	Increased
Innovative Idea Rejection Rate	Increased	Decreased
Fear of Disruption	Increased	Decreased
Level of Team Empowerment	Increased	Increased
Rate of Conflicts	Increased	Decreased
Rework Rate	Increased	Decreased
Firing Rate	Decreased	Increased
Perceived Level of Team Stability	Decreased	Decreased

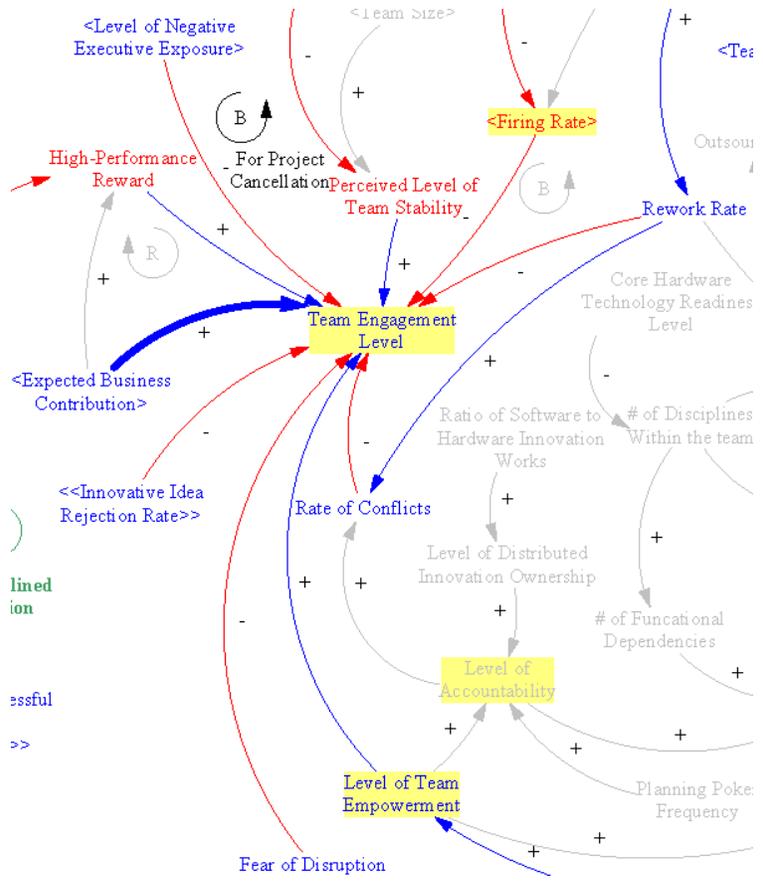


Figure 5-4: A Close-up View of the Variable, Team Engagement Level, at the Team Level

the level of team engagement over time. Thus, the team-level corporate innovation process is not inherently sustainable because of these resulting negative effects.

5.3 Corporate Innovation Mentality Emergence

In addition to the inherent sustainability issue with the corporate innovation culture, these individual and team level causal loop diagrams expose several unknown and undesirable emergent tensions. These tensions consist of two main categories – behavioral tensions and process-oriented tensions.

- Behavioral Tensions

1. A high-performing intrapreneur is typically afforded the freedom to form a team and allocate their work hour to work on the innovation. At the same time, they are expected to carry the team by fielding questions across the organizations.
2. The principle of accountability is effective if and only if the intrapreneurs are held accountable for the tasks from the beginning to the end. Yet, intrapreneurs are allowed to engage in career opportunities, enabling them not to own the consequence of their decisions.
3. Increased emotional attachment to the project has two consequences - increased engagement rate during the innovation process and continuous attachment to the innovation after the innovation project ends. Due to this constant attachment, intrapreneurs or teams are reluctant to accept innovative ideas that threaten or replace the past innovation success, especially when their reputation is at risk.
4. Not all failures are the same. The failure-forgiving corporate innovation culture enables intrapreneurs to take on risks and empower them to make decisions. Yet this encouragement is limited by the corporate intolerance of failures in security, regulation, or safety.

- Process-oriented Tensions

1. In the market-driven innovation culture, incremental innovation is easy to justify financially with data than disruptive innovation, although disruptive innovation creates more business values than incremental innovation.
2. Continuous customer engagement ensures innovation adoption. Simultaneously, this engagement becomes an obstacle to introducing innovation or emerging technology due to the customer's fixation on existing design and solutions.
3. To maximize the experimentation rate, intrapreneurs or innovation teams can reduce the documentation rate. However, this creates a risk of knowledge loss or a significant documentation effort downstream. In mitigating these negative effects, the documentation rate can be increased by slowing the experimentation rate.
4. Invention team, typically highly specialized, is driven by technical curiosity, yet the commercialization team, typically cross-functional, is driven by value capturing. Fundamentally, invention activities are different than commercialization activities, yet a successful innovation requires both.

Behaviorally, both individual intrapreneurs and innovation teams experience these innovation tensions. These tensions are the level of individual autonomy versus the level of the team carrying induced stress, rates of internal and external mobility versus accountability, level of emotional attachment versus willingness to change, and tolerance of failures versus intolerance of mistakes. In the individual-level corporate innovation mentality causal loop diagram, a high level of individual performance leads to an increased level of individual recognition. Yet, it also leads to an increased level of the team carrying induced stress. This team carrying induced stress is evident and excessive when the team is structured to have only one exceptional performer who is recognized for his or her innovation excellence. This induced stress comes from one being requested to handle every inquiry request and becoming a bottleneck of the innovation process. And this stress is strengthened when the team is working on multiple projects rather than on a single project. Moreover, when this stress reaches

an unbearable threshold, the rate of internal and external mobility increases. This mobility is facilitated by the abundance of internal and external opportunities and the corporate's unwillingness to reward the high-performing intrapreneur generously without a change in his or her roles and responsibilities. One source of internal opportunities arises from the individual's autonomy of forming their innovation teams. As a result of this job mobility, individual intrapreneurs are not always held accountable for their decisions throughout the innovation process. This opportunity to avoid accountability encourages imprudent decisions and lowers the willingness to collaborate to ensure a proper innovation pace. Furthermore, the increased mobility rate destabilizes the innovation team, causing the team to incur the coordination cost of training and helping new members to overcome the learning curve. Yet, the reduced mobility rate does not necessarily increase the willingness to collaborate. Similar to the startup culture, a reduced mobility rate could lead to self-centering behaviors. When the schedule pressure is high, or the process hits a bottleneck, the responsible intrapreneurs become unwilling to entertain alternatives. This unwillingness leads to a chain-of-command behavior to overcome other intrapreneurs' strong opinions and results in a trust erosion and a lower willingness for the intrapreneurs to collaborate. Furthermore, to overcome the challenges inherent in the innovation process, the corporate innovation team values intrapreneurs with a strong passion. One manifestation of this strong passion is the willingness to invest personal time in the project. As the intrapreneur becomes more invested in the project, he or she becomes attached to the project. This resulting attachment has two effects. This strong attachment is encouraged to overcome development challenges to maintain the proper development pace during the innovation process. Yet, it is discouraged when the intrapreneur becomes so attached that he or she becomes fixated on the project and unwilling to accept new replacement innovation ideas. Besides, when the innovation is successfully commercialized, the original intrapreneur or innovation team's attachment to the successful innovation increases their willingness to reject any innovative ideas that threaten or replace the past innovation success, especially when new innovation obsolete their expertise. As a result, the accomplished intrapreneur becomes a source of innovation

resistance. Lastly, the corporate innovation culture has a strong unwillingness to discipline innovation failures. Given the high-risk nature of the innovation project, failures are inevitable. Yet, not all failures are the same. This tolerance of failures encourages intrapreneurs to make most decisions without the risk of being fired. In return for this tolerance of failures, individual intrapreneurs are not rewarded generously for their roles in successful innovation endeavors. As a result, intrapreneurs lose the financial drive to pursue innovation. Interestingly, despite this tolerance of failures, the corporate innovation culture is intolerant of regulation, contract, and security failures. Hence, the risk of committing these non-negotiable failures limits the extent of the failure-forgiving corporate innovation culture.

Besides experiencing these four behavioral tensions in the corporate innovation culture, individual intrapreneurs and innovation teams experience four process-oriented innovation tensions. These four are the innovation justification difficulty versus the innovation value, customer engagement rate versus customer induced design fixation rate, documentation rate versus experimentation rate, and invention team structure versus commercialization team structure. Interview data reveals that many large companies are moving toward market-driven innovation. As a result, a business case is required for an innovation proposal. Although this approach encourages the intrapreneurs to assess the value proposition of any new innovation, it unintentionally discourages them from proposing a disruptive innovation for a new or emerging market because of the difficulty in assessing this new or emerging market potential. As a result, the higher the innovation value is, the more difficult it is to develop a convincing value proposition supported by data. Moreover, when the individual overcomes this difficulty, the high innovation value increases the corporate's willingness to exercise the intellectual property protection discretion inhibiting any meaningful engagement among intrapreneurs, suppliers, and customers. This lower engagement rate decreases the customers' desire to adopt the innovation, limiting the extent of innovation value capture. Moreover, even if there is sufficient customer engagement to ensure their innovation adoption, this engagement can unintentionally lead to a design fixation since the customers' product vision is limited by existing solutions and their lack of

understanding of the emerging technology. Another corporate innovation tension is between documentation rate and experimentation rate. In general, intrapreneurs are responsible for both experimentation and documentation. Hence, the maximization of the experimentation rate will minimize the documentation rate or vice versa. In the case of minimal documentation, the risk of knowledge loss increases. Furthermore, minimal documentation will lead to a significant documentation recovery effort at the later stage of the innovation process. This effort becomes a distraction for the intrapreneurs who are pursuing the next innovation. Yet, both knowledge loss risk and the late documentation effort can be avoided by increasing the documentation rate and, consequently, slowing down the innovation pace. This slower pace reduces the perceived innovation productivity leading to management's impatience in the project. Lastly, an invention is different than commercialization, yet a successful innovation requires both. In the corporate innovation culture, the invention team for a disruptive innovation tends to be a single discipline, specialized in the enabling technology or technical foundation needed for the disruptive innovation. The cross-functionality becomes more evident in the commercialization team, which enables the corporate to capture the value from a proven invention. Since both teams are needed for an innovation project, they are driven by different motivations – the invention team is driven by technical curiosity, and the commercialization team is driven by value capturing. Hence, corporate innovation teams are driven by these two incompatible interests.

In summary, these four behavioral and process-oriented tensions illustrate the contradictory nature of the corporate innovation culture. These tensions should be managed as well as any emergent tensions from the implementation of the startup mentality in the corporate innovation setting. These new tensions will be detailed in the next section, and a set of startup mentality management rules is developed to manage these tensions.

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Chapter 6

Cross-Sectional Study Discussion

The previous two sections summarize the analysis results of 262 individual and team innovation mentalities as shown in Figure 6-1. Each count of these mentalities is described and analyzed using the ABC model framework at the individual level and team levels. Hence, one mentality that applies to individual innovators and teams registers one count at the individual level and another count at the team level. Of these mentalities, 97 startup innovation mentalities and 165 corporate innovation mentalities are explored. Interestingly, the published startup innovation mentalities focus on the process dimension. And given the low number of innovation mentalities in the reward and strategy dimensions, the innovation culture across many startups appears to have a consistent set of mentalities in the reward and strategy dimensions. Yet, the cross-sectional study has a balanced set of innovation mentalities across four dimensions. Interestingly, these results show that the corporate innovation culture exhibits more mentalities in the structure dimension than the startup innovation culture. Most importantly, while the startup innovation culture has a narrow set of mentalities in the strategy dimension, the corporate innovation culture has a broader set. These differences highlight and validate that there is a structural difference between a startup and corporate innovation culture.

In addition, the previous two sections specify innovation tensions inherent in the startup and corporate settings. In both settings, the innovative behaviors' causal analysis ascertains that both startup and corporate innovation cultures are inherently

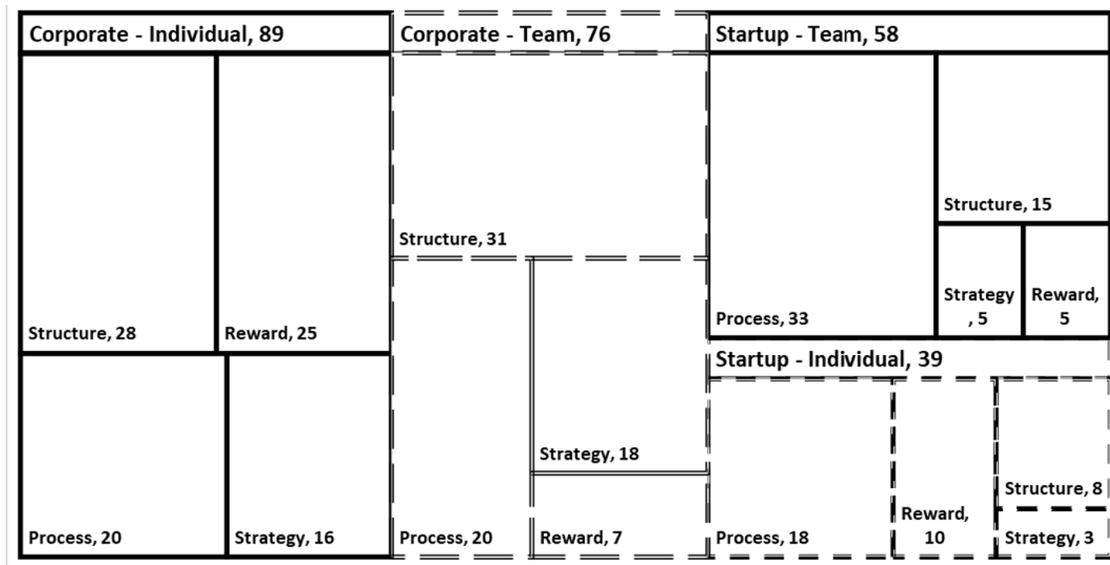


Figure 6-1: Startup and Corporate Innovation Mentality Counts at the Individual and Team Levels According to Four Star Model Dimensions: Process, Strategy, Structure & Reward

psychologically unstable. Both individual innovators and innovation teams will experience behavioral and process-oriented tensions, eroding their motivations over time. And these inherent innovation tensions that existed independently in the startup and corporate innovation culture are a subset of the unknown challenges in sustaining the startup mentalities in large companies. The other subset of challenges comes from the innovation tensions when the large company leaders implement the R&D startup mentalities in the existing corporate innovation culture. To better understand these new tensions, all four causal loop diagrams can be linked through the common auxiliary variables to identify any resulting local and global emergence to explore any new tensions. With these three levels of innovation tensions assessed, a set of startup mentality management rules in large companies are detailed while any shortcoming or uncertainty of the study is acknowledged.

6.1 New Tensions in the Corporate-Startup Innovation Culture

When a large company leader implements startup mentalities within its R&D entity, both intrapreneurs and innovation teams experience a new set of innovation tensions. If not managed, these tensions further accelerate the erosion rate of individual's motivation and team's engagement level and result in the implementation failure of the startup mentality inside the large company. Overall, there are five new or intensified tensions in this new innovative environment.

1. Innovation requires both invention and commercialization that require two different sets of innovation mentalities. The invention phase is technology-oriented, yet the commercialization phase is business-case-oriented. Hence, intermixing these mentalities can lead to unnecessary conflicts.
2. High monetary reward opportunity encourages risk-taking and high-performance expectation in the startup innovation culture. Yet, in the corporate innovation culture, intrapreneurs are not expected to be given the comparable monetary reward as startup innovators but they are expected to function as startup innovators.
3. Firing or credible threat of firing in the startup innovation culture encourages high performance standards. Yet, firing is rarely exercised in the corporate innovation culture. Instead, position rotation is the worst disciplinary action in the cross-sectional study on the corporate innovation culture.
4. Speed is the essence in the startup culture. Yet, corporate innovation culture prioritizes risk reduction. As a result, intrapreneurs are forced to trade speed for risk reduction or vice versa. In the case of prioritizing speed, individual favoritism is noted in the cross-sectional study.
5. Passion is a highly-vetted asset in the startup innovation culture. This passion drives the innovators' high level of commitment to the project. Yet, in the corporate innovation culture, this passion leads to a strong attachment to the

past successful innovations, causing the intrapreneurs to reject future innovative concepts that threaten their past success or obsolete their expertise.

This new set of innovation tensions exemplifies a subset of underlying reasons why the R&D startup mentality inside a large company is rarely successful. Fundamentally, innovation requires two sets of strategies – invention and commercialization strategies. Typically, the innovation starts with a core invention. In both startup and corporate innovation environments, a single discipline is typically responsible for this core innovation. Hence, such a team is naturally small and agile, and customer engagement is a mere source of the innovative idea. Yet, when the innovation process moves from invention to commercialization, this shift requires a different set of innovative behaviors. The commercialization of an invention requires business case development. Customer engagements are essential to align the innovation value with the customers' needs and maximize innovation value capture from these customers. Besides, the team typically gets bigger due to the necessary involvement of different disciplines. As a result, any lack of collaboration will slow down the experimentation rate, and different individual motivators, such as the desire to advance one's career, etc., incite conflicts among these intrapreneurs. These conflicts of interest, shown by different input variables shown in Tables 4.9, 4.13, 5.9 & 5.13, are exacerbated when multiple inventions and commercializations occur simultaneously. Both individual intrapreneurs and innovation teams are intermixing invention and commercialization mentalities. An example of such intermixing is the intellectual control on the new invention throughout the commercialization phase. Intellectual control is a valuable mechanism to protect the innovation value during the invention phase. However, from the cross-sectional study, this control is still in place during the commercialization phase, limiting the customer and supplier engagement rates, leading to the misalignment among business, suppliers, and customers' needs.

Another source of the innovation tension when the large company adopts the startup mentality is the individual intrapreneurs and innovation team's risk and reward profile. In the startup culture, the sense of urgency is facilitated by its high risk and reward profile. Due to this high risk and reward environment, individual inno-

vators are motivated to be accountable and willing to accept personal risks publicly. Furthermore, the innovators in such an environment become intolerant of incompetence. Yet, the corporate culture shields the intrapreneurs from such a high risk and reward environment and instead provides an innovation environment in which individual intrapreneurs and innovation teams are not rewarded generously for their successful innovation endeavors. This financial drive gap is typically met by the promotion, which depends more on the leadership potential and the career length than the innovation excellence, as noted in the cross-sectional study. As a result, internal and external mobility, an alternative path to the intrapreneurs' promotion, is unintentionally encouraged, lowering the perceived level of team stability and the team's engagement level. Thus, this financial drive gap reduces the intrapreneur's motivation to embrace startup mentalities while enabling the large company to provide a stable work environment, even though working in such an environment is not necessarily financially attractive. This dichotomy effectively lowers the individual intrapreneur's willingness to adhere and follow through on the startup mentality.

Another primary source of the innovation tension when the large company acts like the startup is the corporate's avoidance of firing employees and preference of rotating them into another position, yet firing is embraced in the startup. In the startup causal loop diagram, the high team performance standard is upheld by the team's intolerance of incompetence, for which the innovator can be fired. Although this job termination practice increases the fear of failure in the startup culture, it is necessary to encourage the individuals to ask probing questions and demand criticisms to avoid unnecessary risks. Yet, the incompetent intrapreneur in the corporate is not facing an immediate threat of firing. As a result of this intolerance of firing, the individual intrapreneurs' carelessness is encouraged. This high level of carelessness leads to a high failure rate, leading to an increased level of negative executive exposure and slowing down the innovation pace. Hence, the unwillingness to fire individuals in the corporate innovation culture increases the intrapreneurs' and teams' willingness to make mistakes to increase the experimentation rate. It also increases the difficulty of setting a high team performance standard, a driver for the intrapreneurs' and

teams' innovative behaviors, behaviors needed in the startup culture to accelerate and develop the innovation with a limited resource.

The fourth source of innovation tension comes from the value of speed in the startup culture and the importance of risk reduction in corporate innovation. In the startup culture, a fast learning rate is an essence. This emergent attribute of the startup culture is facilitated by the startup mentalities, such as engaging with the incomplete product, achieving speed with the low-fidelity prototype, and managing the intellectual propriety by speed, not by the legal means, etc. Yet, this emergent characteristic cannot be matched in the corporate innovation culture. In minimizing risk exposure, the corporate innovation culture embraces planning practices and the intellectual property control practices, such as limiting intrapreneurs from directly engaging with customers and suppliers when working on the innovation project. Both practices contradict the startup mentality to achieve a high innovation pace through the minimum yet disciplined planning and a high engagement rate with stakeholders outside the office. Interestingly, this urgency encourages an unacceptable behavior of favoritism, by which the intrapreneurs are only willing to work with certain intrapreneurs, excluding other intrapreneurs. Thus, the risk-reduction corporate innovation mentality contradicts the fast startup innovation mentality.

Lastly, the fifth source of innovation tension is the strong emotional attachment to the project. In the startup culture, one manifestation of a strong emotional attachment or a strong passion is a high self-fulfillment level. As a result, individual innovators have a high engagement rate throughout the process, accelerating their decision-making rate and increasing their accountability level. Yet, this strong attachment can become a source of change resistance in the corporate innovation culture. From the cross-sectional study, intrapreneurs with a strong emotional attachment to the project are more willing to invest their personal time. This personal investment reinforces their emotional attachment to the project. However, once this project is successful and another innovative idea diminishes or replaces the innovation value of the prior project for which the accomplished intrapreneurs have a strong emotional attachment, these accomplished intrapreneurs become more willing to reject

any disruptive innovative ideas related to the existing project. Sometimes, the new innovative idea obsoletes the expertise achieved by the accomplished intrapreneurs in past innovation successes. To protect their expertise and reputation associated with the past innovation success, they become resistant to changes. Hence, a strong emotional attachment to the project is a catalyst for changes. But when these changes are realized, this strong emotional attachment becomes an inhibitor for new changes.

6.2 New Paradoxes in the Corporate-Startup Innovation Culture

In addition to the above new tensions, large company leaders also face two innovation paradoxes. These two paradoxes are intrapreneur's risk versus reward profile and the innovation team's willingness to fire incompetent intrapreneurs, as shown in Figure 6-2. These two paradoxes are two fundamental questions that large company leaders should answer before deciding to adopt the startup mentality. Unlike the tensions that large company leaders can manage, these two paradoxes cannot be managed. Hence, the large company leaders wanting their companies to act like startups are forced to make a compromised strategic choice for each paradox.

The first paradox in the corporate-startup innovation culture is whether the intrapreneur's risk versus reward profile is high-risk and high-payoff or low-risk and no-payoff. The exploration of the startup innovation culture confirms that innovators, expected to act like founders, have a chance to gain a large payoff while bearing the fear of failures, including the job loss fear. The cross-sectional study on the corporate innovation culture affirms that the corporate is unwilling to reward the accomplished intrapreneurs generously while fostering a failure-forgiving innovation environment. Hence, the corporate innovation culture is at odds with the startup culture. Given the secondary effects of these risk vs. reward profiles in the respective innovation culture, a large company cannot have the best of both cultures. The large payoff to the innovators counterbalances the brutal side of the startup innovation

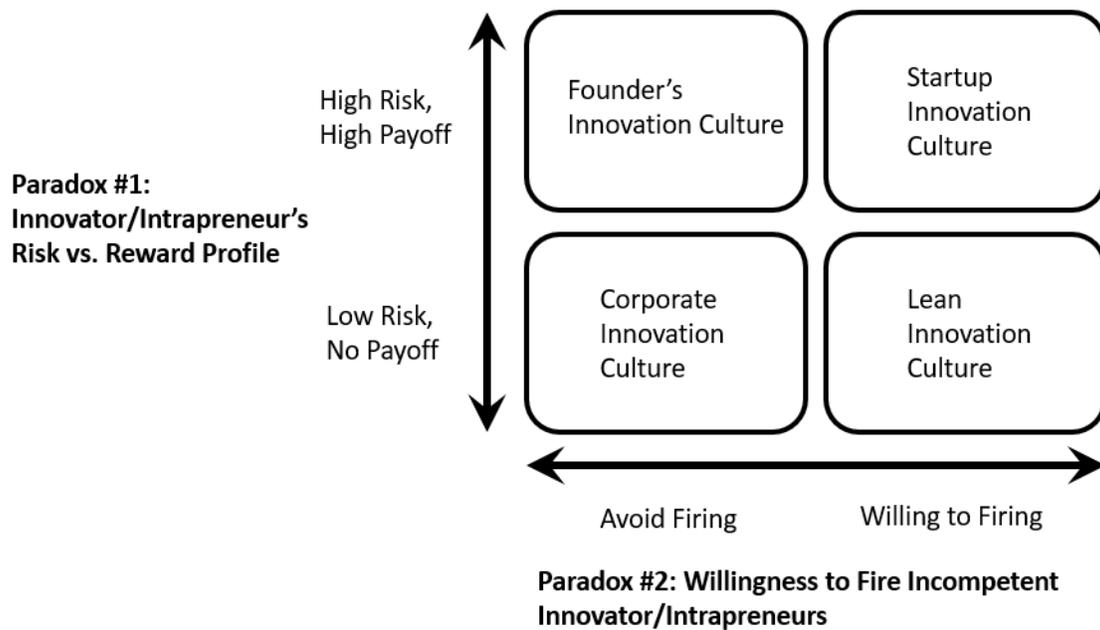


Figure 6-2: New Paradox Matrix in the Corporate-Startup Innovation Culture

culture, including job insecurity. Yet, the negligible payoff to the intrapreneurs or the large payoff to the corporate counterbalances the 100% innovation costs absorbed by the corporate, not the intrapreneurs. That being said, successful innovations are conceived and commercialized by the intrapreneurs. Given that the innovation culture is unsustainable due to the identified dark innovation mentalities, tantalizing the intrapreneurs with a chance at a large payoff could unlock the founder's mindsets among the intrapreneurs. Given that the large company bears 100% of the innovation investment and the intrapreneurs create the value, a profit-sharing innovation model is recommended. This model, splitting the eventual innovation profit between the corporate and the intrapreneurs in a separate organizational entity, could balance the risk versus reward profiles of two key stakeholders in the founder's innovation culture as shown in 6-2.

The second paradox in the corporate-startup innovation culture is whether to terminate incompetent intrapreneurs or not. In the startup innovation culture, a high-performing startup team is intolerant of incompetent innovators. This intolerance results in the willingness to terminate any incompetent innovators and bear

any coordination cost for each new hire to replace each termination. As a result, the team becomes strictly disciplined and accountable to avoid any potential waste arising from careless decision-makings. Yet, the striking attribute of the corporate innovation culture is not to fire any intrapreneurs who make mistakes, even costly and preventable errors. As a result, incompetent intrapreneurs are shielded from any credible threat of gaming the innovation process for personal career aspiration and being not accountable for their decisions. Hence, in creating a corporate-startup innovation culture, the large company leaders have an implementation choice of whether to terminate intrapreneurs based on their innovation performance or not. Given that the termination policy in the startup culture is to discipline unproductive innovation behaviors, the business leaders can pilot a termination policy based on intrapreneurs' innovative behaviors, identified in this thesis, in the lean innovation culture as shown in 6-2

The emergence of these two paradoxes is whether the corporate-startup culture resembles more like a startup innovation culture or not. Given that the large company leaders want their organizations to act like startups, their strategic choices on the above paradoxes should be aligned with their objective of having a startup culture inside the large company. Without this alignment, the large company could not act like a startup.

6.3 Startup Mentality Management Rules in Large Companies

Three levels of innovation tensions are explored in the previous few sections. When a large company acts like a startup, its intrapreneurs and innovation teams experience three startup innovation tensions in learning, prototyping, and team structuring, four behavioral and process-oriented corporate innovation tensions, and five new or intensified tensions emerged when the corporate innovation culture adopts the startup innovation mentality. These tensions illustrate the underlying behavioral factors of

the inherently unsustainable innovation culture, and this sustainability issue is exacerbated when the large company acts like a startup. In other words, these tensions explain why the R&D startup mentality in a large company is rarely successful. To manage the effects of these tensions, Pisano published five innovation management rules show below.

- Rule 1: “Tolerance for Failure but No Tolerance for Incompetence” [71]
- Rule 2: “Willingness to Experiment but Highly Disciplined” [71]
- Rule 3: “Psychologically Safe but Brutally Candid” [71]
- Rule 4: “Collaboration but with Individual Accountability” [71]
- Rule 5: “Flat but Strong Leadership” [71]

Although these rules apply to most cases, they are not especially helpful in managing three sources of innovation tensions for the implementation of the startup mentality in the corporate setting. Hence, additional management rules are proposed and discussed in the following subsections. These rules are to supplement Pisano’s five management rules. They form a holistic set of actionable strategies that a large company leader can follow to address the startup mentality adoption challenges in the corporate setting.

6.3.1 Innovation Definition

Rule 0: Have one definition of innovation and avoid mixing invention with commercialization

The cross-sectional study reveals that not just scholars but also corporate intrapreneurs do not have a universal definition of innovation. Many of them do not clearly distinguish between invention and commercialization. As explained in the previous section on the first source of new tension, the invention is not the same as commercialization. The intermixing invention and commercialization mentalities result in the conflicts, such as prioritization conflicts, etc. Such conflicts erode the intrapreneur’s and teams’ motivations over time. Hence, the first step to address any

innovation culture challenge is recognizing that the innovation consists of invention and commercialization, each requiring different sets of strategies. This step should be prioritized before any implementation of Pisano’s five management rules. The following subsections will detail additional corporate-startup innovation management rules needed in addition to Pisano’s five management rules to manage three levels of corporate-startup innovation tensions.

6.3.2 Startup Mentality Tension Management

Rule 6: Promote accountability while discouraging self-serving behaviors

In the individual-level startup causal loop diagram shown in Figure D-1, one example of the dark startup mentality is that individual accountability emphasis leads everyone to “jealously protects his or her own interests” [71]. Once other innovators recognize this self-serving behavior, their willingness to collaborate decreases, and the trust-building rate decreases. These decreased collaboration and trusting building rates lead to an increasing unwillingness to exchange information. This unwillingness leads to a slower learning rate, which eventually lowers innovators’ self-fulfillment and teams’ engagement. Despite this undesirable aspect of promoting individual accountability, such accountability accelerates the decision-making cycle and fosters collaboration to sustain a proper innovation pace. Hence, to encourage the owner’s mindset in the innovation culture, promoting individual accountability without these self-serving behaviors is necessary to maintain or increase innovators’ self-fulfillment and teams’ engagement, making the innovation culture more sustainable.

Rule 7: Accept balanced risk profiles and reject heterogeneous risk profiles

In the startup innovation culture shown by Figure D-1 and D-5, a proper risk versus reward balance is one of the key drivers of the innovators’ self-fulfillment level and teams’ engagement level. As shown in two startup mentality diagrams, expected payoff and profit accumulation are two input variables that have positive causal links to innovators’ and teams’ motivations. This financial expectation in the startup culture offsets the negative emotional experiences induced by the dark startup mentalities. Hence, the startup risk profile is generally balanced – innovators are taking on high

risks for high gains. Suppose the startup culture lacks a mechanism to reward individual innovators generously. In that case, both innovators' self-fulfillment level and teams' engagement level are decreased, exacerbating the inherent sustainability issue within the startup culture. Hence, the risk profile of individual innovators and teams should be maintained to sustain their motivations.

6.3.3 Corporate Innovation Mentality Tension Management

Rule 8: Promote individual recognition while reducing team carrying

In the individual level corporate innovation causal loop shown in Figure E-1, individual intrapreneurs' self-fulfillment level depends on the individual recognition and the team carrying induced stress. These two variables depend on the level of individual performance. When an individual's level of performance increases, intrapreneurs enjoy their recognition, yet their recognition leads to increased reliance from team members, which increases individual stress levels. Hence, their team carrying stress should be managed by keeping a small team to reduce the total reliance from team members. In doing so, the large company leader can support the highly competent intrapreneurs better and sustain their high level of innovation performance.

Rule 9: Embrace job mobility while fostering accountability

An interesting difference between the startup innovation culture and the corporate innovation culture is the tolerance of job mobility. The cross-sectional study confirms that employee firing is generally avoided or non-existent in the corporate innovation culture. Moreover, the perceived probability of career and salary stagnation drives the intrapreneurs' willingness to seek internal and external opportunities. Furthermore, the corporate's willingness to restructure teams to achieve a better alignment between its human resources and the business needs creates many opportunities. The combined effect of these behaviors is the increased job mobility within the corporate innovation team. As a result, the perceived level of team stability decreases, and the coordination cost increases, eventually lowering the teams' engagement level due to lower team productivity. Most importantly, accountability avoidance is possible,

and the disciplined innovation process becomes undisciplined over time, leading to a higher failure rate and lower return on innovation investment.

6.3.4 New Corporate-Startup Innovation Tension Management

Rule 10: Embrace urgency and avoid favoritism

When a large company wants to act like a startup, the first behavior it needs to adopt is to act fast. Speed is the key emergence of the startup innovation culture. For example, the startup innovation culture leverages speed to manage its intellectual property risk exposure. This characteristic is also emphasized in Rie's Lean Startup Methodology [74]. Yet such an urgency, in the corporate setting, can lead to individual favoritism for a better in-group alignment, especially when individual intrapreneurs have a high level of accountability. This alignment would enable the team to act fast. But this favoritism would unfairly exclude other intrapreneurs from engaging or contributing to the project. As a result, this behavior lowers certain intrapreneurs' self-fulfillment and teams' engagement. Hence, a safeguard against individual favoritism allowing any willing intrapreneurs to contribute and participate should be implemented.

Rule 11: Embrace passion but intolerant of emotional attachment

Passion is the source of energy for innovative behaviors. In the startup innovation culture, innovators' passion drives a continuous engagement behavior and an increased willingness to work long hours. In the corporate innovation culture, this increased willingness leads to increased personal time spent on a particular project. In the end, the intrapreneurs develop a strong attachment to the outcome of that particular project. The unintentional consequence of this strong attachment is intrapreneurs' increased willingness to reject any innovation that threatens or replaces the successful outcome of a once personally invested project. In other words, these intrapreneurs' reputations and careers depend on their prior innovation success. They have lots to lose and little gain when an innovation threatens the foundation of their accomplishments. As a result, these intrapreneurs are no longer acting as change

agents. Hence, proper management of intrapreneurs' attachments to prior innovation successes is required to welcome changes rather than suppress changes.

6.4 Study Limitations

In addition to the above insights from the research methodology proposed in this work, several challenges limit the validity of these insights. To systematically explore these limitations, the following subsection explores the critical threat to the four factors of the validity: construct validity, internal validity, external validity, and conclusion validity [87].

One key threat to construct validity comes from the cross-sectional study. This validity assesses whether the study has identified a proper measure for the topic under the study or not. Prior to conducting the interview, the interview structure and material were refined further post several pilot interviews. However, to increase the preparedness of the interviewees for this interview, preparation tips are provided. Yet, this preparation tip could be a source of bias. To mitigate the effect of this bias, feedback on this particular concern was solicited before the study.

Another key threat to internal validity comes from the researcher's confirmation bias. This internal validity assesses the correctness of the inferences or the causal relationships made or identified in this work. In managing this threat, this work focuses on extracting the causal relationships from the particular quotes, and only the information in each quote is captured and analyzed. Furthermore, in the causal loop diagram, different checks, such as completeness check and causality check, are completed to ensure the validity of the causal links and the appropriateness of the causal loop diagrams to study interdependencies among different mentalities.

A third key threat to external validity comes from the cross-sectional study sample size and the level of analysis. This validity assesses the generalization of the findings. Among these threats, this threat is the strongest. For this work, only eleven interviews were conducted, given the access limitations to the corporate intrapreneurs. As a result, these findings reflect a very small set of large companies, and the applicability

of these findings is limited to companies with similar backgrounds. Moreover, the level of analysis focuses on the qualitative assessment, aided by the visual representation, or the causal loop diagram, of these mentalities. To further improve objectivity and generality, these causal loop diagrams can be converted into numerical models. The results from these numerical models can be analyzed to assess the interdependencies among these mentalities objectively. That being said, a generalization check for this work is whether the findings contradict Pisano's work or not. The final findings of this work expand the five innovation management rules proposed in Pisano's work. Hence, there is some extent of generalization in these findings.

A fourth and last key threat to the conclusion validity comes from the uniqueness of individual view. Given that the cross-sectional study sample size is small, the uniqueness of an individual's perspective on the corporate innovation culture significantly influences the cross-sectional result. Hence, it is essential to recognize that this work exposes a subset of innovation tensions experienced by corporate intrapreneurs and innovation teams. The conclusion of this work provides alternative views and observations on the main research question. When this work is repeated, different sets of innovation tensions could be discovered. Yet, this repeatability concern is addressed by focusing on the reoccurring tensions reported by the interviewees to ensure the applicability of the final findings.

Overall, this study's validity is still strong given that these threats and limitations were recognized during the research methodology phase. Yet, the generalization of this work could be strengthened if the cross-sectional study sample size can be increased by focusing on either one industry or one company.

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Chapter 7

Conclusions

7.1 Findings

Innovation culture is not sustainable because of the inherent tensions. Individual-level and team-level dark startup and corporate innovation mentalities exemplify this innovation sustainability issue. One way to capture value from the innovation culture is to create innovation value before the innovators and the innovation teams hit a critical motivation level. An alternative approach is to recognize these innovation tensions and implement a holistic set of strategies to manage these innovation tensions. This alternative approach is the main focus of this work.

In both startup and corporate innovation cultures, these innovation tensions, coupled with the reinforcing behaviors of the individual innovators and innovation teams, result in the accelerated erosion rate of the innovators' self-fulfillment level and the teams' engagement level. This work exposes these innovation tensions and confirms their two main effects – psychological effect and innovation efficiency effect. In both startup and corporate innovation causal loop diagrams, the psychological effect is represented by two variables, level of self-fulfillment and level of team engagement, and the innovation efficiency effect is captured by a set of variables, such as experimentation rate, failure rate, etc. As shown in these diagrams, these two effects are coupled. To better understand the emergent effect of this couple, this work explores the emerging innovation tensions in startup culture, corporate innovation culture,

and corporate-startup innovation culture.

In the startup culture, three main categories of innovation tensions are learning, prototyping, and team structuring. Among these three categories, the contradictory effect of accountability on team structuring can both drive and kill collaboration. Rather than driving the collaboration and fostering the owner's mindset, accountability can encourage innovators to behave selfishly, leading to the trust degradation within the team and among the teams and the increased probability of conflicts.

In the corporate innovation culture, two main categories of innovation tensions are behavioral tensions and process-oriented tensions. Of these tensions, the tolerance of job mobility in the corporate innovation culture results in a conflicting innovation experience. On the one hand, the cross-sectional study confirms that corporate innovators are motivated by their career and salary expectations. On the other hand, when their perception of career and salary stagnation increases, they go after internal and external opportunities. As a result, accountability becomes unenforceable since innovators are allowed to escape accountability through job mobility. This unenforceable accountability becomes zero accountability, resulting in careless decisions that lead to a higher failure rate and lower return on innovation investment.

Whenever large company leaders proclaim that they want their companies to act like startups, they need to resolve two key innovation paradoxes in the created corporate-startup innovation culture. In adopting the startup innovation culture, a large company needs to be willing to terminate incompetent intrapreneurs and compensate for this risk of termination with a chance at a large payoff from the successful commercialization of a disruptive invention. In the absence of either strategic choice, the corporate-startup innovation culture can only be a founder's innovation culture or a lean innovation culture. Hence, wanting to adopt the startup mentality in the corporate setting, the large company leaders need to embrace both the founder's innovation model and the lean innovation model.

When a large company adopts the startup mentality into its corporate innovation culture, new or intensified tensions emerge. Of these tensions, the emergence of a strong attachment to past innovation successes shifts the accomplished innovators

from change agents to resistance agents. However, this strong attachment or high level of passion is highly valued in the startup culture. This emotional commitment to innovation increases the willingness of the startup innovators to invest personal time and continuously engage with the project to maximize the innovation output given the resource constraint. Hence, to foster a highly engaged innovation team, the company leader should sustain individual innovators' passion while discouraging the resulting attachment to the past innovations.

These unknown challenges in developing and sustaining the startup mentalities in large companies confirm the hypothesis that the R&D startup mentality inside the large company is rarely entirely successful. Yet many large company leaders want the company to act like a startup in an ever-competitive business landscape in which the startup ecosystem continues to disrupt the existing markets. With these mental models of the startup and corporate innovation cultures, Pisano's five management rules are expanded to enable the large company leaders to manage these unknown challenges to improve their innovative capacity by structuring the R&D team to act like a startup. In doing so, the following startup mentalities rules are proposed:

- Rule 0: Have one definition of innovation and avoid mixing invention with commercialization
- Rule 1: "Tolerance for Failure but No Tolerance for Incompetence" [71]
- Rule 2: "Willingness to Experiment but Highly Disciplined" [71]
- Rule 3: "Psychologically Safe but Brutally Candid" [71]
- Rule 4: "Collaboration but with Individual Accountability" [71]
- Rule 5: "Flat but Strong Leadership" [71]
- Rule 6: Promote accountability while discouraging self-serving behaviors
- Rule 7: Accept balanced risk profiles and reject heterogeneous risks profile
- Rule 8: Promote individual recognition while reducing team carrying
- Rule 9: Embrace job mobility while fostering accountability

- Rule 10: Embrace urgency and avoid favoritism
- Rule 11: Embrace passion but intolerant of emotional attachment

With these management rules and innovation tensions identified at different levels, large company leaders are better prepared to foster a startup culture within the corporate innovation culture. These mental models, represented by causal loop diagrams, become another tool to monitor and understand the innovation dynamics throughout this fostering process. In doing so, large companies are in a better position of becoming the next innovation powerhouse.

7.2 Implications and Future Work

This work is impactful in several ways. First, it clearly illustrates that the innovation culture is not only paradoxical but also not inherently sustainable. Secondly, it highlights the inherent tensions in the startup, corporate and corporate-startup innovation environments. These tensions expose areas of concern for large company leaders who want the company to act like a startup. Thirdly, this work provides the large company leaders a visual mental model of the innovation culture, a system of interdependent innovative behaviors. Lastly, this work can be a basis on which the large company leaders can initiate a discussion around a behavioral evaluation system, which assesses individual intrapreneurs based on their innovative behaviors in addition to their innovation outcomes.

For future work, four areas are recommended. First, researchers can conduct a longitudinal study of one large company and observe behaviors of its intrapreneurs and innovation teams to validate the interdependencies of the innovative behaviors and their emergence. Secondly, researchers can improve the current work scope by increasing the cross-sectional study sample size, implementing a numerical model of the developed causal loop diagram, and performing a propagation index analysis to understand the role of each auxiliary variable. This additional scope aims to address the validity threats identified in the study limitation section. Thirdly, researchers can

work with the large company leaders to implement the management rules proposed in this work and observe the effects of these rules to validate the applicability of these rules. Lastly, researchers can explore the founder's innovation culture and the lean innovation culture to understand better how effective these cultures are in the invention and commercialization phases of the innovation and how differently the intrapreneurs behave under these two innovation models.

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Appendix A

Interview Design

CONSENT TO PARTICIPATE IN INTERVIEW Adopted from the Consent to Participate in Interview by the MIT Committee on the Use of Humans as Experimental Subjects[1]

You have been asked to participate in a research study conducted by Shichao “Owen” Ou, advised by Dr. Bruce Cameron, System Architecture Lab Director, from System Design and Management at the Massachusetts Institute of Technology (M.I.T.). The purpose of the study is to assess any unknown corporate innovation mentalities and any limitations of implementing the R&D startup mentalities in the large companies exploring the next disruptive innovation. The results of this study will be included in Shichao Master’s Thesis. You were selected as a possible participant in this study because of your experiences in successful and innovative companies/startups or your expertise or interest in how startups organize themselves to deliver disruptive innovation. You should read the information below and ask questions about anything you do not understand before deciding whether or not to participate.

- This interview is voluntary. You have the right not to answer any question and stop the interview at any time or for any reason. I expect that the interview will take approximately 30 minutes.

- This research intends to advance the startup culture implementation in the corporate environment to pursue disruptive innovation. More specifically, this exposure

enables business leaders to develop a preliminary yet holistic understanding of different dynamics and tradeoffs explicitly and implicitly embedded in the innovative culture.

- You will not be compensated for this interview. However, I am more than happy to share the key outcomes of this research with you and make myself available for further discussions should you become interested in this topic and wanted to gain a deeper understanding.

- Unless you give us permission to use your name, title, company name, and /or quote you in any publications that may result from this research, the information you tell us will be confidential.

- I would like to record the audio of this interview over the Zoom to use it for reference while proceeding with this study. I will not record this interview without your permission. If you do grant permission for this conversation to be recorded, you have the right to revoke recording permission and/or end the interview at any time.

This project will be completed by the end of April 2021. All interview recordings will be stored in a secure workspace until one year after that date.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. In addition, your information may be reviewed by authorized MIT representatives to ensure compliance with MIT policies and procedures.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study.

(Please check all that apply)

I give permission for this interview to be recorded.

I give permission for the following information to be included in publications resulting from this study:

my name my title my company name direct quotes from this interview

Name:[]

Interview Structure This interview focuses on the behavioral dimension of corporate innovation. It is designed to gather your most recent or most memorable innovative product/service development experience or your observations of the innovation teams and innovators at your current or previous employers. To better facilitate this reflection, this interview is broken into three main parts: 1) a general discussion of the corporate innovation activities and strategies at your current or previous employers, 2) a reflection of individual innovator's behaviors/actions, such as individual workflows or work approaches, individual mindsets, motivations and interactions with others, and individual risk vs. reward profile, and 3) a reflection of innovation team's behaviors/actions, such as team workflows or work approaches, team mindsets, motivations and interaction with others, team structure, and team risk vs. reward profile.

This interview's main output is a collection of corporate innovation mentalities at innovator and innovation team levels and both desirable and non-desirable effects of these innovation mentalities.

How to Prepare To better prepare for this interview, it is suggested to reflect on the following topics:

- A general understanding of the startup innovation mentalities
- Your organization's definition of innovation and innovation types (incremental vs. disruptive)
- A reflection of a most recent or most memorable innovative product/service development experience (preferably the disruptive innovation experience) or your observations of the innovation team and its team member at your current or previous employers
 - Reflect on how the innovation team goes about pursuing the innovation by exploring these four dimensions: process, strategy, structure, and reward at innovator and innovation team levels.
 - * Process: daily workflows or work approaches
 - * Strategy: where to play and how to win

- * Structure: mindsets, motivations, interactions among various stakeholders, and team structure
- * Reward: positive and negative outcomes experienced by innovator and innovation team

Thank you for participating in this study. Before we start, do you have any questions or concerns?

We will start with three warm-up questions.

Question 1/13: What is your organization's definition of innovation?

[To confirm whether the interviewee understands innovation has two components: inception and commercialization; startup mentality is focusing on commercialization effort]

Question 2/13: What innovation type are you and your team involved in primarily? Incremental, disruptive, or both?

[A dimension to analyze response: willingness to embrace startup can depend on whether the companies are pursuing incremental or disruptive innovation]

Question 3/13: Is your organization pursuing mainly hardware-related innovations, non-hardware-related innovations, or both?

[Another dimension to analyze response: hardware-related innovation has difficulty in prototyping]

Now, for the following questions, reflecting on your most memorable innovative product/service development experience or your observations of the innovation teams and innovators at your current or previous employers

Question 4/13: Does your organization practice any startup mentalities, such as building minimum viable product, failing fast, learning fast, getting out of the building, actively engaging with the customers, and bootstrapping, etc.?

[Assessing whether the interviewee's organization practice startup mentalities in their organization or not]

Tell me about a time when you were actively working on incepting and commercializing innovation. Is this innovation disruptive?

[To document innovation type that the interviewees are recalling]

Question 5/13: What were your organizational innovation strategies (where to play and how to win) or core cultural values?

[To gather the organizational strategy]

Question 6/13: How were you and your teams affected by these strategies? To what extent, these strategies supported or hindered innovation development?

[To gather the effect of the organizational strategies]

Question 7/13: What individual workflows or work approaches supported or hindered that innovation?

[To gather innovation process at an individual level]

Question 8/13: How did your mindsets, such as the owner's mindset, etc., support or hinder that innovation?

[To gather innovation structure at an individual level]

Question 9/13: How did your risk vs. reward structure within the organization support or hinder that innovation?

[To gather innovation reward at an individual level]

We are continuing with innovation development experience.

Question 10/13: What team workflows or work approaches supported or hindered that innovation?

[To gather innovation process at team level]

Question 11/13: What internal or external influences on the team or team structure supported or hindered that innovation?

[To gather innovation structures at team level]

Question 12/13: How did your team risk vs. reward structure within the company support or hinder that innovation?

[To gather innovation rewards at team level]

Question 13/13: Any final remarks that you would like to add. Is there any other individual or team behaviors that we have not discussed?

Thank you for sharing your valuable insights. Your contribution will help formulate a set of strategies to manage the startup mentality implementation in large companies to pursue disruptive innovation.

Appendix B

Interview Data: Corporate

Innovation Mentality Summary

Table B.1: Industries Targeted in the Cross-sectional Study

Industries Represented	Company (Co.)	Intrapreneurs (Intra.)
Industrial Engineering	A	1,2
Health Care	B	3
Music	C	4
Telecommunications	D	5
Military	E	6
Oil & Energy	F	7
Machinery	G	8
Information Technology and Services	H	9
Sporting Goods	J	10
Aviation & Aerospace	K	11
<p>Note: due to the respective company's confidentiality requirement, many interviewees elected to not giving the permission to include his or her name, company name, title, and direct quotes from the interview in this thesis.</p>		

Table B.2: Categorized Corporate Innovation Mentalities and Identification of Any Individual and Team Level Behaviors Resulting from the Corresponding Cognitive Component

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Process				
X		to get good ideas by getting many ideas	A	1
	X	accept the large expense and the high fidelity to overcome the difficulty in MVP implementation	A	1
	X	for disciplined innovation process to monitor innovation quality while encouraging more inventions	A	1
	X	for the invention-first innovation to exploit the serendipitous innovation	A	1
	X	for the customer engagement to facilitate the collaborative innovation	A	1
	X	for frequent meetings to encourage information sharing and collaboration within the team	A	2
	X	for a verification-before-validation process to facilitate customers' involvement	A	2
	X	for the data-driven decision-making process to achieve the market-growth innovation	A	2
	X	for asset salvaging to maximize the past development values	B	3
X		for the low-cost innovation exploration to encourage the disciplined risk-taking behavior	B	3
X		against the technical curiosity bias to drive market-driven innovation	B	3
	X	for customers' engagement with a low-fidelity prototype to maximize the concept's values to the customers	B	3
	X	for the "if it works, don't fix it" mentality to avoid the perceived risk of disruption	C	4
	X	for the unstructured communication to encourage knowledge sharing	D	5
	X	for failures to increase the idea generation rate	D	5
X		for a strong emotional attachment to drive the owner's mindset and accountability	D	5
X		for the just-in-time innovation to complement or supplement existing business needs	D	5
X		for the unstructured communication to get the unfiltered information	E	6
X		inviting changes to encourage changes	E	6
X		for a fast, costly prototyping process to achieve the desired innovation speed	F	7
	X	against the technical debt to avoid the idea fixation	F	7
X		for a disciplined experiment to increase the chance of learning	F	7

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Process				
X		for a platform or standardization to open up the resources to pursue innovation	F	7
X		for the owner's mindset to get the job done	F	7
	X	for an unstructured workflow to achieve the desired innovation speed	F	7
X		for the hacking mentality to generate more disruptive ideas	G	8
	X	for the customer engagement to source new ideas	G	8
	X	for the customer-driven innovation to achieve a better alignment between innovation and customers' needs	G	8
	X	for the heavy upfront effort to manage innovation-related risks or failures	H	9
X		for the unstructured communication to incubate innova- tive ideas and drive knowledge sharing	H	9
X		for the structured communication to drive knowledge sharing	H	9
	X	for the immediate innovation implementation to immediately benefit from the innovation	J	10
X		for less documentation to achieve the desired innovation speed	J	10
X		for a contractual obligation to report any innovative idea	K	11
X		for an idea contest to generate more disruptive ideas	K	11
	X	for a structured regulation gatekeeping process to ensure the regulation compliance	K	11
X		against changes to protect the entrenched interests	K	11
	X	for a well-understood technology to reduce the regulation incompliance risk	K	11
X		for stubbornness to drive changes	K	11
X		for selective planning to accelerate the core innovation development	K	11
Strategy				
X	X	for the invention-first, commercialization-second innovation to achieve a high invention rate	A	1
X	X	for the market-driven innovation to achieve a high commercialization rate	A	1
X	X	for the individual respect and safety to create a respectful and safe work environment	A	1
X	X	for the market-driven innovation to sustain the innovation success rate	A	2
X	X	for quality over speed to meet stakeholders' expectations	B	3

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Strategy				
	X	for egocentric innovation to better align with organizational needs	C	4
X	X	for the innovation crowdsourcing to source new ideas	D	5
X	X	for the just-in-time innovation to complement or supplement existing business needs	D	5
X	X	for the internal sourced or initiated innovation, not the customer-driven innovation, to complement or supple- ment existing business needs	D	5
X	X	for the chain of command to empower leaders	E	6
X	X	for the combinatorial innovation to exploit the existing technology portfolio	F	7
X	X	for the open innovation to achieve high revenue and low carbon emission by leveraging external experts and resources	F	7
X	X	for the customer-driven innovation to achieve a better alignment between innovation and customers' needs	G	8
X	X	for the egocentric innovation to control innovative products	G	8
	X	for any innovation to dominate the market	H	9
X	X	for the operational innovation to reduce new product's time to market	J	10
X	X	for the customer-centric innovation to align the innovation with the customers' needs	J	10
X	X	for the operational innovation to drive profit generation	K	11
Structure				
X		for the high competent innovators to drive the pace of innovation	A	1
	X	for the separation of technical and business teams to achieve a high invention rate	A	1
X		for the innovation owner's mindset to achieve a high invention rate	A	1
X		for the innovator's empowerment to achieve higher invention and commercialization rates	A	1
	X	for the temporary team structure to encourage collaboration and talent sharing	A	1
X		for the risk aversion to maximize innovation investment value	A	2
	X	for the frequent team restructuring to align the talents' needs with the business needs	A	2
X		for the innovations to achieve a personal career advancement	A	2

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Structure				
	X	for a separated high-risk innovation to centralize innovation and to better coordinate both internal and external resources	B	3
	X	for a cross-functional team structure to achieve the team's agility	B	3
	X	for the small team size to achieve the team's agility	B	3
	X	for customers as the co-developers to gain immediate validation feedback	B	3
X		for a highly competent innovator to drive invention and commercialization rates	B	3
X		for the internal mobility to achieve a highly competent innovation team	B	3
	X	for the accountability to drive the collaboration	B	3
	X	for customer engagement to get direct feedback	C	4
X	X	exploit the personal in-company relationship to inhibit disciplinary actions, especially for the experienced employees	C	4
X	X	for the accountability to drive the collaboration	C	4
X		against failures to protect or enhance one's career trajectory	C	4
X		leverage power dynamics to drive collaboration	C	4
	X	for team cross-functionality to drive collaboration	C	4
X	X	for the intellectual property to protect the company's assets	D	5
X		for the career mobility to better align the individual needs with the business needs	D	5
X	X	for a frequent team formation to avoid a performance stagnation	E	6
X		against the risk-taking behavior to protect one's reputation and authority	E	6
	X	for the chain of command to empower leaders	E	6
X		for the owner's mindset to get the job done	F	7
	X	for a self-organized team to achieve a better alignment among the team members	F	7
	X	for the customer engagement to achieve a better alignment between the innovation and the customers' needs	F	7
	X	for a mixture of structured and unstructured communications to achieve desired innovation speed and align with the organizational goals	F	7
	X	for the scrum team structure to achieve the team's agility	G	8

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Structure				
X		for the customer feedback through an internal intermediary to centralize the information flow from the customers	G	8
	X	for a technical cross-functionality team to accelerate the product delivery	G	8
	X	for the planning poker to encourage team commitment and accountability	G	8
	X	for the team accountability to drive the team-to-team collaboration	G	8
X	X	for the job mobility to advance one's career	G	8
X		for a strong trust between innovators and team leaders to gain job autonomy	G	8
	X	for a small, cross-functional team to accelerate product delivery	H	9
X	X	for a team formation to align with business needs	H	9
X		for the executive-level access to drive knowledge sharing from the top to the front-line employees	H	9
	X	for a progressive development process to gain stakeholders' buy-ins	H	9
X	X	for the customer feedback through an internal intermediary to centralize the information flow from the customers	H	9
X		for the qualification-based accountability to drive the innovation ownership mentality	J	10
	X	for outsourcing initial technology experimentation to lower the innovation cost	J	10
X		for an open culture to drive individual collaboration	J	10
X		for a data-driven conversation to gain buy-ins	J	10
	X	for a small, single discipline team to accelerate the core innovation development	K	11
	X	for a distributed software innovation ownership to accelerate software innovation development	K	11
X		for the suppliers' feedback to refine innovation ideas	K	11
X		for the do-it-first-and-ask-forgiving-later mentality to solicit direct feedback from the customers	K	11
X		for early innovation ownership to drive collaboration	K	11
Reward				
X		for the high competent innovators to drive the pace of innovation	A	1
X		for the individual innovator's autonomy to increase the customer engagement	A	1
X		for the individual innovator's empowerment to target a specific invention or application	A	1

Indiv.	Team	Mentalities (Cognitive Component)	Co.	Intra.
Reward				
	X	for the commercialization failures to encourage a high invention rate	A	1
X		for the individual recognition to achieve the psychological safety of speaking up	A	1
X	X	for the promotion-based employee motivation	A	2
X		for the accountability to protect one's reputation	A	2
X		for the non-monetary innovation performance metric to foster a merit-based innovation culture	B	3
X	X	for the agile methodology to achieve the team's agility	B	3
X		against failures to protect or enhance one's career trajectory	C	4
X		against any compliance failure to meet regulations, contractual requirements, or internal key policies	C	4
X		for the individual recognition to drive the individual innovation contribution	D	5
X	X	for failures to encourage the risk-taking behavior	D	5
X		for a frequent team formation to avoid a performance stagnation	E	6
X		for high individual performance to protect one's career growth	E	6
X		for individual favoritism to achieve a better in-group alignment	E	6
	X	for a forced-distribution performance evaluation to encourage the performance competition	E	6
X		for the individual recognition to obtain a better career trajectory	F	7
X		against failures to encourage the risk-taking behavior	F	7
X		for a stretch goal to encourage the risk-taking behavior	G	8
X		against failures to encourage the risk-taking behavior	G	8
X		against day job workload reduction to protect the core business	H	9
X		for the innovation ownership to drive more accountability	H	9
X		for the individual recognition to drive individual innovation contribution	H	9
X		against innovation-related disciplinary actions to encourage the risk-taking behavior	H	9
	X	for a monetary innovation metric to make innovation-related business decisions	J	10
X		for a homogeneous risk vs. reward profile to drive the technology exploration or scouting	J	10
	X	for changes to create new values	J	10
X		for the past innovation performance to fund the future innovations	K	11

Appendix C

Literature Review: Startup Mentality Summary

Table C.1: The Focused Literature Review: Selective Set of Categorized Startup Mentalities and Identification of Any Individual and Team Level Behaviors Resulting from the Corresponding Cognitive Component

Individual	Team	Mentalities (Cognitive Component)
Process		
X	X	for creative constraints [40]
X	X	for bootstrapping [56]
X	X	for disciplined experimentation [71, 18, 75]
	X	for repeated experimentation [18, 43, 74]
	X	for minimum viable products (MVPs) [46, 74]
X		for the falsifiability principle [36, 19, 74]
	X	for low-cost failures [40]
	X	for low-cost experiment [18]
X	X	for lean prototyping/low-fidelity prototyping [83, 73, 60, 14]
	X	against design fixation induced by early prototype [53, 86]
X		against uncertainty plateauing induced by early prototype [60]
X	X	for direct customer interactions [3, 16, 39, 36]
	X	for Fudd's first law of creativity [73]
	X	for selective planning [42]
	X	for regulations [14]
	X	against hardware technical debt in low-cost solutions [14]
	X	against customer uniqueness [80]
X	X	for incompleteness, against perfectionism [80, 42]
	X	for innovative idea, not ease of experimentation [39]
	X	for consecrating experimental data [71]
	X	against sloppiness [46]
X		against confirmation bias [36]
X	X	for pivot or persevere mentality (for changes) [42, 64, 75, 36, 38]
X	X	against sunk cost fallacy [83, 86, 73, 18, 46, 4]
X	X	for customer behavior changes [74]
X	X	for failures [74, 71, 75]
X		for surprises [36]
	X	for innovation and commercialization [43]
X	X	for fast validated learning [18, 37, 74, 42, 43, 72, 5]
X	X	for speed/fast work/decision making [14, 6, 56, 46, 33]
X	X	for unstructured communication [14, 41]
	X	against incurring coordination cost [80]
	X	for actionable customer feedback [80]
	X	for cross-functional capabilities [74]
	X	for minimum distance between leaders and employees [72]
	X	for paced learning [80]
X	X	for bias toward action individually and collectively [12, 71]

Individual	Team	Mentalities (Cognitive Component)
Strategy		
	X	Building faster, measuring faster, and learning faster [74]
X	X	for innovation with extreme uncertainty [74, 83]
X	X	for exploration mindset [80]
	X	at war against industry standards [4]
X	X	for a learning organization [66, 22]
Structure		
X	X	for openness to experience [52]
X		for achievement orientation [52]
X		for the Founder's optimism bias [43, 36]
X		for the owner's mindset [4]
X	X	for strong social interactions [37, 34]
	X	for customers as an information node [33, 64]
X		for individual accountability [71]
	X	for collaboration, against consensus [71]
	X	for the "we" consciousness [66]
X	X	for the culturally flat organization [71]
	X	for hierarchically flat organization [72]
	X	for intolerance of incompetence [71, 43]
	X	for frontline obsession [4]
	X	for small team size [75]
	X	for single sourcing [22]
X		for individual autonomy despite regulations/standards [48]
	X	for individual and interaction over processes and tools [41]
	X	for the "all hands on deck" approach [72]
	X	for antidisciplinary [84]
	X	for creativity over control [43]
Reward		
X		for wealth recycling [37]
X	X	for big gains over big risks [37, 43, 70, 21]
X		for safety to speak up [71]
X		for safety to admit mistakes [10, 75]
X		for hardworking [21]
	X	for delayed profitability [75]
X	X	for failure tolerance [85, 75, 66, 43]
X		for personal accountability at all costs [71, 72]
X		for pivot-induced stress tolerance [22, 38, 57]
X		for innovator's career path [74]
X		for strong emotional attachment [4, 18]
	X	for employee empowerment [75, 33, 56]
	X	for learning as a metric of team performance [74]

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Appendix D

Startup Mentality Causal Loop

Diagrams at Individual and Team

Level

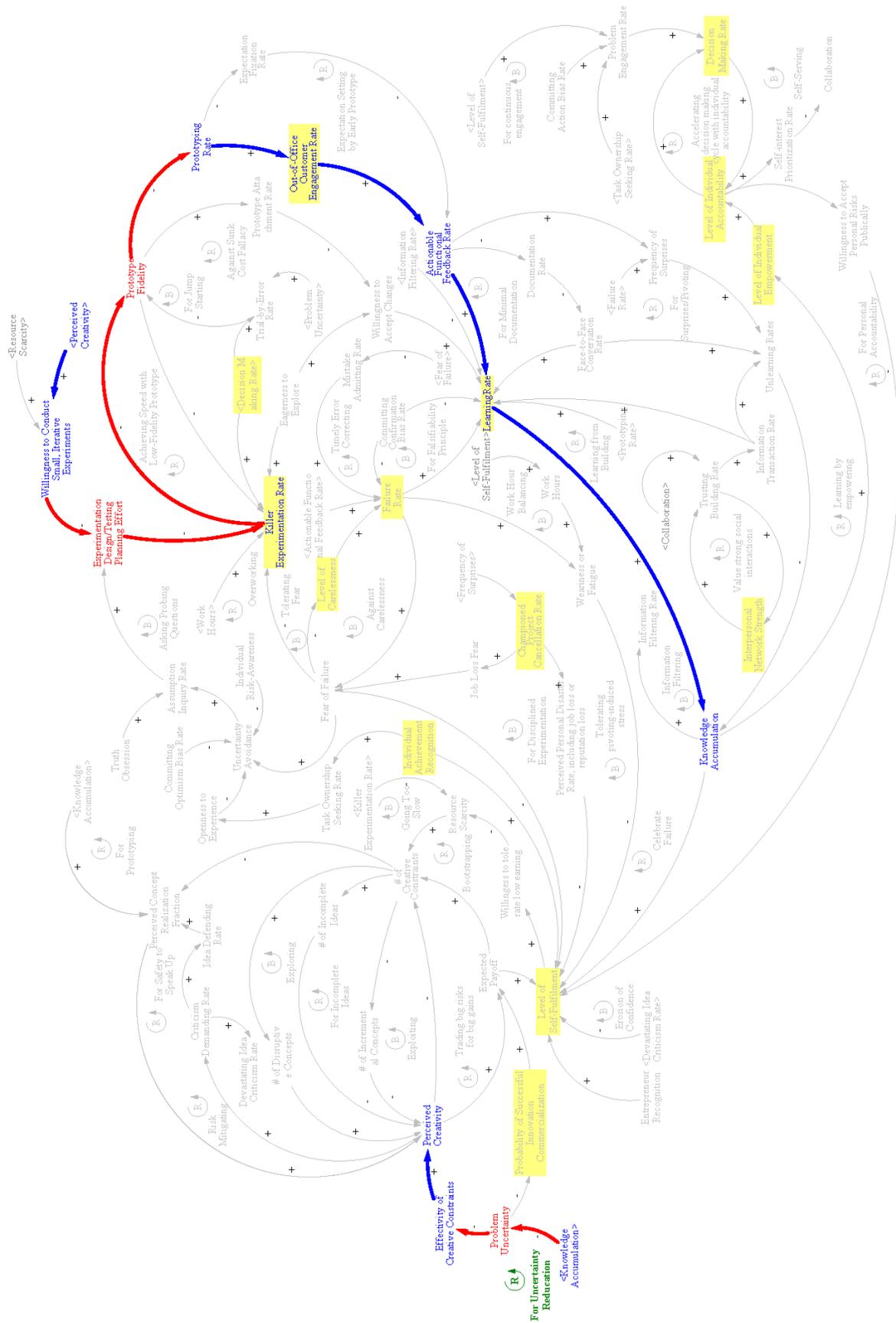
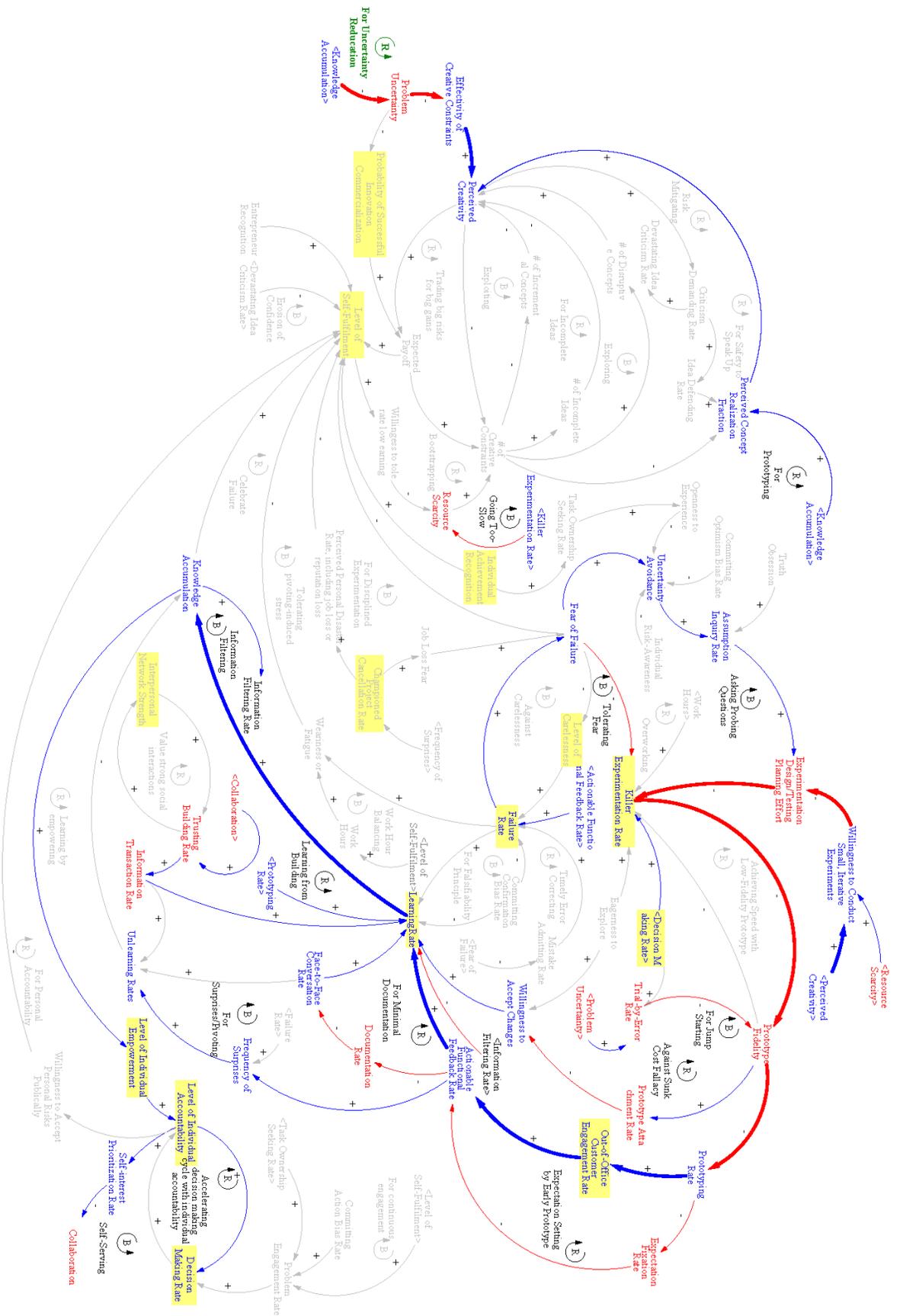


Figure D-2: Partial Individual Level Startup Innovation Causal Loop Diagram: Main Causal Loop

Figure D-3: Partial Individual Level Startup Innovation Causal Loop Diagram: Main Causal Loop with Key Balancing and Reinforcing Loops Acting on It



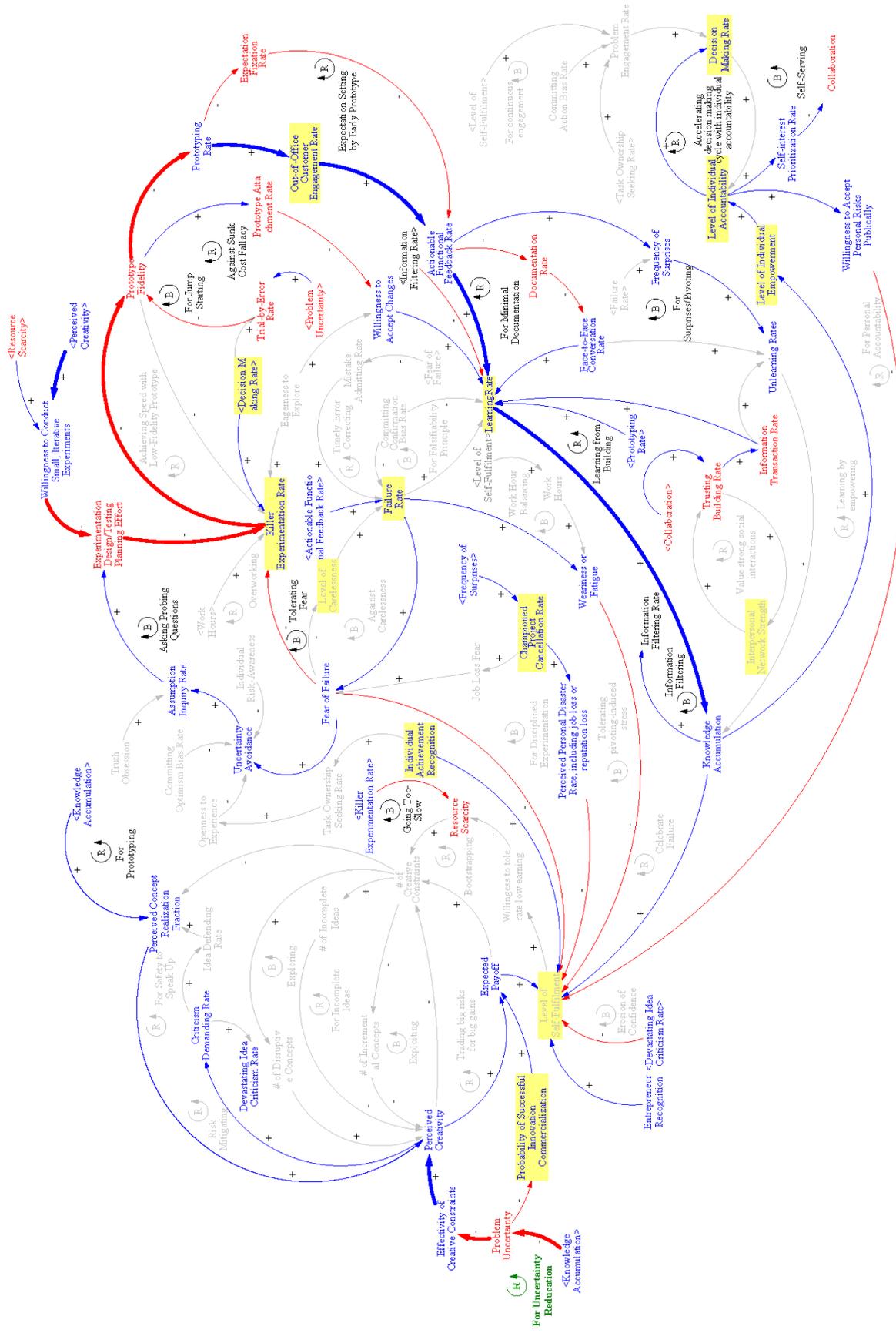


Figure D-4: Partial Individual Level Startup Innovation Causal Loop Diagram: Resulting Causal Links on Innovator's Level of Self-Fulfillment

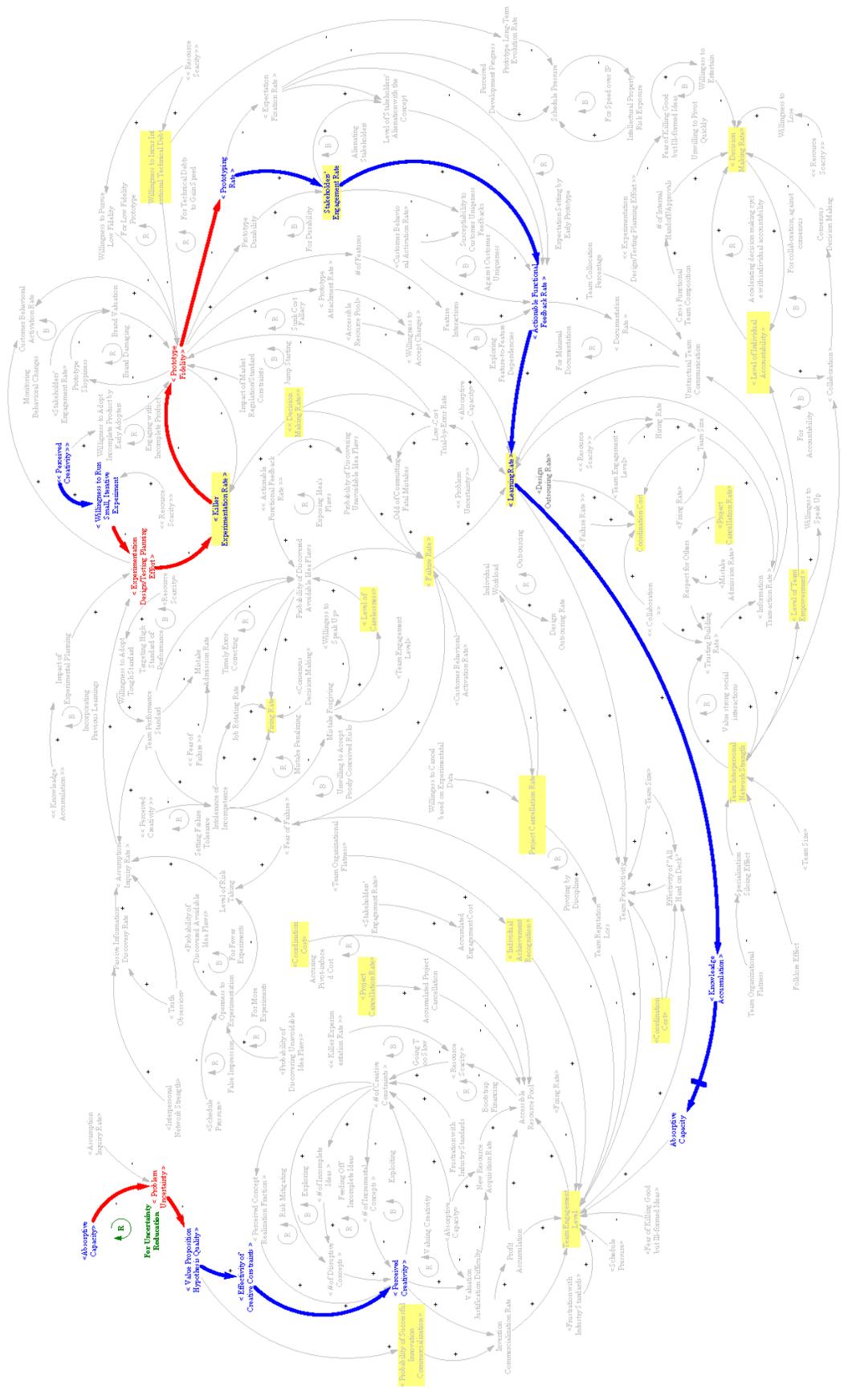
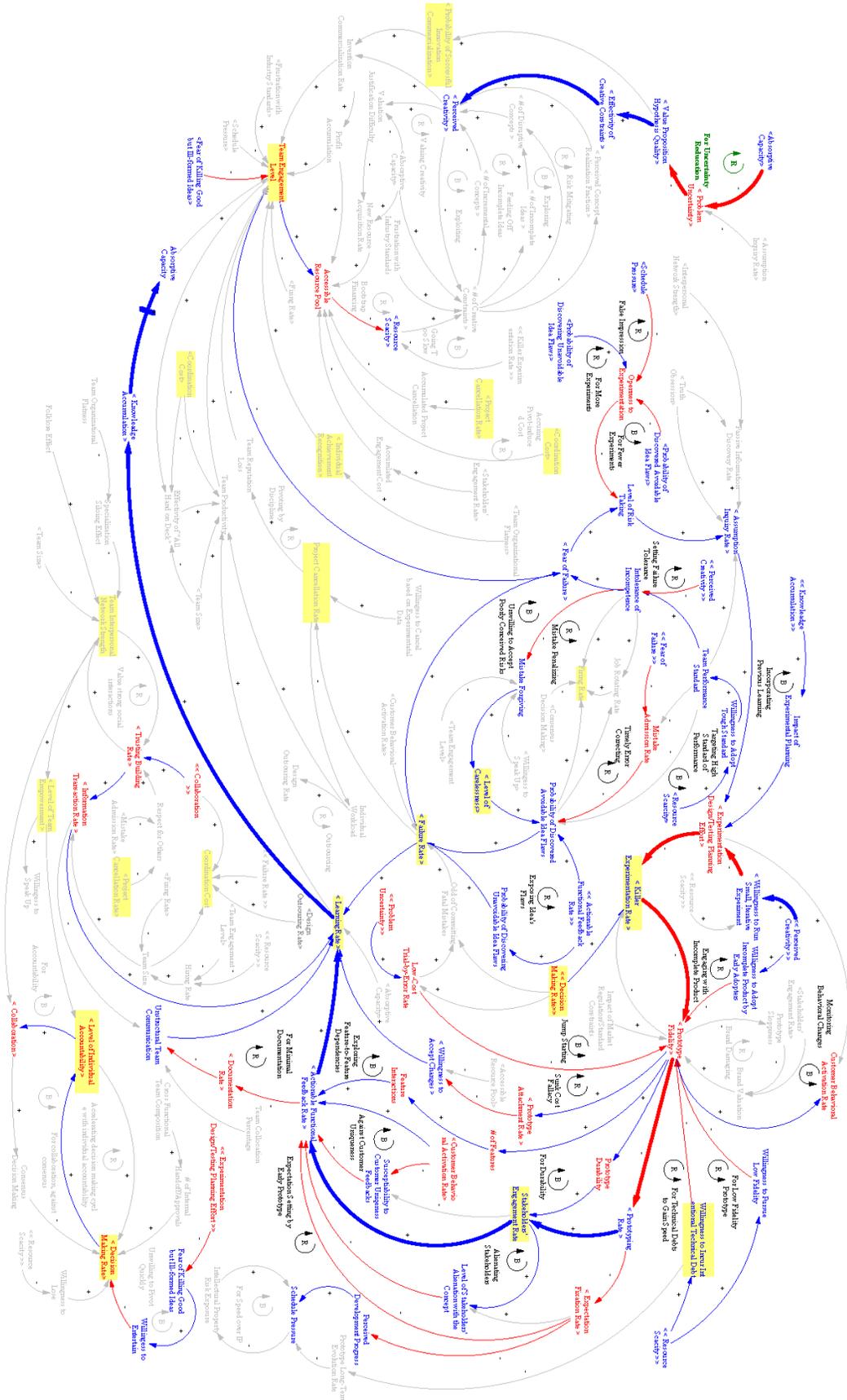


Figure D-6: Partial Team Level Startup Innovation Causal Loop Diagram: Main Causal Loop

Figure D-7: Partial Team Level Startup Innovation Causal Loop Diagram: Main Causal Loop with Key Balancing and Reinforcing Loops Acting on It



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Appendix E

Corporate Innovation Mentality

Causal Loop Diagrams at Individual and Team Level

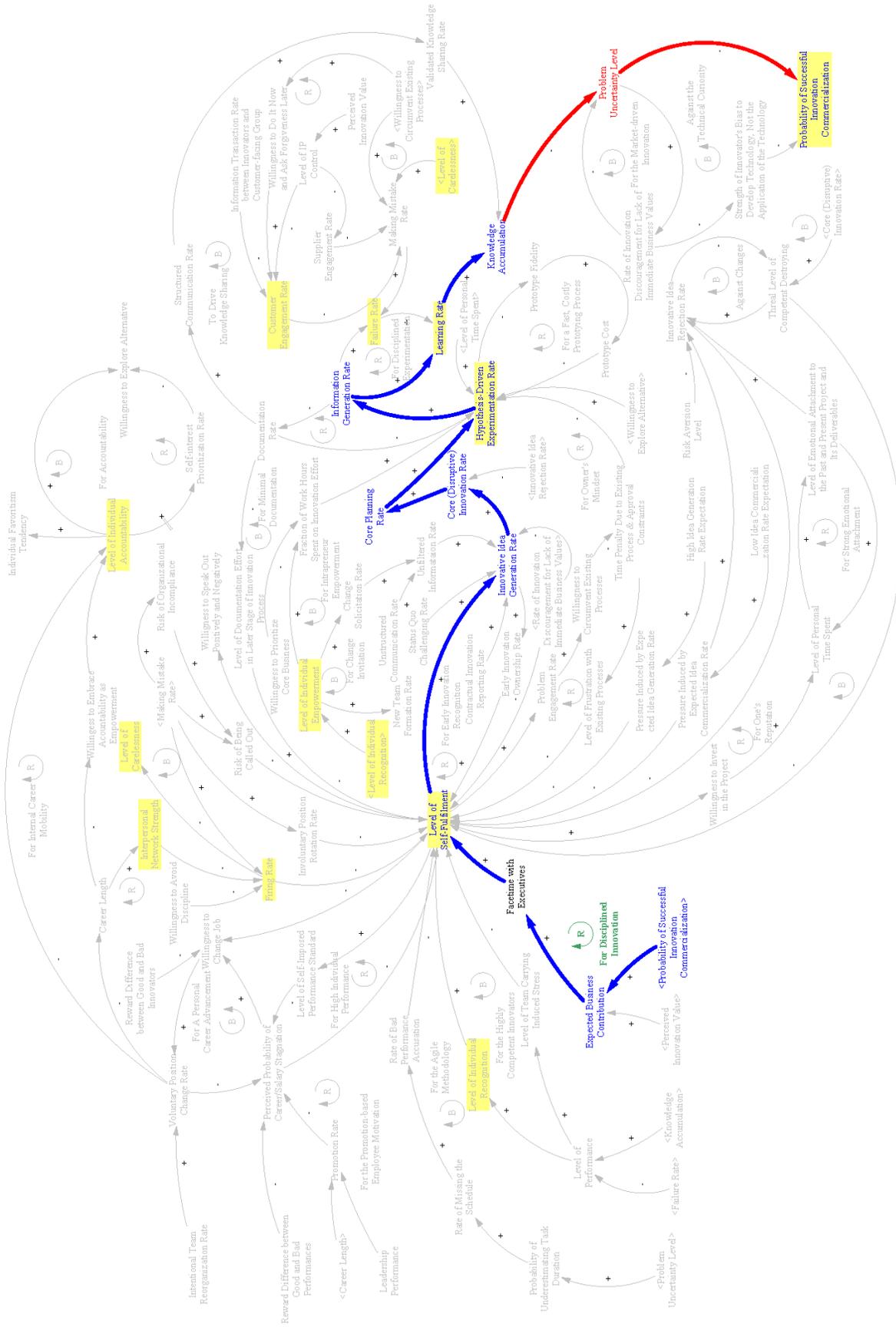


Figure E-2: Partial Individual Level Corporate Innovation Causal Loop Diagram: Main Causal Loop

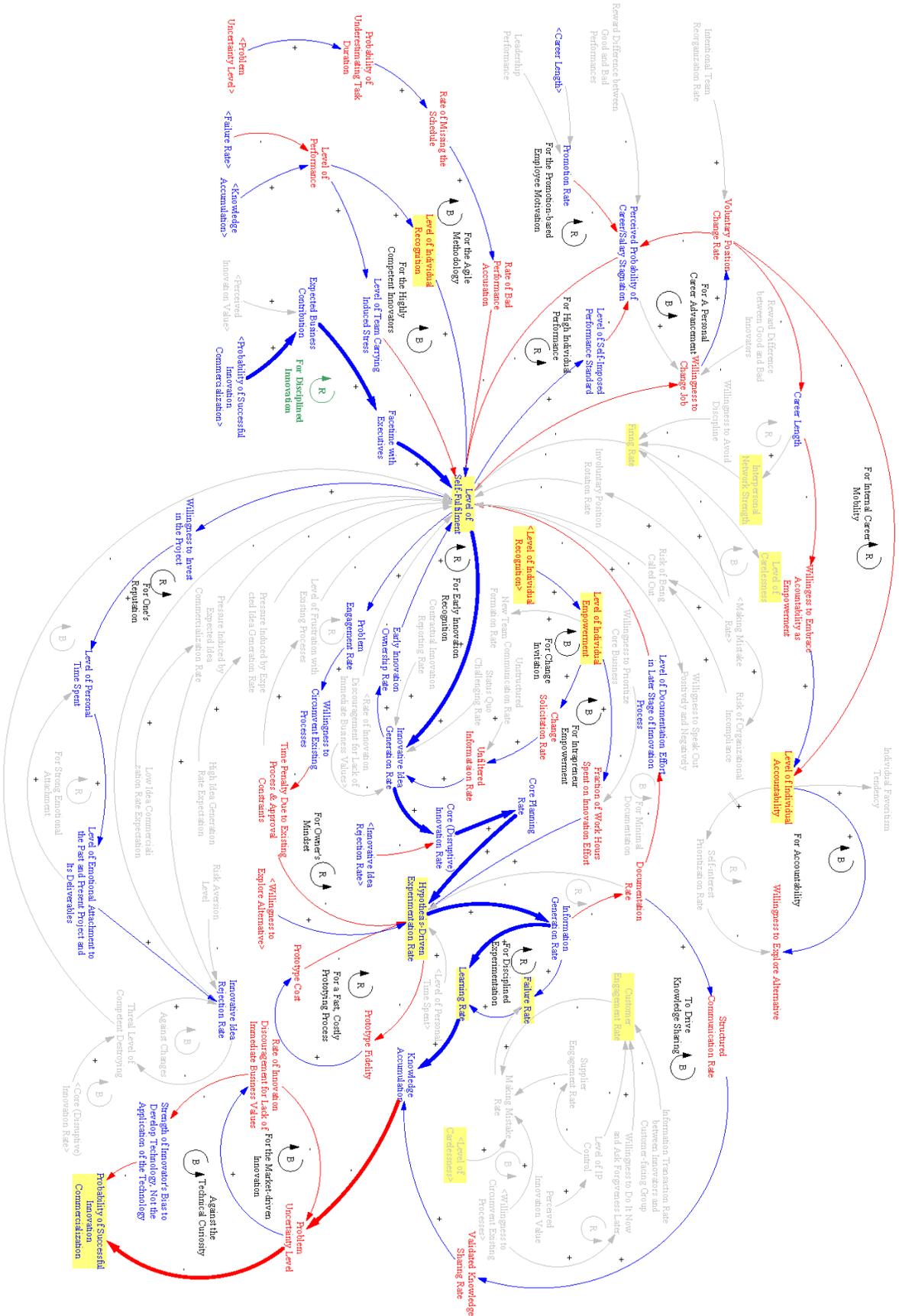


Figure E-3: Partial Individual Level Corporate Innovation Causal Loop Diagram: Main Causal Loop with Key Balancing and Reinforcing Loops Acting on It

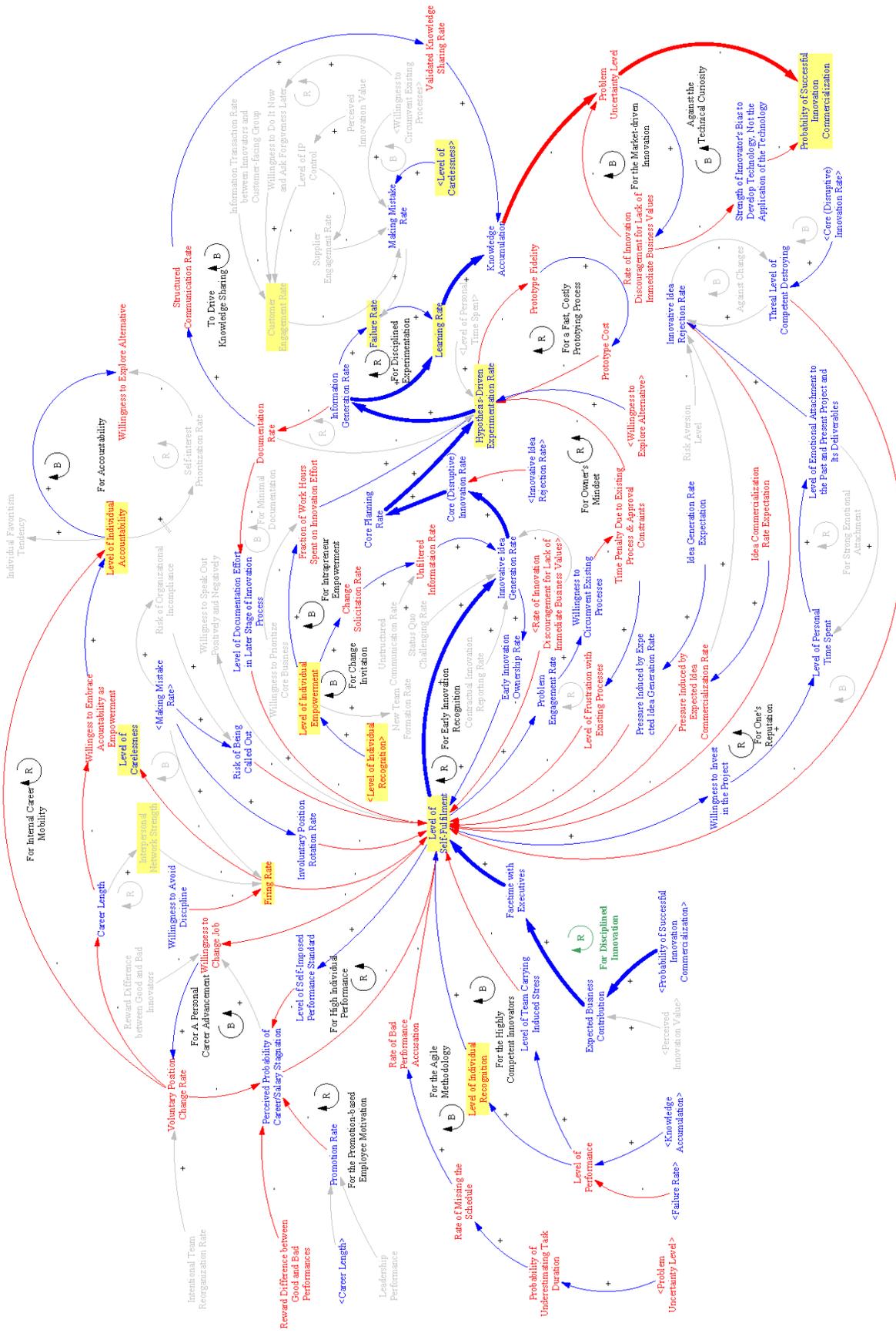


Figure E-4: Partial Individual Level Corporate Innovation Causal Loop Diagram: Resulting Causal Links on Intrapreneur's Level of Self-Fulfillment

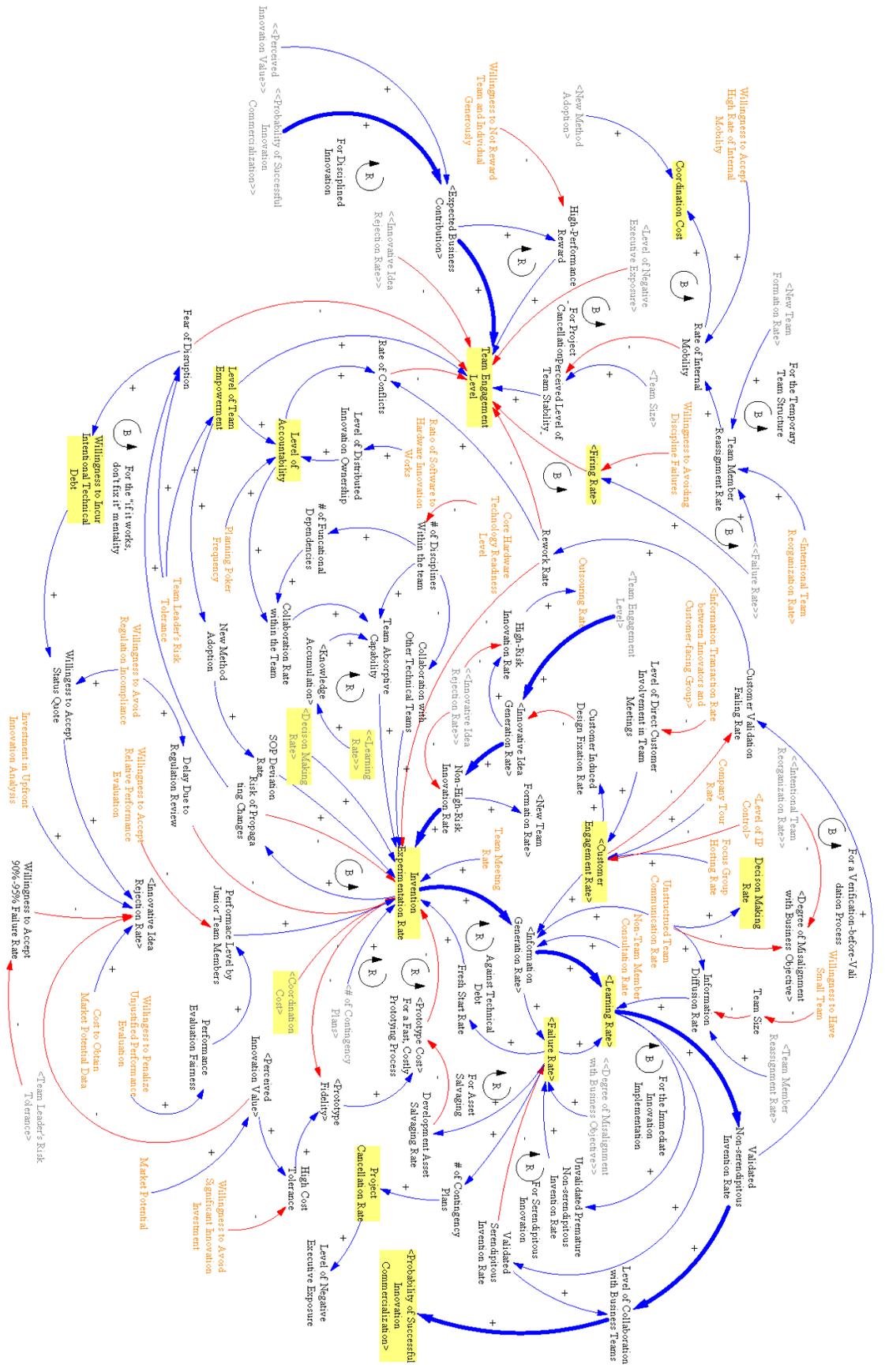


Figure E-5: Partial Team Level Causal Corporate Innovation Loop Diagram: yellow highlighted variables are common variables in startup and corporate innovation cultures

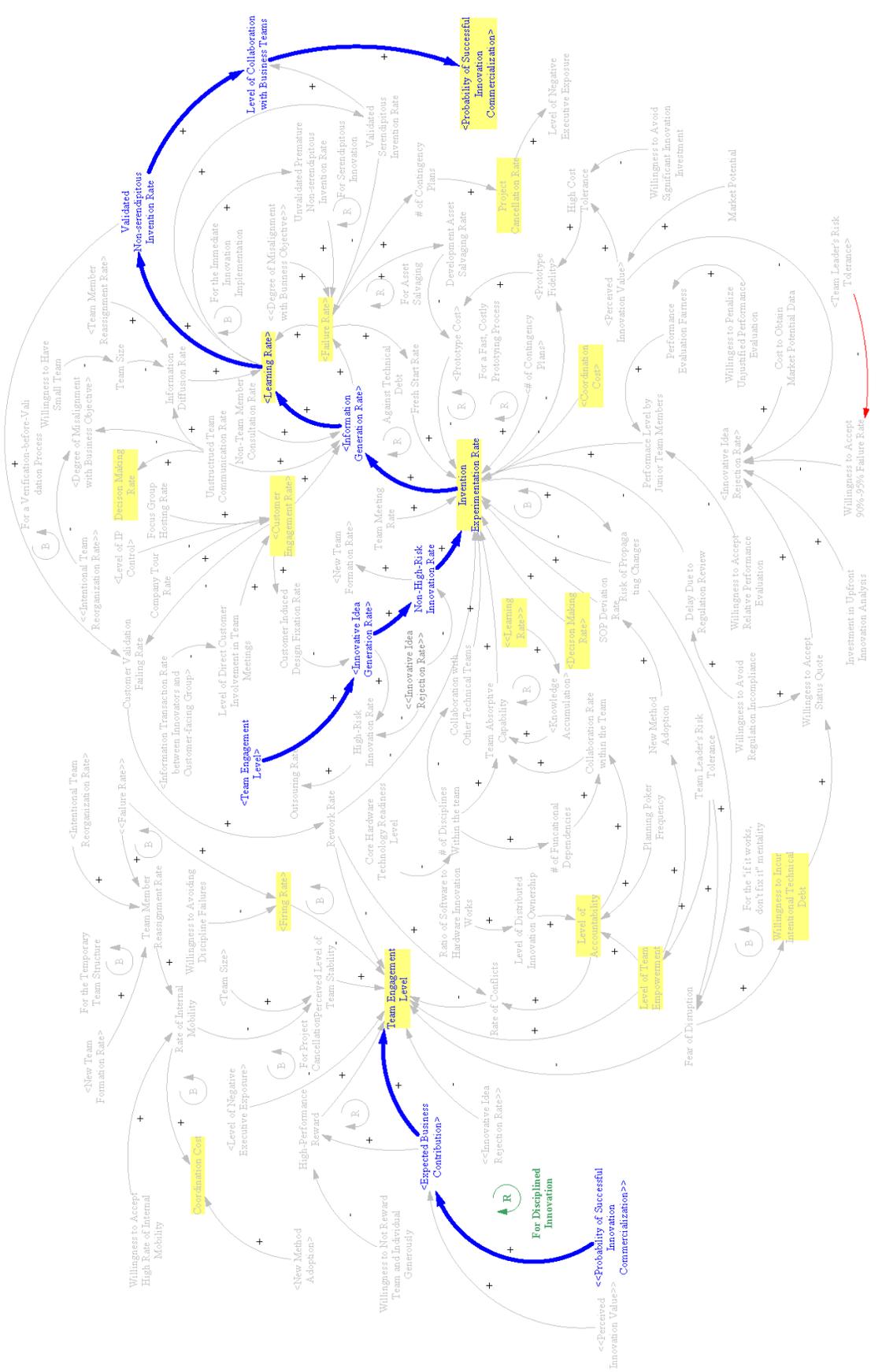


Figure E-6: Partial Team Level Corporate Innovation Causal Loop Diagram: Main Causal Loop

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