

Can Profitability and Sustainability Co-exist? An empirical study on design-thinking and digitalization for sustainable practices¹

(Developmental Paper)

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Background

In the realm of business, prioritizing sustainability is not just important – it's essential. Thus, gaining insight into how companies navigate toward a sustainable and economically feasible future becomes paramount. This developmental paper explores the strategies that firms use to balance profitability and sustainability. It examines whether and how *design-thinking* (a human-centred approach for creating innovative solutions to complex problems by incorporating designers' principles, approaches, methods, and tools)², along with *digitalization* (the application of digital technologies to transform business models and generate new revenue and value-producing opportunities)³, can lead to both business success and sustainable outcomes.

Balancing profitability and sustainability presents a significant challenge. In this context, design thinking, known for its efficacy in addressing complex problems, is increasingly recognized as a promising approach (Santa-Maria et al., 2022; Nagaraj et al., 2020). A fundamental aspect of design thinking is its human-centred approach, prioritizing the needs of individuals (Brown 2008, Micheli et al., 2019). Collaboration is integral to design thinking, engaging diverse stakeholders to tackle intricate issues (Adomako et al., 2022; Akhtar et al., 2018). Through these divergent and convergent processes, design thinking expands the scope of ideas and facilitates the selection of optimal solutions (Brenner et al., 2016, Santa-Maria et al., 2022). Despite its prevalence in business practice, the empirical application of design thinking to achieve a balance between profitability and sustainability remains relatively unexplored.

Conversely, the rise of digital technologies has brought about a paradigm shift in the twenty-first century. Digital transformation is considered one of the most significant megatrends in human history, permeating institutions, societies, and organizations (Hopp et al., 2018). In recent years, digitalization and artificial intelligence (AI) have garnered increasing attention in business and management literature (Brown et al., 2024). Digitalization transforms intra- and inter-organizational collaboration, serving as a priority for firms seeking to enhance capability building and competitiveness (Demirel and Kesidou, 2019). Notably, while digital technologies offer opportunities for reshaping business and management practices, this advancement brings forth a series of complex dilemmas including those surrounding privacy, ethics, and cybersecurity (Awan et al., 2022; Nishant et al., 2020). Nevertheless, there

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² See Brown, 2008 and Micheli et al. 2019.

³ See Awan et al., 2022 and Demirel and Kesidou, 2019.

remains a lack of comprehension regarding how companies navigate through digital transformation while grappling with the inherent dilemmas to maintain the equilibrium between profitability and sustainability.

Research Method

Motivated by this backdrop, this developmental paper explores how firms apply design thinking and digitalization as means to pursue business success and environmental responsibility. To achieve this, we conducted a multiple-case study research grounded in critical realist epistemology (Lawani, 2021). Multiple-case study methodology is well-suited for capturing firms' practices and refining conceptual frameworks, enabling investigation into complex, context-sensitive processes with explanatory rigor for enhanced validity and reliability (Eisenhardt, 1991).

For data collection, we employed theoretical and purposeful sampling techniques (Dubois and Araujo, 2007) to select cases that offered rich experiences and practices for observation. Interviews and focus groups were conducted to compile case studies. Our investigation was conducted in Japan, a nation that has undergone notable fluctuations in environmental performance and economic instability throughout the last fifty years. For instance, during the rapid industrialization of the 1950s and 1960s, Japanese industrial cities became synonymous with air pollution. Following the 1973 oil shock, through to the early 2000s, successive Japanese governments made aggressive efforts to combat air and water pollution while enhancing energy efficiency. Meanwhile, Japan's post-bubble economy was adversely affected by large negative influences, such as the economic shock of 2008, ongoing deflation, and negligible economic growth. These transitions prompted many Japanese businesses to search for new sustainable business models, providing invaluable data for our study.

For data analysis, we employed the systematic combining approach (Dubois et al., 2023), which is particularly useful for analysing complex datasets with a developmental objective. This approach relies on abductive logic—an intermediate position between deduction and induction—allowing for continuous development and refinement of the emerging conceptual framework in line with our research aim. Abductive logic facilitated increasingly nuanced conceptual mapping of our empirical data within an evolving theoretical framework. We conducted multiple cycles of within-case content analysis to interpret transcribed interviews and material evidence, followed by cross-case pattern searching, which involved mapping within each case and analysing patterns across cases. We utilized NVivo-20 and tabulation techniques such as clustering and comparison/contrast for data display and reduction (Miles et al., 2014). To ensure coherence and avoid redundancy in presenting empirical findings, we employed thematic cross-case analysis (Yin, 2018) to synthesize evidence from multiple cases and report our findings conceptually.

As a result, data were collected from three case studies using interviews and focus groups, totalling a cumulative duration of 465 minutes.

Case 1: Company A is a longstanding Japanese chemical company with over a century of history.

Case 2: Company B is a Japanese conglomerate company with operations spanning multiple industries globally, playing a substantial role in various sectors of the economy.

Case 3: Company C is a Japanese company operating across a wide range of industries, including information technology, electronics, infrastructure, automotive, healthcare, and financial services, establishing itself as a diversified multinational corporation.

Preliminary Findings

Case 1

Our findings indicate that Company A is deeply committed to sustainability across its operations and product lines. The company actively pursues measures to minimize its environmental footprint, including initiatives targeting energy efficiency, waste reduction, and recycling. Moreover, Company A demonstrates a dedication to eco-friendly innovation, developing products like biodegradable plastics and materials for electric vehicle batteries. Additionally, the company engages in sustainable sourcing practices and contributes to community development projects, showcasing its positive societal impact, aiming to “*use less energy, and fewer materials to produce new products...*” a *resource optimization* concept is highlighted by our interviewee.

Furthermore, our data highlights Company A's integration of design-thinking principles into its product development approach. This human-centred methodology enables the company to craft innovative solutions tailored to the needs of customers and end-users. By adopting this approach, Company A effectively differentiates its offerings in various industries, including automotive, electronics, and healthcare. Here, the approach that “*...we collaborate to produce new products...exchange various information...and confirm their (customers') needs...*,” is emphasized.

Moreover, our research reveals Company A's embrace of digitalization to enhance its manufacturing processes and overall operational efficiency. Leveraging technologies such as automation, data analytics, and the Internet of Things (IoT), the company optimizes production workflows, monitors equipment performance, and streamlines supply chain operations. According to our interviewee, this digital transformation enables Company A to respond rapidly to market shifts, reduce costs, and deliver high-quality products more efficiently to its customers, as our interviewee stressed “*We try to improve processes to reduce consumption of energy, by adapting new technologies.*”

In short, the data suggest that a committed organizational culture is crucial. Design thinking fosters innovations for sustainability, creating differentiation, while digitalization enhances operational efficiency. Together, these elements drive competitiveness and, consequently, profitability.

Case 2

Evidence from our case study illustrates that Company B strategically incorporates sustainability, design-thinking, and digitalization into its business strategies to tackle global challenges, fulfil customer requirements, and foster long-term growth and competitiveness across its diverse range of enterprises. By embracing these principles, Company B endeavours to “*co-create value not only for its stakeholders but also for society as a whole...even collaborating with competitors is quite essential to expand the market...*” as articulated by one of the interviewees.

Our findings indicate that Company B adopts a design-thinking approach to both product development and service delivery across its various business sectors. By comprehending the needs and preferences of its clientele, Company B strives to devise innovative solutions that cater to specific market demands. This commitment to the human-centred design principle is evident in the creation of eco-friendly vehicles, efficient industrial machinery, and user-friendly electronic products, all aimed at generating value for customers. As highlighted by our interviewee “...want to shift to user-centric (rather than product-centric) approach.”

Moreover, our case study underscores that Company B embraces digitalization to optimize its operations, enhance efficiency, and drive innovation throughout its enterprises. This entails harnessing digital technologies such as artificial intelligence (AI) and data analytics to refine manufacturing processes, improve product performance, and deliver tailored experiences to customers. Furthermore, Company B invests “in digital solutions for smart infrastructure, energy management, and transportation systems” as mentioned in a conversation with one of the authors. This approach promotes the development of more sustainable and interconnected communities.

In short, data indicate that a strategic approach incorporating sustainability, design thinking, and digitalization into business strategies fosters long-term growth and competitiveness. Design thinking, with its human-centred approach and ecosystem concept, nurtures co-created product and service development. Meanwhile, digitalization and AI optimize operations, enhancing efficiency and stakeholder cooperation.

Case 3

Evidence from the case study indicates that Company C's dedication to tackling societal challenges through customer-centric solutions and leveraging innovation and technology to foster sustainable growth and enhance societal well-being. Our findings suggest that Company C places a strong emphasis on minimizing its environmental footprint through various initiatives, including enhancements in energy efficiency, waste reduction, and the development of eco-friendly products. Furthermore, the company actively participates in community development endeavours and promotes diversity and inclusion within its workforce.

In addition, Company C adopts a design-thinking methodology in both product development and service delivery, prioritizing a thorough understanding of customer needs and preferences to drive innovation. By adhering to human-centred design principles, the company endeavours to deliver products and services that offer maximum value and usability to its customers. Here, our interviewee explained: “...calling it a ‘Design Centre’ is that we have now achieved a level of co-creation. It’s now part of our culture...” This approach “not only facilitates the identification of new growth opportunities but also enhances differentiation in the marketplace,” as emphasized by one of our interviewees.

Furthermore, our data unveils Company C's prominent position in global digital transformation. As emphasized by our interviewee, “...the primary focus of our R&D lies in digital services... The essence of Linking Society is collaborative development with society... Technology stands as the sole means...”. This strategy leverages state-of-the-art technologies to drive innovation and boost operational effectiveness. Through its digital solutions, the company enables businesses to streamline processes, elevate decision-making, and provide customized experiences to stakeholders within society.

In short, data reveal the importance of top management's dedication to addressing societal challenges through human- and customer-centred solutions, while leveraging digitalization and innovation to foster sustainable growth and profit. Upon which, digitalization streamlines processes, enhances decision-making, and provides customized experiences.

Figure 1 – 3 illustrate the major themes emerged from the case studies.

Discussion and Conclusion

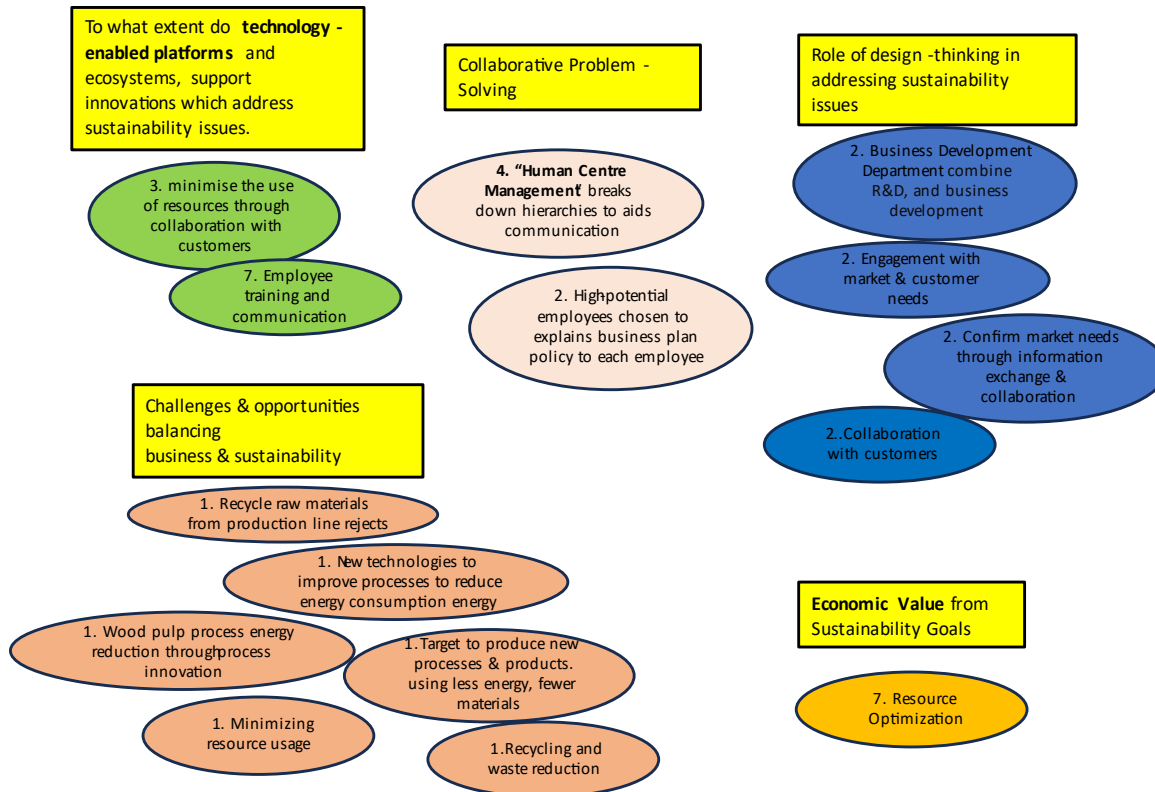
As humanity confronts numerous sustainability and environmental challenges, can we navigate our way out of the damage we have inflicted? As the conventional linear economy model of "take, make, dispose" is no longer sustainable for preserving our planet, a new sustainability paradigm is emerging - the circular economy, characterized by principles of "reuse, repair, and recycling." (Ghisellini, et al., 2016; Zucchella and Previtoli, 2019). Pursuing a balance between profitability and sustainability poses a formidable challenge. Managers are tasked with the daunting responsibility of upholding their businesses' financial health while safeguarding the well-being of both people and the planet. A shift in mindset is underway. This developmental paper sheds lights on this endeavour.

Through an examination of firms' integration of design thinking and digitalization, several repeated themes have emerged. Three cases suggest that human/customer centric solutions and co-created value (the fundamental characteristics of design-thinking concept) lead to new product/service innovation, along with digitalization that is applied to enhance process and operational efficiency. Hence, revenue and competitiveness are optimized on one hand; cost is mitigated, and operation/process effectiveness and efficiency are enhanced on the other. Not only does our research suggest that profitability and sustainability can harmonize within businesses, but it also furnishes empirical evidence on how this alignment can be realized. As a result, this preliminary study promotes us to propose *a conceptual framework* (Figure 4) that depicted a synergistic system. The ramifications of this intricate synergy are manifold. Firstly, organizational culture emerges as pivotal, with management commitment and leadership fostering mindsets towards human-centred design thinking. Secondly, an ecosystem perspective underscores the significance of stakeholder collaboration for value co-creation, mutually benefiting firm profitability and sustainability. Thirdly, an innovative corporate culture necessitates the embrace of data-driven initiatives (including AI, IoT, and cloud-based technology) as indispensable tools to facilitate stakeholder collaboration within the ecosystem and innovative managerial approaches. In short, achieving a balance between profitability and sustainability revolves around an innovative organizational culture facilitated by dedicated management commitment and leadership, cooperative ecosystem for value co-creation, and supported by digital transformation. This complex synergy is imperative for firms' endeavours towards sustainability, environmental conservation, and an economically sustainable future.

This developmental paper contributes to knowledge in different dimensions. It presents an evidence-based study, addressing the under-explored research question of whether and how profitability and sustainability can coexist, thereby enriching literature in business management and the circular economy. Furthermore, drawing from prior scholarly contributions and contemporary societal trends, this paper scrutinizes the concept of design thinking and the implementation of digitalization, offering fresh insights into a crucial topic in business and environmental studies. Additionally, this paper proposes a conceptual framework of intricate synergy for further exploration, grounded in organizational culture,

including leadership and top management commitment, a cooperative ecosystem with a value co-creation concept, and digital transformation involving big data analytics, AI, and IoT. Lastly, although the analysis is confined to a single country (Japan), it serves as a benchmark for future cross-country research endeavours. Notably, while this study emerges crucial applications of design-thinking and digitalization between sustainability and profitability, it does not address how companies tackle the inherent dilemmas (e.g., ethics and security) to maintain the equilibrium between profitability and sustainability – a limitation requires further research.

Figure 1: Company A



RELEVANT QUOTES

1. We try to recycle bad quality product from the production line in order to recycle the raw materials.

1. We try to improve processes to reduce consumption of energy, by adapting new technologies.

1. The wood pulp industry uses a lot of energy in manufacturing the pulp e.g. use of steam. We are now trying to produce it from wood directly (to reduce energy consumption)

1. Our target is to create new products, and new processes. The target should be to use less energy, and fewer materials to produce new products.

2. There are 120 people in my department supporting innovation. We combine R and D and business development function in our department..

2. To create a new business we focus on the market, based on customer needs. We create new products or new businesses, to meet needs of the customer or from the market.

2. If we collaborate to produce new products, we can exchange various information and we could confirm their needs more deeply.

2. In our Mid Term Business Plan our management tries to make each employee understand this policy in detail. To achieve that, our company has "Caravan Corp" (where a team explains the policy to each employee).

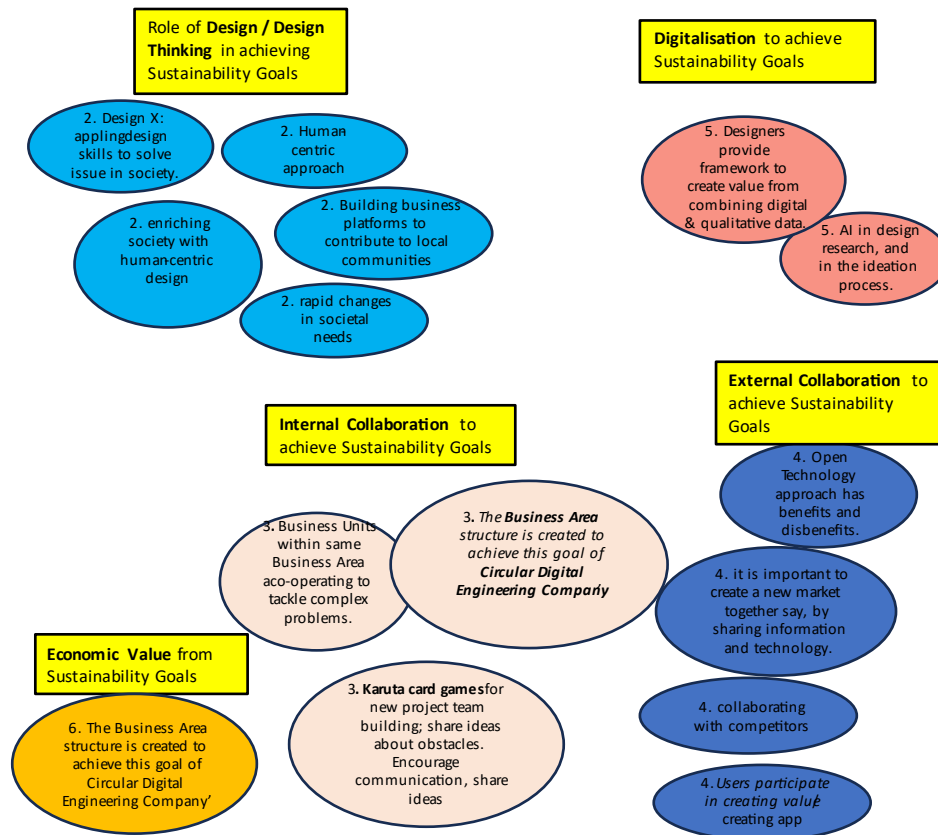
2. Each department chooses candidates (for the Caravan Corp). They are future management candidates with high talent and strong management potential.

3. We produce some functional air conditioner filters. This is sustainable because Daikin gave us more options to minimise the use of resources for development through collaboration

4. One example of "Human Centre Management": when I meet our company's president, I don't call him "President XXX". We don't use the person's formal title, only Mr. XXX. It is very unusual.'

7. Resource optimization and employee training are important to creative sustainable values.

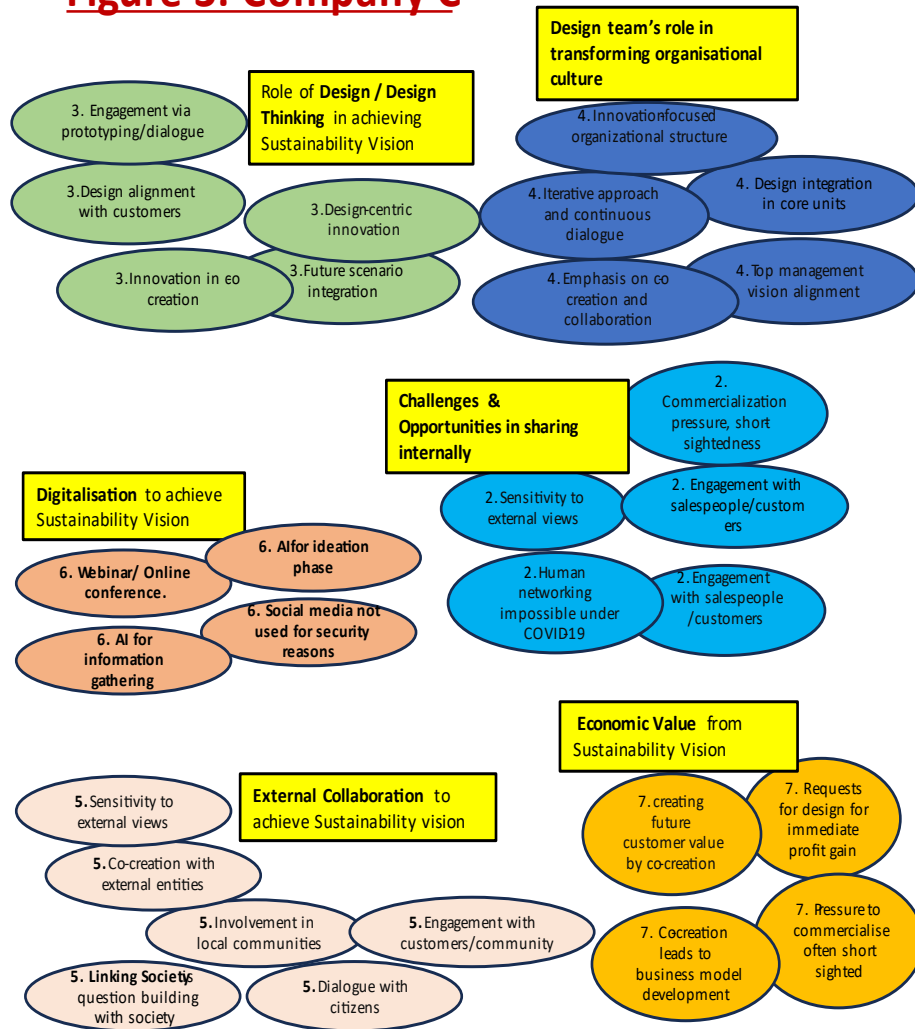
Figure 2: Company B



RELEVANT QUOTES

- our design structure takes a wholly 'humæentric' approach. We strive to create value from putting humans front and centre.
- enriching society with humæentric design
- I think that the problem here is that 'design thinking' is now understood as a process. This makes it more difficult to make the jump.
- To solve these wicked problems, we should not be stuck to the conventional solutions. Designers may find a solution in a unique and interesting way. Their brains are wired in a different way.
- We would like to change the mindset of account managers, from doing routine jobs only. We would like sales to apply 'design thinking' as well as engineers; focusing on latent or invisible demand.
- What we have been doing so far is selling our products/technology as they are. Want to shift to user-centric (rather than product-centric) approach.
- Our R&D is based on 'design thinking', and we see this as an approach to find solutions for current issues
- we are focusing on changes in people's values when considering visions
- By combining these diverse talents/skills in our R&D efforts, we are able to respond to the rapid changes [in societal needs]
- Design X development projects: Designers can choose their own projects, even if it is unrelated to their main work, if they feel there is something they can apply their design skills to, to solve a certain issue in society.
- Foresight 'scanning', detecting early signs of any potential developments (to 2050)
- Business units within the same BA are cooperating to tackle these difficult complex problems
- With the foresight tool, we are trying to imagine our future society and thinking about some possible scenarios up to around 2050.
- creating a new market, open innovation, creation are essential
- Even collaborating with competitors is quite essential to expand the market.
- Users can participate in creating value, too. Their comments can contribute to creating an app
- We also combine digital data and qualitative data. Designers provide a framework to create value from the combined data.
- in the Design Centre, we are not using much AI. We are still in the process of finding out how best to use AI.
- AI for example in design research, and in the ideation process. There is huge potential. We could use AI for research. As you know, it is very useful for Coding. We could use AI as part of a team as a virtual member to link with other team members and "break the ice".
- We're building business platforms, (smart phone apps) by leveraging 'product design' order to contribute to local communities
- We are trying to create a platform that will help in revitalizing local areas (Node-20 organisations)
- The Business Area structure is created to achieve this goal of Circular Digital Engineering Company.

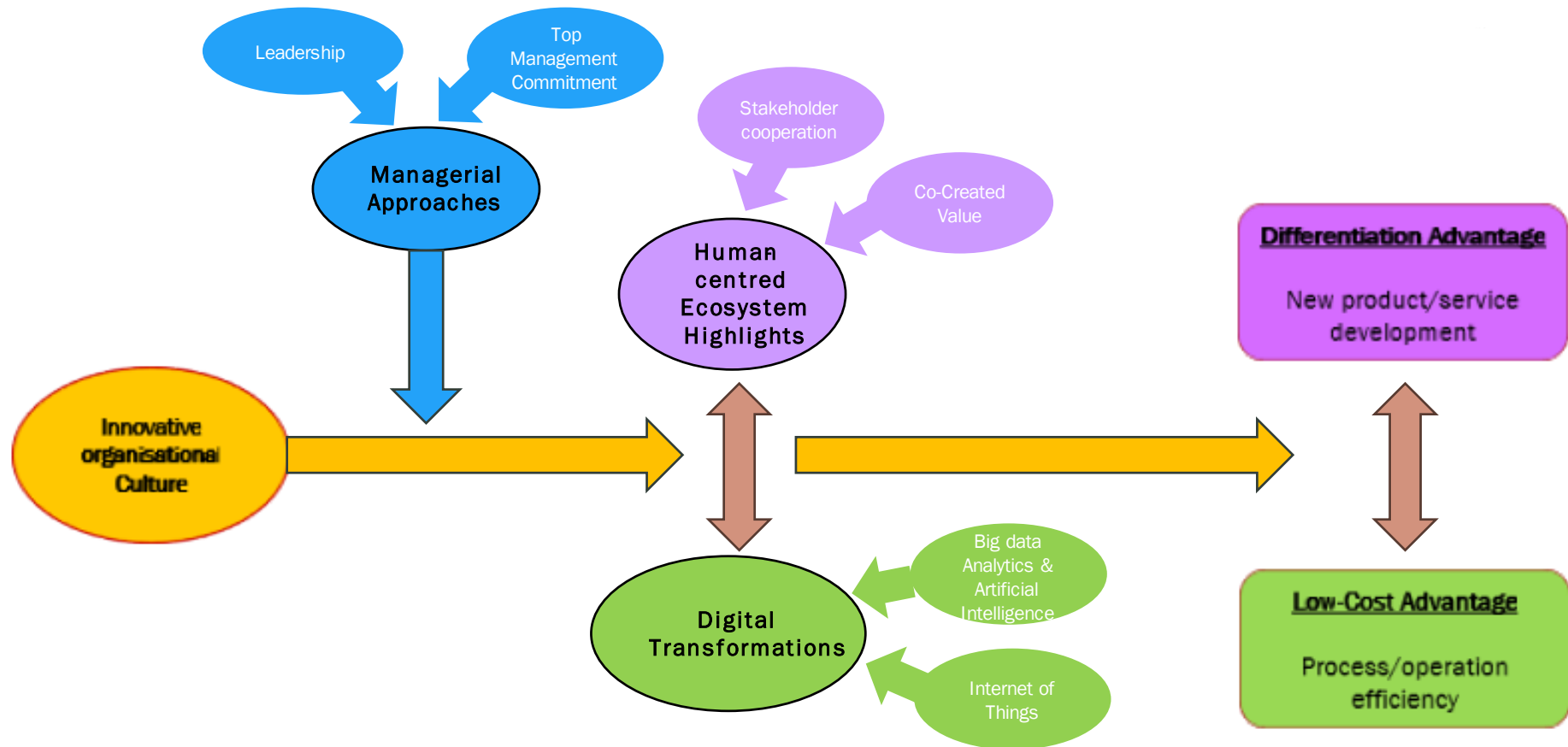
Figure 3: Company C



RELEVANT QUOTES

1. From 2006, we started creating companywide. So, we collaborated with many business units internally. (e.g. Sales, System Engineering, Information Systems etc)
2. We had human network, but this was impossible under COVID19 (creation methodology) has a very simple frame.
- 2,4. We are quite sensitive to outsiders' views. It has an impact on the company. So, we can use this to our advantage.
3. The designer is aligned to the project, understands customer issues and builds the story. But there are many ways to prepare scenarios about the future. I respect each units' perspective.
3. We do research, listen to what various people say, share the situation with each other. ~~The~~ ~~come~~ ~~up~~ with what we think would make a reliable project.
- 3,5 We try to create engagement using prototyping and with customers and citizens. Through continuing dialogue with citizens, we try to get opportunity, and create community.
- 3,4,5 There are those who can 'visualise' and those that can't. We need to speak to those that can as much as possible. Secondly, we need to publicise what we are doing. Hitachi is quite sensitive to outsiders' views.
4. Once they announce achievement in experimental project, and is diffused by word of mouth, then they have influence on Hitachi as we are very sensitive to external voice.
- We changed the objective for the Creation Centre, from a technological development unit to one centred on innovation. We brought designers into the core business unit and called it CSI. The reason we've gone back to calling it 'Design Centre' is that we have now achieved a certain level of ~~of~~ ~~ation~~. It's now part of the culture.
4. Manager changed the organisational structure to focus on innovation. This is why they change R&D structure itself. Our research department for Social Innovation and ~~Creation~~ is focusing on creating future customer value by-co creation. Their purpose is to solve future social issue.
- The purpose of Linking Society is to change basic R&D basic attitude and basic research process style
4. The main purpose of Linking Society is question building with society. We need to understand necessary purpose in the future. Technology is only the way.
4. 6. Hitachi's R&D is split into three areas. The first is 'Digital services'; we belong to that ~~area~~ ~~the~~ large R&D area is Sustainability
4. 7. Cocreation: Discovering future and business opportunity finding, and ideation, business model and value of business
5. Hitachi is keen to hear the customer's voice, and voice from the community
5. we have to contact with salespeople to customer if they have account with Hitachi.
5. We go into the ~~community~~ ~~and~~ try these things out with the local people. We repeat this process over and over, talking and revising it, and ultimately creating what kind of future we want to see.
5. Foresight activities include: Developing scenarios for future. They imagined what future society would be like. They go to local community and develop something which can be used and continuously modify the vision and conduct experimental research and try to reach a very clear future scenario.
5. Practically, instructing customers to create is very difficult. Many of these companies worry about what the world of the future will be like. If they have such worries, we try to collaborate with them.
5. Co-creation: For large projects, for example in the past, we've created a lab to work jointly with Tokyo University. We have also created consortiums with various entities. It depends on the objective
6. AI for information gathering. "AI ideation" phase
6. Hitachi has sensitive business area: defence, nuclear. Information management is very strict social media is not used.
7. (In design) there are requested to do two things: One is explorative, and it is very future oriented research. The other request is to develop it for profit gain immediately. They also have pressure to commercialise.
7. 98% of the research is focused profit generation. we feel that ~~we~~ ~~have~~ to change the way we do R&D, and ~~we~~ ~~have~~ to change the company.
7. When there is pressure to commercialise, it tends to be ~~short~~ ~~sighted~~.
7. The design team make huge effort on integration of future scenarios and existing business & their customer's business
7. some managers have a shared sense of a Future Vision. They try to bring these issues to them, and they may make money and coordinate.

Figure 4: A Synergistic System



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