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# Managing Innovation Paradoxes: Ambidexterity Lessons from Leading Product Design Companies

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Companies frequently attempt to gain a competitive advantage in their market through innovation, yet this critical factor is often elusive. Obtaining innovation requires both *exploration* to tap new opportunities and *exploitation* to enhance existing capabilities. The ability to excel at these conflicting modes of innovation can be termed organisational ambidexterity. But how do highly innovative companies foster ambidexterity throughout the organisation? The authors of this paper examined seven market-leading companies in product design – an industry renowned for innovation. The results offer three lessons in ambidexterity that showcase the power of paradox. First, *paradoxes can fuel, as well as frustrate innovation*. The case study companies embraced nested paradoxes of innovation: long-term adaptability against short-term survival; possibilities-constraints; diversity-cohesiveness; and passion-discipline. Second, *innovation paradoxes require paradoxical management approaches*. Each company used integration techniques, stressing both/and thinking to foster synergy, and splitting techniques, separating tensions to focus resources and action. Lastly, *paradox guides a common managerial approach, but enables contextual variations*. While the case studies share overarching patterns, integration and splitting practices differed, often depending on company size.

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## Introduction

As change accelerates, rivalries intensify and customer expectations rise, the importance of innovation hardly needs emphasis. Innovation entails identifying tools, ideas and opportunities to create new or improved products or services.<sup>1</sup> Both scholarly research and the popular press have stressed that we live in the “creative age”; a time in which a company’s most vital asset is its creative capital — the action-orientated problem solvers who fuel these efforts.<sup>2</sup> Indeed, mounting evidence suggests that innovation capabilities offer valued competitive advantage, but also are essential for organisational performance, adaptation and long-term survival.<sup>3</sup>

*Organisational ambidexterity* is the ability to excel at exploration and exploitation — vital, but conflicting modes of innovation.<sup>4</sup> Respectively, these modes spark the imagination, invention and experimentation to create future opportunities, and enhance current skills, specialisation and capacity to meet today’s business demands.<sup>5</sup> Early research warned that ambidexterity is rare. Most companies struggle, seeking trade-offs between the opposing routines and logics underlying exploration versus exploitation.<sup>6</sup> Frustrations mount as tensions pull the company, teams and individuals in opposing directions. Yet recent work has proposed several approaches to ambidexterity. First, *dual architectures* separate strategic and structural supports into dedicated units aimed at either radical or incremental innovation, requiring executives to integrate efforts and balance resources.<sup>7</sup> Second, certain *leadership characteristics and processes* help top management pursue conflicting modes of innovation.<sup>8</sup> Third, behavioural and social means can foster an *organisational context* that encourages ambidextrous efforts throughout a company.<sup>9</sup> Context, in this setting, denotes the largely invisible set of stimuli and pressures that shape daily individual and collective behaviours.<sup>10</sup>

Although ambidexterity studies have multiplied, together they provide an incomplete guide to ambidexterity. Prescriptions remain fragmented and largely targeted toward top management, in spite of claims that innovation tensions pervade organisations.<sup>11</sup> James March described exploration-exploitation tensions as nested across multiple levels, complicating management challenges.<sup>12</sup> Indeed, two foundational studies illustrate how individuals may embody these tensions. In his study of creative genius, Rothenberg described Janusian thinking as the ability to apply contradictions, such as Mozart’s blending of harmony and discord.<sup>13</sup> Guilford similarly depicted how the exceptionally creative use both divergent thinking (i.e., “breaking out of the box” to explore new fields) and convergent thinking (i.e., connecting ideas within an existing structure).<sup>14</sup> Projects and groups offer other, important levels of innovation, but understandings of related tensions are limited.<sup>15</sup> For instance, product development projects, whether seeking radical or incremental innovation, face pressures to create new knowledge and improve performance.<sup>16</sup> Conflicting findings in project management literature may reflect inherent tensions, such as the need for autonomy and flexibility, as well as for supervision and formal milestones.<sup>17</sup> Likewise, studies have noted contradictions within groups, often termed “creative abrasion”, such as the simultaneous needs for knowledge depth and breadth.<sup>18</sup>

The promise of organisational ambidexterity and lingering gaps in understanding motivated us to ask: how do highly innovative companies manage tensions across levels, from top management through projects and groups, down to individual creative workers? To gain more holistic insights into innovation tensions and their management, we studied seven leading companies in the product design industry. Resulting lessons highlight the role of paradox in enabling ambidexterity. First, *paradoxes can fuel, as well as frustrate innovation*. Specifically, these companies embraced four, nested paradoxes: long-term adaptability-short-term survival, possibilities-constraints, diversity-cohesiveness and passion-discipline. Second, *innovation paradoxes require paradoxical management approaches*. The companies studied used techniques for both integration, stressing both/and thinking to foster synergy and splitting, separating tensions to focus resources and action. Last, *paradox guides a common management approach, but enables contextual variations*. While our case studies demonstrate overarching patterns of ambidexterity, specific integration and splitting practices varied, often by company size.

## Methods

For this four-year study, we examined top product design companies, because the work of this fiercely competitive industry *is* innovation.<sup>19</sup> These companies develop new products, helping clients from start-ups to Fortune 500 corporations transform ideas into commercial success. The New Product Development industry is an ideal setting to examine ambidexterity as these companies must demonstrate both exploiting current capabilities, while at the same time they explore new possibilities and develop new competencies. In this setting, exploitation entails supporting repeat clients' need for incremental innovation. Indeed, most projects are of this nature, demanding that the companies improve on previous product designs to satisfy rising expectations of both the client and the client's customers. Exploration, on the other hand, denotes much more disruptive or radical innovation, those "blue sky" projects for either new or repeat customers that seek to create new market segments or dramatically alter the dominant design in an existing market segment. Therefore, we chose companies based on consistent creative prowess (e.g., design awards; *Business Week* design rankings) *and* business performance (e.g., profitability; highly visible, repeat clients). We also diversified the cases in terms of company size, major clients and specialty areas. Table 1 profiles the seven cases, using pseudonyms to ensure confidentiality.

To research how innovative companies promote ambidexterity, we used a comparative case study method.<sup>20</sup> Multiple cases enabled collection of rich, qualitative data, analysis across organisational levels, and between-company comparisons. Interviews were our primary data source for theory building, while archival materials (e.g., employee handbooks, company reports, media articles) and observations (e.g., shadowing employees, attending client meetings and brainstorming sessions) deepened our understanding of each case. To select interviewees, the companies' top executives nominated employees across levels, disciplines and tenure. Then we used a snowballing technique, asking nominated employees to recommend others for a total of 114 informants.<sup>21</sup> For each case, the first interview was conducted with the founder(s)/CEO(s), to learn more about that company's history, structure, culture, strategy and rivals. We then interviewed those directly involved in innovation efforts, such as directors, designers and engineers.<sup>22</sup> Following Miles and Huberman, we carefully catalogued all data, including email communications, field notes and reports, as well as transcribing and coding the interviews.<sup>23</sup> For this article, we present the most robust patterns — including only those features identified by numerous informants within each of the seven case studies.

### *From nested tensions to paradox management*

Following Glaser and Strauss and Miles and Huberman, systematic, iterative comparisons of data, emerging categories and existing literature aided our development of an integrative theoretical framework.<sup>24</sup> Resulting case studies illustrate innovation tensions across levels and their management to promote ambidexterity. Analysis started by examining all interview transcripts, with an aim to identify patterns and variance in descriptions of tensions. Next, within each case, we sought to group patterns into coherent themes. We noticed an interesting pattern among case informants' descriptions. Rather than frustrating, either/or dilemmas or paralysing trade-offs, informants across companies described tensions as paradoxes — contradictory yet co-existing, interdependent and valuable elements of innovation. The cases detail innovation paradoxes at organisation, project, group and individual levels. By using paradox as a lens, we present its underlying tension, dangerous extremes and corresponding management.<sup>25</sup> Tensions are the source of paradox, fostering a tug-of-war between opposing forces. But pulling too far to one side can prove counterproductive, as informants often warned of dangerous extremes. Managing paradox, therefore, does not imply avoiding, fighting or even resolving tensions, but tapping their energy.

After completing all seven cases, we conducted cross-case comparisons using standard techniques.<sup>26</sup> We looked for similar themes across cases, which we gathered into aggregate dimensions that served as the basis of our emerging framework. We labelled these dimensions either by capturing the content at a higher level of abstraction or by referring to past studies of ambidexterity and paradox to refine our labels and understandings. For instance, previous paradox studies have

Table 1. Case study product design companies

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**Company A** (headquartered in California) was founded in 1984 and employs around 45 staff in its two offices. It has been involved in 3,500 projects; has won more than 200 design awards and holds approximately 93 patents.

*Illustrative success:* Designs a laptop that becomes a billion-dollar business for its client during its first year.

Research for this case study involved 30 in-depth interviews with the CEO, senior managers/directors, engineers and designers, complemented by observation in both offices (two weeks) and analysis of archival material.

**Company B** (headquartered in Massachusetts) was founded in 1983 and employs around 125 staff in its three offices around the world. It has been involved in 2,700 projects, has won 140 awards and holds more than 280 patents.

*Illustrative success:* Designs sports equipment, doubles revenues in one year, increases sales by \$1.2bn.

Research for this case study involved 10 in-depth interviews with the CEO, senior managers/directors and designers, complemented by office observation (one week) and analysis of archival materials.

**Company C** (headquartered in California) was founded in 1969 and employs around 250 staff in its eight offices around the world. It has been involved in 10,000 projects, has won 500 awards and holds more than 200 patents.

*Illustrative success:* Generates \$200bn in revenue from its products.

Research for this case study involved 15 in-depth interviews with the CEO, senior managers/directors and designers, complemented by observation in two offices (two weeks) and analysis of archival materials.

**Company D** (headquartered in California) was founded in 1994 and employs around 16 staff. This company has won one Catalyst Award, a separate, prestigious prize for products that have done well in the marketplace by *Business Week*. It has been involved in 250 projects, has won more than 15 design awards and holds approximately 20 patents.

*Illustrative success:* Generates \$4bn in revenue from more than 150 products.

Research for this case study involved six in-depth interviews with the CEO, senior managers/directors and designers, complemented by office observation (one week) and analysis of archival materials.

**Company E** (headquartered in New York) was founded in 1985 and now around 65 staff in its two offices. It has been involved in 800 projects, has won 125 design awards and holds more than 100 patents.

*Illustrative success:* Founded a spin-off company, develops most of its products, sells company for \$275 m.

Research for this case study involved 25 in-depth interviews with the CEO, senior managers/directors, designers, engineers and researchers, complemented by observation in both offices (two weeks) and analysis of archival materials.

**Company F** (headquartered in Oregon) was founded in 1984 and employs around 95 staff in its five offices around the world. It has been involved in around 4,200 projects, has won 206 design awards and holds more than 150 patents.

*Illustrative success:* Designs mop system, generates \$200 m in sales the year introduced.

Research for this case study involved 21 in-depth interviews with the CEO, senior managers/directors, designers, engineers and researchers, complemented by office observation (one week) and analysis of archival materials.

**Company G** (headquartered in California) was founded in 1999 and employs around 26 staff. It has been involved in numerous projects and has won around 58 awards.

*Illustrative success:* Designs new and original branded line for a carmaker. Products within the line won nine awards in two years and this success story was covered by more than 20 magazines and newspapers.

Research for this case study involved seven in-depth interviews with the CEO, senior managers/directors, designers, engineers and researchers, complemented by office observation (one week) and analysis of archival materials.

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proposed using integration or splitting practices.<sup>27</sup> Our cases extend these understandings by illustrating a systematic approach of using both to manage nested paradoxes of innovation. This approach supports claims that paradox management is paradoxical.<sup>28</sup> *Integration* efforts foster a mental model or framework that helps employees view tensions as interdependent. Such a paradoxical framing may reduce the anxiety caused by competing demands, while raising expectations to excel in both arenas.<sup>29</sup> *Splitting* practices, in contrast, separate tensions in time (e.g., sequential

focus on one side, then the other) or space (e.g., different units focus on either side). Targeting each side of the tension may help maximise their distinct benefits, while enabling focus and consistency. We now detail these findings.

### ***Managing the long-term adaptability – short-term survival paradox***

***Underlying tension:*** At the organisation level, companies seek to define their purpose in a way that offers direction and inspiration, but may encompass contradictory demands. Indeed, prior research proposes that high-performing companies aim to preserve internal morale and cohesion, while meeting external changes and demands.<sup>30</sup> In product design, our cases suggest that ambidexterity requires that organisations promote the joint pursuit of experimentation with new approaches towards technologies, business processes typically addressing the needs of emerging clients (adopting a long-term adaptability focus) and the application, improvement and extension of existing competencies, technologies and products aimed at satisfying the needs of existing clients (adopting a short-term survival focus). Company F's creative director expressed this paradox as follows:

*“Certainly the origins of the company are driven by the creative thing, but you know we have to make money or the organisation is not going to survive. So there is kind of a healthy tension between making the absolute best product or environment or whatever we are designing, and ensuring that we are financially profitable. Those things aren't necessarily mutually exclusive.”*

Informants stressed the importance of both orientations and their interdependence. Long-term adaptability requires risk-taking, seeking cutting-edge innovation that builds the company's reputation through design awards and media exposure. These companies' near fanaticism for design excellence, coupled with the pride of industry acclaim, also enhances employee commitment. In turn, the resulting corporate image generates new business and fosters long-term financial success.<sup>31</sup> Meanwhile, the short-term survival imperative helps guide resource allocation and build specialisation. A director at Company E explained: “We develop a sweet spot, like an area that we are targeting, where there is more profit potential, and we develop capabilities that address the needs of those areas.” Others noted the impact on long-term adaptability, as profit offers the slack to tackle high-risk projects.

***Dangerous extremes:*** Informants warned how a narrow emphasis on long-term adaptability or short-term survival can trigger failure or success traps.<sup>32</sup> Companies may trigger “failure traps” by singularly seeking breakthroughs, straining resources and eventually reducing funds for opportunistic projects. Gradually intensifying exploratory efforts and taking increasingly high risks in hopes of overcoming past failures, can feed a vicious, downward spiral.<sup>33</sup> In the words of a Company C general manager: “That is the challenge of a creative consultancy... when the pendulum swings over too far to focusing on the creativity side, you are not making any money.” At the opposite extreme, concentrating on incremental projects may earn short-run profit but spur “success traps”. Companies hone their specialised expertise, but eventually neglect changing consumer trends or technologies, missing chances to affect, even revolutionise a product, market or industry.<sup>34</sup> Similarly, Bob Herbold explained that he was hired by Microsoft to instil greater financial and productivity focus.<sup>35</sup> While excitement for pushing the software envelope had fuelled imagination at Microsoft, efforts often ran amok, fostering chaos and waste. Interestingly, the case study companies suggest that a healthy wariness may help avoid such traps, and motivate thoughtful management of innovation paradoxes.

***Paradox management:*** Organisational vision may act as an integrating framework, helping companies target dual purposes. Other high-performing companies have illustrated this approach, using a vision of *pragmatic idealism*.<sup>36</sup> This oxymoron denotes a collective vision of profitability and idealism (i.e., with idealism ranging from social responsibility at Merck to pioneering technologies at Sony). Similarly, the case study companies foster a paradoxical vision stressing long-term adaptability and short-term survival, seeking to build commitment for these critical, long-run goals (Table 2 summarises case comparisons).

Table 2. Managing the long-term adaptability – short-term survival paradox

Case	Integration Communicating and reinforcing a paradoxical vision	Splitting Structuring a balanced portfolio
A	Two staff meetings per month	Seek projects that exploit existing competencies, while partnering with high-risk clients, and developing joint ventures creates new opportunities (Managed by the director of ventures)
B	One staff meeting per month	Seek projects that exploit existing competencies, while partnering with high-risk clients creates new opportunities
C	One staff meeting per month	Seek projects that exploit existing competencies, while partnering with high-risk clients, and developing joint ventures creates new opportunities
D	Project Reviews	Seek projects that exploit existing competencies, while partnering with high-risk clients, and developing joint ventures creates new opportunities (Managed by the director of ventures)
E	One staff meeting per month	Seek projects that exploit existing competencies, while partnering with high-risk clients, creates new opportunities (Managed by the founder)
F	Smaller, project-based units enable on-going communications	Seek client projects that both exploit existing competencies and develop new opportunities
G	Project Reviews	Seek projects that exploit existing competencies, while partnering with high-risk clients, creates new opportunities (Managed by the founder)

Note: At the organisation level, the top management team communicates an overarching paradoxical vision that stresses the importance of *both* long-term adaptability and short-term survival. While all seven companies stressed integration by stressing this paradoxical vision, their methods and frequency of reinforcing communications varied. They also used a proactive, splitting approach, maintaining a balanced project portfolio that includes radical projects that aim to create new opportunities, as well as incremental innovations that exploit existing competencies.

To avoid the paradoxical vision being interpreted as oversimplified or unrealistic, consistent and reinforcing communications appeared vital. Reiteration builds trust and avoids mixed messages, such as employees perceiving cost control as taking priority over creativity.<sup>37</sup> Across cases, leaders went to uncommon lengths to help their employees view long-term and short-term orientations as synergistic. According to an industrial design director in Company B: “We spend a fair bit of time with everybody in the company talking about how important it is to have profitable work so that we can pay wage increases and buy stuff and fix our facility and buy new software packages. On the one hand, we are educating people to say: ‘It’s not bad that we have to do these things to make money,’ and, on the other hand, we take money that we have earned, and we do pure, creative things that probably will not generate any profit... so we try to describe the link between profitability and the freedom to do something creative... we try to create that link to people’s mind.”

While all seven companies stressed a paradoxical vision, their methods and frequency of reinforcing communications vary. Staff meetings, for example, briefed employees on current projects, emerging opportunities and design awards, but addressed the company’s fiscal performance. Leaders share enough financial information to explain company decisions, while ensuring that employees do not feel enslaved by the profit imperative. In the words of Company A’s graphic designer: “In the staff meetings, [senior managers] focus on the business end but also on what people work on, breakthrough products and awards.” Formal communication was most frequent in the three smallest companies. For example, Company A holds staff meetings twice a month and Companies D and G communicate their vision in every project review. The larger companies – B, C and E – only have staff meetings monthly. Company F, although relatively large, adopted a unique approach, breaking down the company into smaller, project-based units and communicating the vision frequently and informally within these more intimate settings.

In contrast to an integrating vision, splitting practices separate the organisational purposes by diversifying the company's project portfolio. Specifically, the case study companies take on more routine and profitable projects that leverage their existing competencies, while also seeking high-risk, breakthrough projects to feed individuals' creative aspirations and develop new expertise. Similarly, scholars prescribe aggregate project plans to diversify innovation streams, including incremental projects that pay the bills, and disruptive projects that build morale.<sup>38</sup> In the words of an engineer in Company E: "I think it is another thing that the company and all consultancies struggle with... There are certain new areas that they want to focus on, but at the same time the dollars are important... It is definitely a balancing act."

To maintain a diverse portfolio, all seven companies initiate their own pet projects when breakthrough opportunities provided by clients are scarce. Blue sky projects can excite employees and showcase creative prowess. Companies A, D, E and G, the smallest companies, use a formal process of creating such projects, led by a director of ventures (A, D) or the founder (E, G). They pursue such entrepreneurial efforts as forming joint ventures or partnering with start-ups and assuming some of the risk. Company A's director of ventures explained: "I am focusing all of my energy on projects that have a venture aspect or starting new businesses or doing projects where we get partially paid in equity instead of fees." In contrast, Companies B and C leverage their size, negotiating with clients to ensure a flow of both incremental and experimental projects.

### ***Managing the possibilities-constraints paradox***

***Underlying tension:*** Within and across the case studies, informants often noted a paradox at the project level. Regardless of its particular goals (e.g., a radical or incremental innovation), a project seems inherently driven by competing demands, typically promoted by the design team or the client. On the one hand, design teams hope to identify emerging market and technological possibilities, and thereby create frame-breaking products. Clients, in contrast, stress the constraints of their existing manufacturing, distribution and other capabilities. An industrial designer in Company C described the intersection of these project drivers: "We will satisfy the client's requirements, but at the same time we will make suggestions to add value, like suggesting different types of material or different carrying method or accessories, so that you can reach a different and new market, and that is how we innovate."

Case informants described the possibilities-constraints paradox as enabling. During projects, efforts to explore new options and question past assumptions help challenge current product offerings and market segments. Likewise, clearly defining a project's boundaries aids understanding of its context, tapping clients' extensive experience with the product and its industry.<sup>39</sup> In addition, difficult constraints push creative workers out of their comfort zone, as designers and engineers can become complacent in their favoured techniques.

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*Difficult constraints push creative workers out of their comfort zone, as designers and engineers can become complacent in their favoured techniques*

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***Dangerous extremes:*** When projects are driven too forcefully by either possibilities or constraints, however, results are often problematic. Informants, for example, cautioned against allowing project boundaries to become imposing and inflexible. According to a team member in Company C, such projects are "not interesting from a design perspective because [the clients] have an already established language, so it's not like the designers are coming in with anything new." For instance, existing product lines can become confining, inhibiting experimentation. Such extremism limits creativity to current product trajectories, derailing the potential for truly

novel work.<sup>40</sup> At the other end of the spectrum, projects may become driven by dreams of a “cool” design. If allowed to ignore commercial realities, design teams increasingly rely on their own interests, avoid considering alternative approaches, and neglect market needs. The outcome, as explained in interviews, is likely to be a cutting-edge, but impractical product.

**Paradox management:** Strong emphasis on improvisation can help manage this tug-of-war, providing an integrating framework that captures the interwoven value of possibilities and constraints. Improvisation seeks creativity from *experimentation within boundaries*.<sup>41</sup> Accomplished improvisers combine ideas within a set structure, like jazz musicians who rework prescribed musical scores into a new melody.<sup>42</sup> In the case of product design, client demands clarify such boundaries as target market needs, manufacturing and marketing capabilities and competitor positioning. These boundaries provide insightful direction for the skills and imagination of creative workers. Similarly, previous research poses improvisation as the synergy between planning and execution.<sup>43</sup> A plan guides artistic expression and helps ensure valued, useful output. Yet that plan also can evolve throughout its execution. Table 3 summarises the management practices adopted by our cases to resolve this paradox.

An improvisation emphasis helps build mutual respect between design teams and their clients and can foster serendipity. Client demands are valued for disturbing the taken-for-granted routines of creative workers. Defined goals can act as triggers to investigate new territory and alter past design practices. Likewise, by surfacing new possibilities that question initial bounds, design teams can extend understandings of target consumers and technological options. Through this interplay, improvisation may spark innovative uses of existing ideas, markets and tools.<sup>44</sup> Improvisation also may spur serendipity – the right idea at the right time, fitting the right need. The industrial design director at Company E explained: “You start sensitising yourself to [clients’] issues; you start looking for them all over the place. You start seeing it in life. You know, you start observing with a sensitised point of view, so that you collect this information and store it so that when you need it, it’s there.”

Splitting approaches separate the possibilities-constraints paradox to sequentially stress one project driver, then the other.<sup>45</sup> Informants noted how purposeful iterations help each driver inform the other. For instance, often the entire design team attends the first client meeting with one goal in mind: leverage the clients’ knowledge to build a base. Focus is on discovering more about the product/service under development, the culture of the client company, the competitive landscape and other constraints.<sup>46</sup> According to an industrial designer at Company B: “Quite often what we do is we take a step back and refine the problem in the first place.”

As a project unfolds, the design team systematically shifts between drivers. During early brainstorming, for example, freedom is maximised. Teams ignore initial constraints, spanning project boundaries to explore and experiment unfettered. An industrial designer at Company A noted: “A brainstorming session is a key factor that makes it work... everybody asks about their different

**Table 3. Managing the possibilities - constraints paradox**

Case	Integration Emphasising improvisation	Splitting Iterate between freedom and boundaries
A, B, C, D, E, F, G	Stress need for and synergies between emerging possibilities and current project constraints	Start by gaining deep insight on client expectations and the market environment; pull away from initial constraints to explore new domains; return to assess project boundaries

Note: At the project level, all cases used improvisation as an integrating tool, accentuating the synergy between experimentation and working within set boundaries. Yet, when working on a project, NPD teams would alternate between periods of experimentation and periods of ensuring fit to existing market needs and client capabilities.

takes on things and bounces ideas of each other, so I can say, 'Wow! I have never thought of that', instead of saying 'Ah! It will never work'." Iterations between possibilities and constraints intensify as projects move into later stages. Increasingly frequent client meetings, for instance, seek to ensure fit between the emerging product and existing market needs and client capabilities, and to adjust project boundaries as new options arise.

This paradoxical approach to project possibilities and constraints helps to promote creative expression and commercial success.<sup>47</sup> The general manager of Company C explained: "We do design for businesses. This is not an art company. We are not here to make the coolest-looking wastepaper basket. We're here to solve creative problems that impact our clients' businesses in a major way." An improvisation framing reinforces the interwoven nature of both project drivers, while iterations leverage their distinct benefits.

### ***Managing the diversity-cohesiveness paradox***

***Underlying tension:*** Group work is a constant at design firms, occurring within and across projects and in daily work. The diversity-cohesiveness paradox often surfaced as an aid to spurring project teams from initial ideas toward valued solutions. In these companies, creativity is not seen as an individual act, because results rely heavily on social interaction and collective inspiration. Indeed, recent studies have dispelled the myth that creative output depends on a few, often flamboyantly different, individuals working in isolation.<sup>48</sup> Case interviews accentuated the value of diversity for fostering creativity and ground-breaking advancement, and of cohesiveness to nurture mutual understanding, learning and efficiency, and of the power of these synergistic contradictions.<sup>49</sup> An industrial designer in Company C explained: "Collaboration is a necessity but the individual expression definitely comes *through* the collaboration. Everyone's unique voice is respected, and you're encouraged to get your wild ideas across — you'll never be criticised for being too creative."

On the one side, diversity increases the breadth of capabilities and experiences within a group, facilitating idea exchange that encourages further individual expression. Varied expertise is fodder for creativity, enabling "deep-level" diversity, rather than more superficial, demographic differences.<sup>50</sup> Such differences enhance creative output beyond that of individuals by juxtaposing varied viewpoints and targeting greater energy at the endeavour.<sup>51</sup> According to a senior designer of Company E: "I think it comes down to just being a decent person and recognising other people's abilities... be passionate, but not so caught up with your own ideas that you lose sight of the other people that you need to get it done. I mean, no matter how fantastically creative you are, there is no project that is a one-person project." Individual expression also appeared motivating, fuelling members' commitment to the group.

On the other side of the coin, cohesiveness enables the shared goals and expectations that smooth group work.<sup>52</sup> Mutual understandings and trust are greater among members who have previously worked together. In addition, those members can more quickly agree on what needs to be done and how to do it (e.g., applying routines and standards developed during previous collaborations).<sup>53</sup> An industrial designer at Company E explained: "Different projects, different people... I always work with different people but certain people are repeated...if it works well, then why not?... If you work with someone you understand, you know how to bring something out of the other people and they know how to bring something out of you... when it's a good synergy, why waste it?"

***Dangerous extremes:*** Excessive diversity or cohesiveness, however, can undermine a group. Extreme differences may overrule team goals, foster isolation and inhibit trust. A major concern repeatedly expressed was that of encouraging "prima donnas" — experts who become overprotective of their ideas, shun collaboration and neglect implementation details. According to Company B's CEO: "A prima donna says 'I am wonderful and there will be no other'. There is a difference between that prima donna mentality and the mentality of the inquisitive mind. The inquisitive mind always says 'Gee, there is so much I don't know' no matter how gifted or talented they are." Excessive cohesiveness, however, also poses a threat. Informants noted how this extreme can stifle individuality by limiting personal time, and impede decision making by pressuring consensus. These dangers are well documented in studies of groupthink.<sup>54</sup> Similarly, teams working together repeatedly may form

cliques with their own norms, hindering knowledge transfer across teams and fostering a “not-invented-here” mentality.<sup>55</sup>

**Paradox management:** Researchers have long believed that capitalising on diversity and cohesiveness may enable exceptional group performance.<sup>56</sup> These case study companies exemplify such a both/and approach. In the words of the industrial design director at Company E: “There’s collective everything, but the point is that the ‘one’ still has to be a team member to dig hard, to really, deeply think the problem, and not rely on a surface-level discussion.” Table 4 summarises case comparisons.

Paradoxical definitions of success offer an integrating framework: team success is defined in terms of individual members’ performance (nurturing diversity), while individual success is defined in terms of their team’s performance (nurturing cohesiveness). Playful practices reinforce these definitions. For instance, members may compete with each other to create a winning solution for the team. Described by an industrial designer at Company D: “The founder sort of fosters a friendly competition between the designers... let them show their best ideas and how they work... and usually from there it funnels down, and one or two people might take the project over from there.” Informants stressed that group success stems from individuals. This paradoxical frame reflects

Table 4. Managing the diversity-cohesiveness paradox

Case	Integration Define team success via individuals and vice versa	Splitting Differentiate team members and work spaces	
		Team membership varies	Work layouts vary
A	All Cases: Team success is defined in terms of individual members’ performance (nurturing diversity); individual success is defined in terms of team’s performance (nurturing cohesiveness)	Members of core teams share past experience, while other members join teams for first time	Office “neighbourhoods” organised by discipline; meeting rooms for cross-disciplinary work
B		Members of core teams share past experience, while other members join teams for first time	Office “neighbourhoods” organised by discipline; war rooms for cross-disciplinary work
C		Members of core teams share past experience, while other members join teams for first time	Office “neighbourhoods” organised by discipline; war rooms for cross-disciplinary work
D		Infuse existing, internal teams with outsiders	Open office plan with all employees in same area; meeting rooms for cross-disciplinary work
E		Members of core teams share past experience, while other members join teams for first time	Office “neighbourhoods” organised by discipline; war rooms for cross-disciplinary work
F		Members of core teams share past experience, while other members join teams for first time	Office “neighbourhoods” organised by discipline; war rooms for cross-disciplinary work
G		Infuse existing, internal teams with outsiders	Open office plan with all employees in same area; meeting rooms for cross-disciplinary work

Note: At the team level, all seven cases offered paradoxical definitions of success that aim to leverage the synergy between diversity and cohesiveness. Yet, different splitting practices were adopted to differentiate team members and work spaces to support either diversity or cohesiveness.

the belief that “the group exists, grows and becomes strong and resourceful only if the individuality of its members can be expressed.”<sup>57</sup>

Likewise, the expectation that personal achievement requires collaboration was noted repeatedly. The director of industrial design at Company B explained the priority given to teamwork: “We value people who can work effectively with other people, and that is well-known.” The success of individuals stems from their ability to leverage other people’s skills, knowledge and expertise. According to the senior vice-president of design at Company A: “It’s more enriching to work with people who have different understandings of a problem or a different methodology. And I think people from different cultures and disciplines can solve the same problem in different ways.” Such a mindset, in return, fosters an attitude where teammates go out of their way to share what they know and collaborate to produce great designs. As Company E’s senior industrial designer summarised: “We help each other to create better ideas.”

While a diverse group helps spark innovative solutions, it does not aid smooth implementation.<sup>58</sup> Likewise, common understanding and shared experiences promote efficiency, but not necessarily creativity. Across the cases, splitting practices differentiate team members and work spaces to support either diversity or cohesiveness. For example, by varying team membership, creative workers can gain exposure to different projects, industries and technologies, but also have prolonged experience with colleagues’ skills and abilities. In most of the companies, employees serve as consistent members of a core team, chosen for their particular technical or industry expertise. A core team develops trust and a common language, reducing the time required to execute ideas. As the creative director of Company D explained: “I think if a team can work well together... it’s a lot more efficient, and there’s also that mutual respect... people respect one another as designers and people... they are more attuned to each other and can create great things.” At the same time, these employees work with other teams as newcomers. This often occurs when employees unfamiliar with the project help brainstorm. A Company D designer noted: “Early on in a project, we will get everyone involved in a brainstorm and in the creative process so that everyone brings their best ideas forward.” Scholars and practitioners have argued that more diversity during brainstorming promotes greater generation of ideas and commitment of creative employees.<sup>59</sup> The smallest companies, D and G, however, use different means to foster such diversity. Their creative workers know each other quite well. In these settings, “outsiders” (e.g., interns, freelancers, advertising agencies, technology companies) join existing, internal teams to offer fresh perspectives and insights.

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### *More diversity during brainstorming promotes greater generation of ideas*

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Physical work spaces also are used to encourage diversity or cohesiveness. The very nature of new product development requires interactions across many specialisations.<sup>60</sup> To promote collaboration, all of the companies operate in flexible offices. For example, employees in the larger companies (A, B, C, E, F) work close to others in their discipline. Organised into “neighbourhoods”, designers work in one area, while engineers, strategists, researchers, etc. are located in other parts of the office. Such layouts aid informal and ongoing knowledge exchange within disciplines.<sup>61</sup> Yet to avoid building isolated and rigid subcultures, meeting rooms or project “war room” spaces are used often for cross-disciplinary efforts. During observations, we watched these spaces spur collaboration as diverse team members would sketch collaboratively, display competing products and share project findings. As explained by the director of industrial design in Company E: “We need those community spaces where we get together and talk about stuff. That is great. That is what we share. My desk is... my papers, my files... project tables are what we think about on the team. It is the team table. We are all going to work in there. It is all even.”

Again, the smaller companies (D, G) use space differently and employees from all disciplines share the same area. The result is a near continuous sharing of ideas. As a Company D designer

explained: “I have seen it happening as spontaneously as ‘Hey guys, we need a call here.’ We try to make a decision on a detail; it can happen as spontaneous as... who is around you.” At the same time, this close-knit setting ensures that common goals are achieved and mutual understanding is developed for efficiency.

### ***Managing the passion-discipline paradox***

***Underlying tension:*** In product design, whether working alone or in a group, the need for personal energy is considerable. Creative workers face constant pressure to develop new and practical products within short timeframes and tight budgets. At the individual level, passion and discipline offer contradictory yet interwoven sources of creative fuel. Across these cases, passion fosters intrinsic motivation that builds commitment and excitement for the work, while discipline channels individuals’ efforts from ideas to fruition.

Informants described passion as helping them internalise product design. Their missionary zeal seemed to stem from a strong sense of curiosity and desire to solve problems differently. By “living and breathing design”, ideas may arise at unexpected times and in unexpected places. As illustrated by a Company C industrial designer: “I am passionate about it, so I am very inquisitive about it; so I am always reading new things and trying them out.” Past studies have suggested that passion is paramount to intrinsic motivation, fostering the curiosity, cognitive flexibility, risk taking and persistence that energise creativity.<sup>62</sup>

On the flipside, discipline channels creativity and supports execution. Individuals across disciplines and positions stressed the value of discipline for helping them view deadlines, budgets and goals as personal challenges, guiding their use of the companies’ resources and of their own time. A principal engineer in Company B explained: “We have people... quite creative but if they are lazy, they are not really useful. You can sit around and come up with a great idea but if you don’t execute it...”

***Dangerous extremes:*** Passion or discipline alone, however, can drain, rather than energise, creative workers. Taken to excess, passion fuels chaos, resulting in escalating obsession for individuals and inefficiency for companies as employees intensify their efforts in a reinforcing cycle. A senior industrial designer at Company E explained: “I would say 99.9 per cent of designers are indecisive people. They would not close doors. They would open all the doors, and keep them open as long as they can.” On the other hand, discipline can foster excessive standardisation and structure that alienates, inhibiting inspiration and experimentation so that there are few, if any, ideas to channel. As Amabile found, discipline can become an end in itself, developing a work environment that systematically squelches creativity.<sup>63</sup>

***Paradox management:*** These companies seek to feed passion and encourage discipline in their creative workers. An integrating identity helps reinforce both as employees – across disciplines, levels and projects – are socialised to view themselves as “practical artists”, while splitting practices separate their creative and routine work (Table 5 summarises case comparisons).

Whether interviewing a designer, engineer or manager, informants often described themselves and those around them as “practical artists”. The creative director of industrial design at Company C explained: “You cannot be free and be an industrial designer – unless you are working totally for yourself. Because it is still a business. Design is very different from art and I think that is the biggest misconception in the industry... Design is a facet of a mixture of business, technology and art where the freedom is in how you do it, and not by virtue of what you do.” In sum, “practical artists” seek to creatively express themselves, yet remain fully aware of the boundaries surrounding a project. This integrating framework supplements existing understandings of creative identity. Previous studies have proposed that identity can foster a self-fulfilling prophecy.<sup>64</sup> That is, individuals who see themselves as creative are more likely to act in creative ways. In our cases, identification as practical artists may spur respective behaviour, which is further reinforced by peers and managers through implicit and explicit socialisation.

Socialisation denotes processes by which an individual comes to understand the values, abilities, performance and knowledge vital for adopting a work role and contributing as an organisation

Table 5. Managing the passion – discipline paradox

Case	Integration Socialise “practical artists”		Splitting Separate creative and routine work	
	Hiring varies	Mentoring varies	Within a project	Across different projects
A	Network of interns and freelancers, panel interview (founders, group representatives)	Formal and longer-term system (“buddy system”)	Employees shift between passionate creativity to disciplined routines	Being new to a project domain (i.e., the product, market, and/or technology)
B	Initial HR screening, panel interview (managers, group representatives)	Project mentors		spurs inquiry, while being an “expert”
C	Initial HR screening, panel interview (managers, group representatives)	Project mentors		triggers past processes
D	Network of interns and freelancers, panel interview (founders, group representatives)	Founder as role model, shares insights		
E	Panel interview (founders, group representatives)	Project mentors		
F	Panel interview (founder, group representatives, other employees)	Project mentors		
G	Network of interns and freelancers, panel interview (founders, group representatives)	Founder as role model, shares insights		

Note: At the individual level, across cases an integrating identity was reinforced that allows employees to express themselves, yet remain fully aware of project boundaries. The companies socialised this identity using different hiring and mentoring efforts, but applied common splitting practices that helped employees compartmentalise their work modes within and across projects.

member.<sup>65</sup> Informants described desirable employees as those who were not only “wonderfully adept and skilled in their own disciplines”, but who also “can work and play together in a real seamless way” and “acknowledge and work under commercial constraints”. The CEO of Company B described how effective socialisation deters those who do not fit the identity or helps newcomers self-select: “They come into an environment where the majority of people think about creative friction... are comfortable with creative friction, comfortable with collaboration and also provocation... so that within a period of months... either they find themselves uncomfortable, so they don’t stay, or they become one of the converted. That is a very unnatural selection.”

Hiring and mentoring efforts were particularly stressed as means of socialising practical artists. For instance, while the seven companies require consensus among all interviewers for a candidate to be selected, fostering very high rejection rates, other hiring practices varied. The smaller companies (A, D, G) identify prospective candidates from a network of interns and freelancers who have done work for the company in the past. In comparison, B and C use their HR department to oversee initial screening, while managers and group representatives join panel interviews to evaluate shortlisted candidates. Mentoring practices reinforce selection efforts.<sup>66</sup> Across cases, senior managers strive to help their juniors adopt the desired identity as a way of life. In the smallest companies (D, G), founders act as mentors, presenting themselves as embodied symbols of “practical artists”, yet in some of the larger companies (B, C, E, and F), project leaders help mentees by highlighting the daily importance of practical artistry in context.

While an integrative identity promotes both passion and discipline, splitting practices allow employees to compartmentalise their work modes. As a project iterates between freedom and boundaries, so can individuals shift from passionate creativity to disciplined routines. Across companies,

as projects evolve, an individual's work is encouraged to follow its flow from experimentation and discovery to execution and implementation. A vice-president at Company B explained: "There are times where we may explore a bunch of different directions on what this project might work like, how it might function, what the architectural layout of the product might be, that is very open. While in other times, we have to narrow the ideas down."

Splitting also seemed to occur depending on an individual's role within a team. As noted previously, design teams are comprised of those new to the project domain, to spur inquiry, as well as those with expertise in that area, to ensure efficiency by leveraging their past processes. By participating in multiple teams, creative workers can play varied roles, emphasising either exploration and creativity or productivity and routine.<sup>67</sup> At Company B, a principal engineer explained the need to find the right project mix: "People here do not want to do work that they are entirely comfortable with all the time. We want to find people challenging work, but we don't want to give more challenging work than they can do."

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*Creative workers can play varied roles, emphasising either exploration and creativity or productivity and routine*

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**Conclusion: innovation, paradox and ambidexterity**

This research leverages and extends previous understandings of innovation, paradox and their interactions for ambidexterity. Studies of innovation have provided numerous, but varied insights into its challenging tensions and varied management responses.<sup>68</sup> Research has offered insights into innovation tensions experienced by companies, team projects or individuals, yet others have stressed that tensions are interwoven and nested through organisations.<sup>69</sup> Our comparative case study responds by enabling a mix of depth and breadth. More specifically, these cases detail innovation tensions across levels and present a comprehensive approach to their management. Likewise, paradox literature enabled valuable insights into these case patterns. Yet, in turn, our work deepens claims that paradox may empower organisational adaptation, change and innovation.<sup>70</sup> Indeed, recent studies have alluded to the value of paradox in enabling organisational ambidexterity.<sup>71</sup> Our cases go further to present paradoxes at four levels — organisation, project, group and individual — and interwoven practices to managing exploration and exploitation. By examining seven companies that lead an innovation-based industry, we glean potentially valuable lessons. We now propose three, specific lessons learned, their value to managerial practice and their implications for future research.

First, *paradox can fuel, as well as frustrate, innovation*. Managers should view tensions as paradoxical, which may, in return, reduce the anxiety, stress and frustrations intensified by conflicting innovation demands. Our findings suggest that managers and creative workers value each side of a tension as well as their synergy. Indeed, these companies seem to embrace nested paradoxes of innovation: long-term adaptability — short-term survival, possibilities-constraints, diversity-cohesiveness and passion-discipline. Fear of possible traps was evident, however, as informants repeatedly described the "dark sides" of paradox. Companies need to consider the relative importance of a healthy wariness, which seems to reinforce a collective mindset of paradox. Concerns may counter tendencies to prefer or bias a particular side; tendencies that can spark vicious cycles of neglecting exploration or exploitation and, thereby, inhibiting long-term success, adaptability and survival. The possible benefits of such paradoxical thinking beg more longitudinal research. How might companies sustain such a mindset throughout the organisation? These case study companies have enjoyed over a decade of high performance in terms of both creativity and profitability. Yet is a paradox mindset precarious, easily toppled in tough times (e.g., when top management might be tempted to overemphasise efficiencies and cost cutting)?

Second, *managing innovation paradoxes is paradoxical*. Integration and splitting efforts permeate the company, leveraging nested paradoxes of innovation. Managers should adopt both integrating frameworks supporting the paradox mindset, highlighting the interdependence of tensions, while

splitting practices enable focused action and resources. The multi-layered nature of these paradoxes also suggests that management is a shared responsibility. At the company level, strategic and resource decisions enable dual emphasis on long-term adaptability and short-term survival, while separate radical and incremental projects diversify the innovation stream. Regardless of project type, however, tensions continue. Enabling commercial success requires identifying novel possibilities as well as staying within project constraints. Likewise, groups thrive by enabling both diversity and cohesiveness. Teams seek different perspectives and skills to foster inspiration, creativity and ground-breaking advancement. On the other hand, shared experiences and mutual understanding enable trust, learning and efficiency. Even within the creative individual tensions persist. Needs for passion and discipline reiterate overarching demands for imagination and artistic expression, while ensuring focus, direction and execution. Our emergent framework offers a guide, but raises new questions. We encourage future research that examines the interactions and dynamics among levels. Process models could shed light on whether or how the paradoxes and management practices feed into each other, reinforcing a virtuous cycle of ambidexterity.

Lastly, *paradox guides a common managerial approach, but enables contextual variations*. These seven companies share robust, overarching patterns, but specific integration and splitting practices vary. Most often, management differences appear linked to company size, illustrating the possibility of developing creative alternatives to fit different organisational settings. For instance, the smallest companies in our sample often turn to their external networks to help manage innovation paradoxes. Their networks of freelance contractors, interns, entrepreneurs and other creative workers help them initiate exploratory projects with start-up ventures, interject fresh and varied perspectives on design teams and identify potential “practical artists” during the hiring process. In contrast, the larger companies find ways to make their organisation feel smaller (e.g., dividing into project-based units to enhance communications or enable mentoring) and to leverage their scale (e.g., negotiating with clients to ensure a mix of radical and incremental projects). These examples, however, also highlight the need for research beyond the new product design industry. Calls for paradoxical approaches to management have certainly been aimed at more traditional manufacturing and service industries. Do similar, broad patterns exist in such settings? How might innovation paradoxes and corresponding management practices vary? Likewise, while we sought to learn from innovation leaders, a key next step is to compare and contrast our findings patterns with those found in low-performing companies. Such studies will be vital to testing, extending and refining the lessons learned here.

In sum, our case studies highlight the challenging, nested and paradoxical nature of innovation tensions. Yet these ambidextrous companies thrive, embracing the tensions to illustrate a shift in managerial thinking from one of executive control over either/or decisions toward paradoxical thinking and managing by all. The result is a potentially powerful, reinforcing cycle that fuels exploration and exploitation throughout the company.

*“Our experience is that paradoxes can definitely impact a company negatively. It’s easy to align oneself to only one side of the paradox. To help our staff avoid this, we instituted a value we call ‘the genius of the and’. This comes from the book, Built to Last. We believe that reality is deeply rooted in perception. If people perceive that only one side of a paradox works, only one side will work... If there is a perception that both sides of the paradox can be achieved, it is more likely this will occur.” (COO, Company A)*

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## Biographies

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