NINTENDO AND INNOVATION THROUGH LATERAL THINKING WITH WITHERED TECHNOLOGY

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Master's Thesis submitted to the Post Graduation Program in Production Engineering, COPPE, at the Federal University of Rio de Janeiro, as part of the requirements for obtaining the title of Master of Production Engineering.

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April/2024

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Department: Production Engineering

This study outlines the innovation strategy of Nintendo, centered on the "Lateral Thinking through Withered Technology " concept. This strategy capitalizes on utilizing technologies considered obsolete to forge new products and services, which are not confined to the original sector of Nintendo's operations. The analysis is primarily based on interviews with two significant figures in Nintendo's history: designer Gunpei Yokoi (1965-1996) and CEO Satoru Iwata (2002-2005). Through these insights, visual models were developed to depict the innovation process and strategy at Nintendo, including its engagements with the external market. The investigation reveals that "Lateral Thinking through Withered Technology" provides Nintendo with a competitive advantage, particularly in reducing time and costs, suggesting that this approach could be advantageous for other firms as well. Furthermore, the study introduces a discussion on different strategic approaches to market entry—choosing to enter late versus being compelled to as a latecomer firm—and proposes a new variation of secondary innovation, referred to as lateral secondary innovation.

Resumo da Dissertação apresentada à COPPE/UFRJ como parte dos requisitos necessários para a obtenção do grau de Mestre em Engenharia de Produção (M.Sc.)

NINTENDO E A INOVAÇÃO A PARTIR DO PENSAMENTO LATERAL COM TECNOLOGIA MURCHA

Rafael Coimbra Guilherme Ferreira

Abril/2024

Orientador: Prof. Édison Renato Pereira da Silva, D.Sc

Programa: Engenharia de Produção.

Este trabalho descreve a estratégia de inovação usada pela empresa Nintendo, a partir do conceito do "Pensamento Lateral com Tecnologia Murcha", que se baseia no uso de tecnologias consideradas obsoletas para a criação de novos produtos e serviços, não necessariamente oriundas do mesmo setor da Nintendo. O material analisado concentra-se em entrevistas realizadas com dois executivos considerados importantes na história da empresa, a saber, o designer Gunpei Yokoi (1965-1996) e o CEO Satoru Iwata (2002-2005). A partir desse estudo foi possível sugerir modelos visuais de como se dá o processo e a estratégia de inovação dentro da companhia e sua relação com o ambiente externo. Os resultados observados indicam que o "Pensamento Lateral com Tecnologia Murcha" confere vantagem competitiva para a Nintendo em termos de tempo e custos, sugerindo que o modelo pode ser usado por outras empresas. O estudo também fomenta um debate sobre a estratégia de entrante tardio opcional frente à estratégia de entrante tardio por necessidade (*latecomer firm*), sugerindo um novo tipo de inovação secundária, denominado inovação secundária lateral.

CONTENTS

1 INTRODUCTION

Nintendo stands as a paramount technology conglomerate globally. As of 2022, it boasted a market valuation of around $53 billion, with revenues hitting $15.2 billion and net profits at $4.3 billion. Originating in 1889 as a playing card company, Nintendo ventured into the electronic gaming industry in the 1960s. Since this pivotal shift, it has consistently innovated its business approach within a fiercely competitive international market.

Annapormina *et al*. (2011) delved into the hurdles that an established company like Nintendo encounters with the entrance of new competitors. Their analysis revealed that Nintendo harnessed dynamic capabilities to address competition, eschewing direct rivalry in advanced technology development in favor of enhancing its distinctive value proposition. This focus emphasized consumer experience, featuring simpler, more intuitive elements, and the development of secondary technologies and accessories that augment the value of its core offerings.

Rodríguez-Escudero *et al*. (2011) explored how the timing of market entry affects the launch of new products, particularly regarding speed and quality. They discovered that early entrants often benefit from speed, whereas latecomers can achieve greater gains by concentrating on quality.

A pivotal element in sustaining Nintendo's success is attributed to its "Lateral Thinking with Withered Technology" strategy. Devised by Nintendo designer Gunpei Yokoi, this strategy seeks out mature, readily available technologies for innovation, offering a cost-effective and accessible alternative to the development of novel, cutting-edge technologies. The essence of this approach lies not in pursuing innovation through new technology but in innovating through a novel amalgamation of established technologies.

Lieberman and Montgomery (1988) examined the merits and demerits of being a pioneer versus a late entrant, highlighting that late entrants can capitalize on the investments of pioneers and introduce new products and services in a more certain market environment than that faced by market creators.

Shankar *et al*. (1998) investigated the sequencing of market entrants, distinguishing between lagging companies based on their innovation status. They concluded that innovative laggards could economically benefit by saving time and money, following the path laid by pioneering firms.

Zhao *et al*. (2012) expanded on open innovation and disruption theories, illustrating how both pioneering and later-entering firms could collaborate rather than compete, leveraging mutual strengths.

The notion of "Lateral Thinking with Withered Technology" aligns with "secondary innovation" as proposed by the National Institute in Technology Management (NIIM) at Zhejiang University, Hangzhou, China, per Wu and Xu (2009) and analyzed by Proença *et al* (2015). "Secondary innovation" is associated with latecomer firms and developing countries, showcasing specific traits.

Despite characteristics close to the secondary innovation studied so far, there seem to be indications of differences in relation to "Lateral Thinking with Wilted Technology." One of the inquiries of this research is to find the answer to the question: Can the strategy adopted by Nintendo be considered a new type of secondary innovation?

This study zeroes in on the latter half of Nintendo's journey, focusing on two critical epochs: its foray into the electronic gaming sector in the 1960s, marked by designer Gunpei Yokoi (1965-1996), and the more recent era from the century's turn to today. This period saw the entry of new competitors and the advent of new technologies, necessitating a quicker pace of innovation at Nintendo, predominantly under CEO Satoru Iwata (2002-2015). The analysis of these two periods reveals that Nintendo implemented and adapted the "Lateral Thinking with Withered Technology" strategy in response to evolving challenges.

The primary objective of this work is to thoroughly analyze Nintendo's innovation strategy from the perspective of "Lateral Thinking with Wilted Technology" and its impact on the company's business model. The secondary objective is to determine if this innovation strategy can be characterized as one of the types of secondary innovation described so far, or if it represents a different model.

The research anticipates developing a strategic innovation model based on the "Lateral Thinking with Withered Technology" concept. This model aims to serve companies seeking innovative paradigms, particularly those desiring accessible and cost-efficient formats.

1.1 Current context

The global economy is currently navigating through a phase of rapid transformations, spurred by the advent of new technologies and overarching global trends. To secure market share and sustain relevance, both startups and established corporations are compelled to innovate.

Tushman (1996) posited that for an organization to sustain success over extended periods, it is imperative for managers and the organization at large to exhibit ambidexterity, meaning they must adeptly manage both incremental and radical changes concurrently.

The escalation of competition, coupled with macroeconomic cycles that are often restrictive in terms of financial allocations for research and development, necessitates the exploration of less costly innovation strategies.

Yamazaki (2016) scrutinized the approach of companies like Nintendo, which opts to utilize externally developed technologies for product creation rather than solely relying on in-house developments. He noted that Nintendo procures components such as chips (CPUs) and graphics boards (GPUs) from other entities, centering its strategy on game creation. Yamazaki (2016) underscored the benefits of not depending on core technologies, including the flexibility to swiftly adapt to market fluctuations at a reduced cost. This strategy is particularly relevant in the electronic gaming industry, which stands as one of the most vibrant and rapidly evolving sectors of the modern economy, continuously inviting new competitors who challenge established players.

Selecting Nintendo as a case study facilitates a targeted analysis of innovation through "Lateral Thinking with Withered Technology" across the company's evolution, pinpointing the elements that have positioned it as a market leader. This inquiry into Nintendo's strategy presents a distinctive opportunity to examine how a key entity in the electronic gaming sector has maneuvered through the hurdles of a swiftly shifting technological environment.

The selection of Nintendo as a case study enables a focused analysis of innovation through "Lateral Thinking with Withered Technology" across the company's history, identifying the key factors that have positioned it as a market leader.

1.2 Research problem

In the fiercely competitive landscape of the global market, innovation is essential for both emerging startups and established companies, encompassing industry leaders. Irrespective of their operational model, all companies are influenced by the dynamics of the market. The emergence of new technologies, shifts in consumer behavior, and a range of political, economic, and environmental factors necessitate continuous strategic adaptation by companies.

Joseph Schumpeter, a trailblazer in the exploration of innovation and its effects on society and the ever-evolving economy, introduced the concept of "creative destruction" to describe the emergence of disruptive innovations as a key driver of economic progress. Schumpeter (2020) remarked:

> "Capitalism is inherently a method or form of economic transformation and is not merely stationary, for it could never be. The evolutionary character of the capitalist process is not solely due to the fact that economic life occurs in a natural and social environment that changes, and by virtue of this transformation, alters the economic situation." (p. 91)

and further elaborated:

> "The fundamental impulse that sets and keeps the capitalist engine in motion comes from new consumer goods, new methods of production or transportation, new markets, and new forms of industrial organization created by the capitalist enterprise." (p. 92)

The exploration of Nintendo's innovation strategy is intimately connected to the core ideas posited in Schumpeter's writings, particularly when considering the range of external and internal challenges encountered by the company to this day.

Clayton Christensen addressed the imperative of ongoing innovation for ensuring business longevity. He identified a significant oversight in strategic planning as the reliance on past successes and current achievements, overlooking the ongoing changes enveloping the company. Christensen (2015) observed, "These principles, which I term the principles of disruptive innovation, illustrate why well-managed companies may falter; often, it is because their leaders overlooked these principles or elected to resist them." (Christensen, 2015, p. 24)

The quandary for firms lies in the manner of innovation, as modifications can span various levels of complexity and financial commitment. According to Christensen (2015), innovations may be incremental, enhancing existing offerings, or disruptive. He also explored

how disruptive innovation interacts with a company's business model, focusing on customer value and its impact on the industry, rather than solely on technological advancement:

> "Disruptive technologies bring to a market a very different value proposition than what was available before. Generally, these technologies underperform compared to established products in mainstream markets. But they have other features with some additional (and usually new) advantages of value to the customer. Products based on these technologies are typically cheaper, simpler, smaller, and often more convenient to use." (Christensen, 2015, p. 28)

Thus, while the imperative to innovate is evident, the approach each company adopts must be tailored to their unique internal competencies and the external business environment.

Henry Chesbrough brought forth a novel perspective on innovation through the collaboration between varied entities, such as corporations and academic institutions. Chesbrough (2003) claimed that open innovation is a paradigm that "encourages firms to utilize both external and internal ideas, as well as internal and external paths to market, in their pursuit of advancing technology."

Investigating open innovation within Nintendo is critical, as it is closely aligned with the "Lateral Thinking with Withered Technology" concept. It is clear that from its initial product development stages to the current day, Nintendo has engaged in recurring collaborative endeavors with other technology producers.

In the realm of innovation, Joe Tidd and John Bessant emphasize the significance of viewing innovation not as an isolated event but as a continuous process that is strategically managed according to the company's policies. Tidd *et al* (2013) also contend that innovation and competitive success are not solely the province of high-tech firms, stating:

> "The reality is that, although sometimes innovation involves a discontinuous transformation, most of the time it occurs incrementally. Essentially, it's an improvement of products/services within the idea of 'doing what we know, but better' - and there is much to be highlighted in this approach." (Tidd *et al*., 2013, p. 30)

With respect to incremental or radical innovation, this research seeks to deduce how such processes are integrated within Nintendo, whether deriving from the company's own innovations or those of other entities.

Ultimately, this study endeavors to ascertain whether the various hypotheses presented by leading thinkers on innovation can be validated through the examination of products

developed by Nintendo, especially during the eras of Gunpei Yokoi and Satoru Iwata, and their application of innovative principles.

The central question guiding this thesis is: "How has Nintendo leveraged 'Lateral Thinking with Withered Technology' to innovate its products and services?"

1.3 Motivations

The study of "Lateral Thinking with Withered Technology" is imperative in the face of global financial constraints, characterized by inflation and high interest rates, as well as challenges in securing specialized labor. This environment significantly affects startups, which rely on venture capital to establish their business models, and also impacts established companies that, amid uncertainties, curtail their investment in innovation.

Even with a potential shift towards a more favorable macroeconomic climate, the cyclical nature of economic constraints underscores the necessity for cost-effective innovation strategies. Additionally, the escalating pace of international competition will persist in compelling businesses to seek more affordable innovation methodologies.

Hence, it is crucial for organizations to cultivate dynamic capabilities, enabling them to adeptly respond to opportunities and threats. This involves leveraging, combining, safeguarding, and, when required, reconfiguring the organization's tangible and intangible resources to sustain competitiveness, as highlighted by Teece (2007).

This research aims to uncover patterns that will assist companies at various stages in discovering financially feasible and creatively innovative approaches. By harnessing withered technologies and applying lateral thinking to explore adjacent alternatives outside their primary sectors, businesses can achieve innovation in a cost-effective manner.

Furthermore, by extending the strategic framework beyond corporate entities to encompass public institutions, it is anticipated that such approaches could be beneficial in a governmental context as well.

1.4 Limitations

The constraints of this study are intrinsically tied to its foundational research sources. Literature pertaining to Nintendo's innovation strategy is sparse, predominantly concentrating on the company's history or the broader electronic gaming industry, rather than focusing specifically on its innovation approach. Additionally, detailed scholarly work on Gunpei Yokoi's "Lateral Thinking with Withered Technology" methodology is notably absent.

Nonetheless, the literature that has been identified provides sufficient insights into Nintendo's process of innovation and the influence of "Lateral Thinking with Withered Technology" on its operations.

This research is primarily focused on Nintendo's organizational framework within Japan, particularly during the tenures of Gunpei Yokoi (1965-1996) and Satoru Iwata (2002-2015). The exploration of "Lateral Thinking with Withered Technology" as applied in other firms will be restricted to initially identified patterns, aiming to spark further academic curiosity in this area beyond the context of Nintendo.

Despite these limitations, given the relatively uncharted nature of the topic at an international level, the findings of this study are anticipated to contribute significantly to future research on innovation.

2 METHODOLOGY

This research seeks to explore a company distinguished by a unique trait: the adoption of the "Lateral Thinking with Withered Technology" strategy for fostering innovation. Consequently, the methodological approach chosen is to pursue an inductive process.

Through delineating innovation patterns discerned within Nintendo, the objective is to formulate a working framework. This framework is intended not solely for dissecting the company's historical innovation endeavors but also to aid in future scholarly inquiries. This is predicated on the prospective utility of these insights across different organizations.

2.1 Type of research

The study will be executed as a case study, employing the methodology suggested by Robert Yin. According to Yin (2014), the decision to frame research as a case study stems primarily from the nature of the research question and the focus on contemporary phenomena. In scenarios where data is limited, an in-depth examination is vital for a comprehensive understanding of the phenomenon under investigation.

This study aligns with Yin's (2014) criteria, given the absence of control over Nintendo's historical and current events, and its focus on a contemporary issue. While there is a historical aspect concentrating on specific timeframes, the research also encompasses the ongoing impact of these periods, thereby including the present in its scope.

The research question meets Yin's (2014) stipulation, with the central inquiry being: "How did Nintendo innovate its products and services using 'Lateral Thinking with Withered Technology'?" The research will be largely confined by geographical and temporal boundaries.

Geographically, the study zeroes in on Japan, Nintendo's base, where "Lateral Thinking with Withered Technology" was instrumental in crafting innovative products. Nonetheless, it acknowledges that the influence of these innovations extended beyond Japan, notably to the United States, where Nintendo operates a significant subsidiary.

Historically, the focus is on the years between 1965 to 1996, corresponding with Gunpei Yokoi's tenure at Nintendo, and from 2002 to 2015, under the leadership of CEO Satoru Iwata. Despite this historical focus, the research aims to ascertain if "Lateral Thinking with Withered Technology" continues to be evident, not only within Nintendo but also in other firms that employ technology innovatively in their products and services.

In delineating the Nintendo case study, the decision was made to examine the company as a singular, holistic case to understand the phenomenon's impact on the entity in its entirety, rather than conducting a comparative analysis of its internal segments. It is pertinent to note that, at certain junctures, a comparative analysis with other leading technology companies' strategies may be necessary. This comparison aims to juxtapose "Lateral Thinking with Withered Technology" against strategies that prioritize the development of cutting-edge technologies at greater financial and time costs.

2.2 Research Sources

One of the principal research sources is the unpublished book in both Portuguese and English, "Gunpei Yokoi's Game Room: Imagination that Built the 'Nintendo of the World'" (a provisional translation), which is exclusively available in Japanese. This book serves as an autobiography of Gunpei Yokoi, co-authored by journalist Takefumi Makino shortly before Yokoi's demise in 1997, merely a year after his resignation from Nintendo. This narrative offers a unique and invaluable insight, enabling an observation of Yokoi's perspective throughout his tenure at Nintendo and facilitating the extraction of pivotal concepts from the "Lateral Thinking with Withered Technology" philosophy.

Another critical research source is the "Iwata Asks" interview series, conducted by Satoru Iwata, the then CEO of Nintendo (2002-2015), with the company's and its partners' employees, including interviews with Iwata himself, regarding product and service development. This collection of 126 interviews reveals Gunpei Yokoi's significant influence in developing Nintendo's products and services, as recounted by colleagues who worked closely with him. It also allows for the exploration of "Lateral Thinking with Withered Technology" in post-Yokoi products and services, analyzing the continuity and relevance of these concepts within the company.

Additionally, a bibliographic review of academic texts pertinent to this study's theme was performed. Terms such as "Nintendo," "Innovation," and "Lateral Thinking" were investigated. Following the article listing, a selection process identified texts directly relevant to the research theme, cataloged in Appendix 1. Despite an exhaustive search, there is a notable lack of scientific articles exclusively dedicated to Gunpei Yokoi or "Lateral Thinking with Withered Technology," with only a few texts addressing Nintendo's innovation process.

Although limited, these texts contribute to a comprehensive overview and detailed understanding of the company's innovation dynamics.

Moreover, public materials like Nintendo's Financial Reports and articles in communication media were reviewed. Concurrently, literature expanding on the concepts discussed in this thesis, including "lateral thinking," "innovation," "business models," and "digital platforms," was examined.

2.3 Case study stages

According to YIN (2014), there are four main stages in a case study:

i) Preparation;

ii) Collection: data gathering from various sources, such as interviews, observation, documents, and artifacts;

iii) Analysis;

iv) Sharing.

This study strictly followed the stages described above, adhering to the schedule presented in Appendix 2.

2.4 Content Analysis

The case study on Nintendo will be undertaken utilizing a content analysis methodology, guided by the frameworks proposed by Laurence Bardin.

Bardin (2015) delineates a comprehensive method for the qualitative analysis of research materials, structured into three primary phases: (i) Pre-analysis, (ii) Exploration of the material, and (iii) Processing and interpretation of the results.

The Pre-analysis phase underscores the necessity of an initial review of the materials, meticulous document selection, corpus formation based on defined criteria, and the establishment of hypotheses and objectives. For the Nintendo case study, this preliminary phase entailed the review of literature and reports pertinent to Nintendo and the broader electronic gaming industry. This review specifically concentrated on two key resources: the autobiography

“Gunpei Yokoi's Game Room: Imagination that Built 'Nintendo of the World'” and the “Iwata Asks” interview series, conducted by Satoru Iwata, the company's then CEO.

Following this, the Exploration phase, as outlined by Bardin, encompasses the coding, categorization, and enumeration of the material, with an emphasis on the selection of units of analysis and context.

For the units of record, the decision was to focus on themes associated with innovation and "Lateral Thinking with Withered Technology," as elaborated from the concepts delineated in the theoretical framework of this study. A coding system was developed based on these themes, detailed in Appendix 3. It's crucial to highlight that this analysis is subjective and contextual, thus no word counts were performed. The codes presented correspond to themes identified during the preliminary analysis of the material.

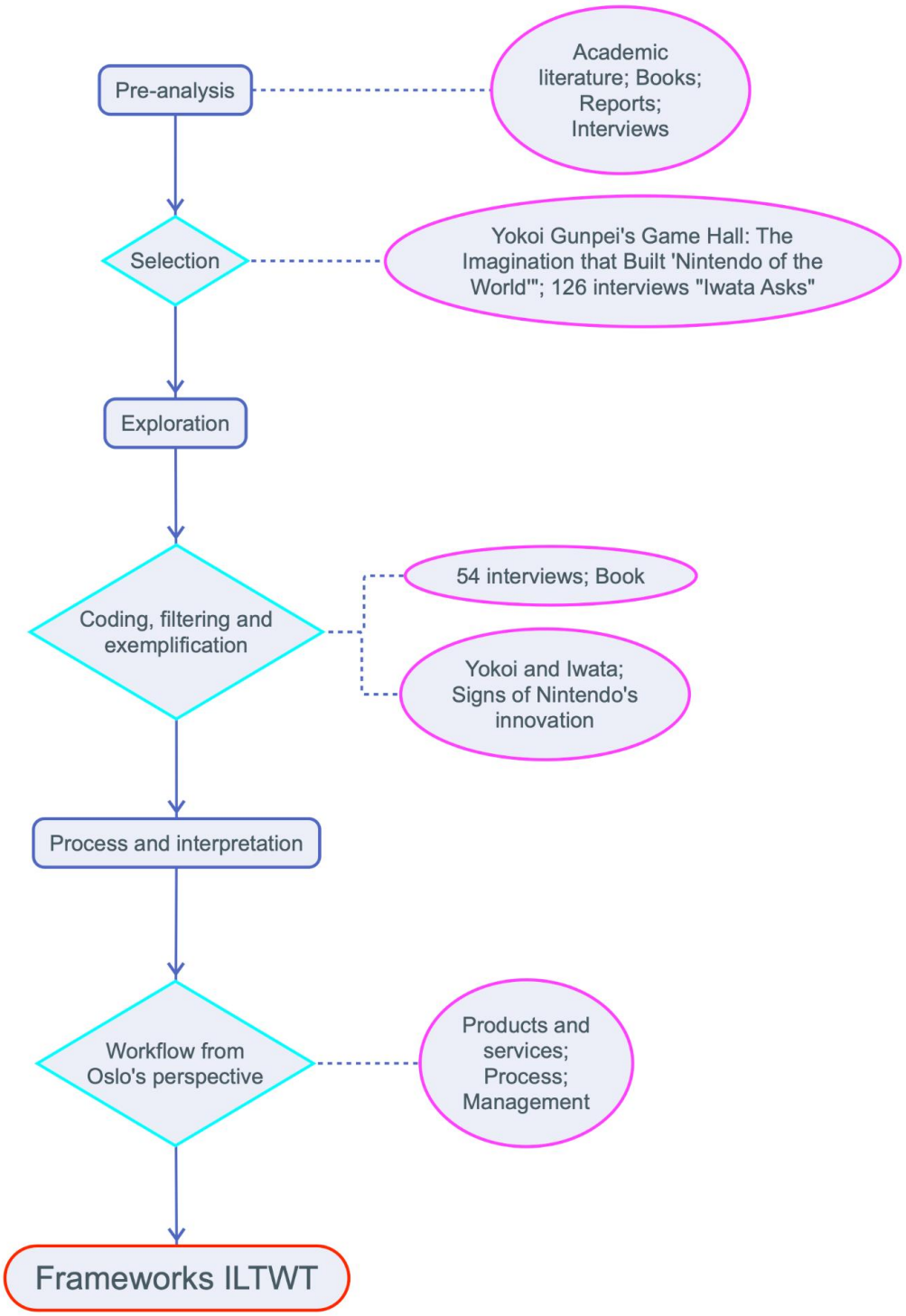
Given the comprehensive scope of the material, coding and analysis were specifically directed towards themes recognized in "Yokoi Gunpei's Game Hall: The Imagination that Built 'Nintendo of the World'" and the collection of 126 interviews "Iwata Asks". After the coding process, an analysis was conducted to pinpoint explicit mentions of innovation and "Lateral Thinking with Mature Technology" within Nintendo. Following the identification of these references, a tally for each theme was recorded.

In light of the voluminous nature of the material, an effort was made to pinpoint contributions that could elucidate the employment of "Lateral Thinking with Withered Technology" and its methodology. Initially, 54 interviews were selected for revealing pertinent elements, excluding those with weak ties to the central theme or that were deemed repetitive (instances of very similar games), in addition to the selected book.

The outcomes of this selection process are elaborated upon in chapter 5 of this dissertation, showcasing excerpts from the analyzed content that support the validation of the scrutinized themes.

Ultimately, as Bardin suggests, the phase of result processing and interpretation involves a meticulous inference of the findings. Upon determining that there were ample elements aligned with the initial hypotheses, namely, that Nintendo demonstrated innovation and applied "Lateral Thinking with Mature Technology," the findings were categorized to facilitate observation from the standpoint of concept applicability. This analysis culminated in chapter 6 of this dissertation, introducing two visual models examined through the lens of the Oslo Manual's dimensions, specifically the innovation flow concerning products, services, and processes, alongside a visual diagram addressing organizational innovation (management). The content analysis phases are depicted in Figure 1.

Figure 1 - Content Analysis



Source: Author

2.5 Research structure

This research was conducted by adhering to the structure and analytical framework depicted in Figure 2. The goal was to deconstruct, examine, and validate the components constituting the research question, employing subsidiary hypotheses that, upon verification, advanced the project to its subsequent phase.

Initially, the investigation evaluated whether Nintendo has been innovative, grounding this assessment on the theoretical frameworks introduced in this study.

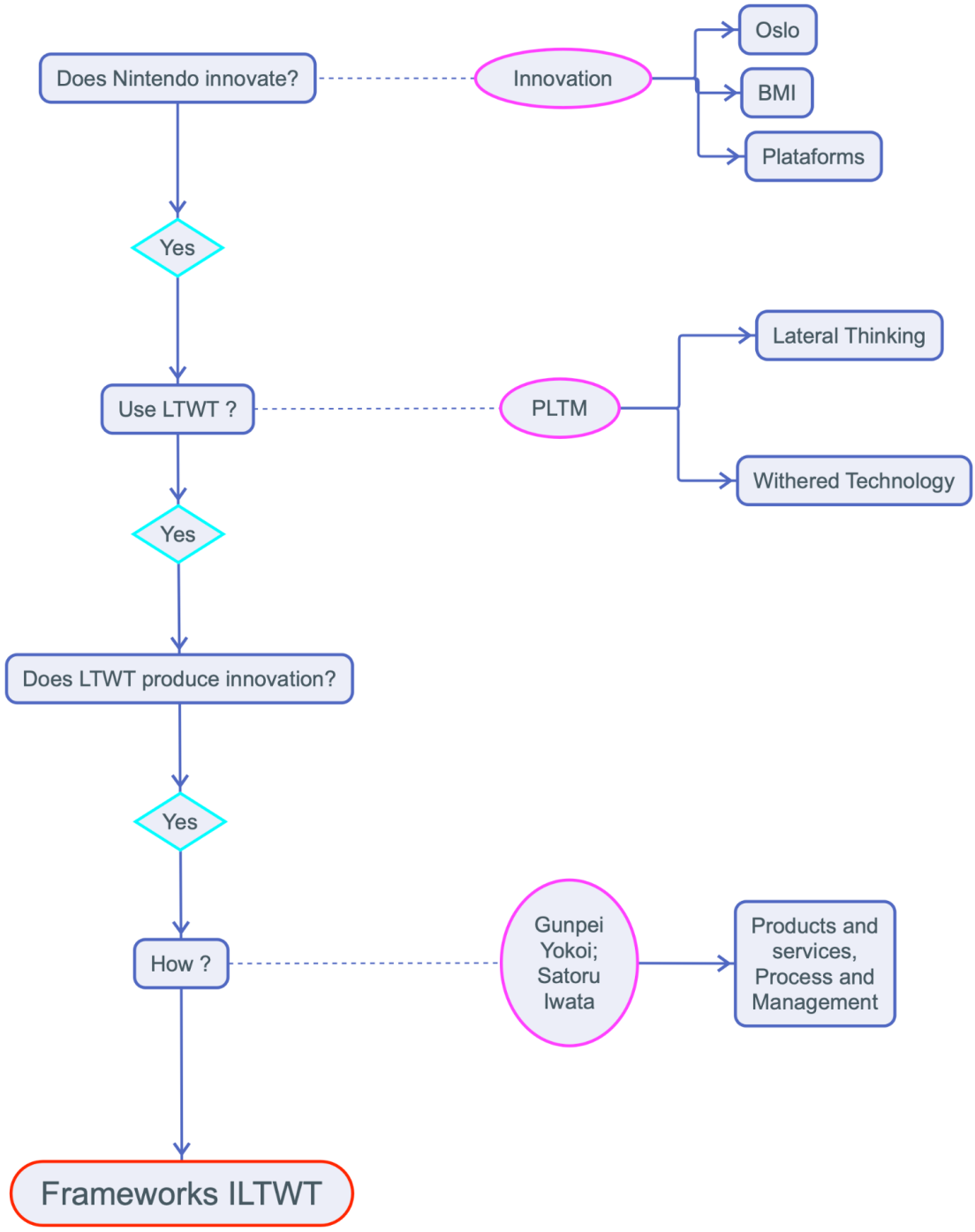
Upon confirming Nintendo's innovative endeavors, the analysis progressed to examine whether the corporation employs—and continues to employ—the "Lateral Thinking with Withered Technology" concept. This overarching concept was dissected into two separate components for detailed analysis: "Lateral Thinking" and "Withered Technology."

With the hypothesis affirmatively validated, the subsequent phase aimed to ascertain the interrelation between the two previously mentioned premises, specifically, whether Nintendo has indeed innovated by leveraging "Lateral Thinking with Withered Technology."

Following a positive conclusion, the research endeavored to identify underlying patterns indicative of Nintendo's innovative practices through "Lateral Thinking with Withered Technology." These identified patterns were subsequently conceptualized into a visual and theoretical model, illustrating the methodologies employed by Nintendo in its innovation processes.

This refined section is intended to present the research methodology with greater precision and academic rigor, illustrating the systematic approach taken to investigate and substantiate the central question through a logical progression of hypothesis testing and analysis.

Figure 2 - Research structure



Source: Author

3 THEORETICAL FOUNDATION

The study on "Lateral Thinking with Withered Technology" was conducted in the realm of innovation, encompassing basic principles and the innovative evolution within the framework of business models. To this end, an initial examination and delineation of themes pertinent to this research were essential, as described below.

3.1 Innovation

The Oslo Manual serves as a pivotal document providing definitions pertinent to innovation and is recognized internationally as a benchmark (Oslo Manual, 2018). The Manual delineates innovation as the act of introducing a novel element or enhancing an existing one. Innovation is categorized into four principal dimensions:

i) Product;
ii) Process;
iii) Marketing;
iv) Management.

Furthermore, innovation is classified into two primary types:

i) Radical: introduces significant alterations across one or more innovation dimensions.
ii) Incremental: involves gradual modifications across one or more innovation dimensions.

The Oslo Manual further explores the notion of open innovation, which includes the inward and outward flow of knowledge for corporations. Chesbrough (2003) highlights the benefits of leveraging both directions to expedite internal innovation processes and to broaden market reach.

The concept of open innovation, as articulated by Chesbrough (2003), intersects significantly with the idea of "laterality" as explored in "Lateral Thinking with Withered Technology". This research will demonstrate how Gunpei Yokoi conceived "laterality" both in

terms of cognitive approaches—whether generalist or specialist—and through the acquisition of mature technologies from firms outside Nintendo's traditional industry verticals.

Throughout this study, we will analyze both the dimensions and types of innovation with the objective of dissecting Nintendo's strategic approach over its history, particularly in relation to "Lateral Thinking with Withered Technology".

3.2 Secondary Innovation

The notion of "secondary innovation" was introduced by the National Institute of Technology Management (NIIM) at Zhejiang University in Hangzhou, China. It is characterized as a process in which innovation originates within developed countries and, upon reaching a more mature phase of development, entities from developing nations adopt these innovations and adapt them to suit their own capabilities and the demands of their markets (Wu, 2009). The "secondary innovation" model, as formulated by Wu (2009), delineates two specific phases of adoption and is associated with the idea of "latecomer firms," which will be further elucidated below.

3.2.1 Latecomer Firms

Latecomer firms, as defined by Hobday (1995), are entities that inherently or potentially face two major competitive disadvantages when attempting to enter export markets. The first of these disadvantages is technological: situated in developing countries, latecomer firms lack access to the primary sources of technological innovation. The second disadvantage, as highlighted by Hobday (1995), pertains to cutting-edge markets. Specifically, in the absence of internal competitiveness or a demanding consumer base, the innovation-driven link between producers and demanders remains underdeveloped.

Mathews (2002) differentiates between latecomer firms, referred to as LCFs, and late entrants. LCFs find themselves in leading-edge markets out of necessity due to a lack of resources, while late entrants choose their timing strategically, allowing market pioneers to validate their innovations before committing resources. Mathews (2002) outlines four prerequisites for the existence of LCFs:

> 1. Industry Entry: LCFs enter industries late due to historical contingencies rather than choice.
> 2. Resources: Initially, LCFs are resource-constrained, lacking in technology and market access.
> 3. Strategic Intent: The primary objective of LCFs is to catch up.
> 4. Competitive Position: LCFs possess certain initial competitive advantages, such as cost-efficiency, which they leverage to secure a foothold in their chosen industry.
>
> Mathews (2002) p.472

Mathews (2002) further posits that LCFs do not pursue "sustainable" competitive advantages indefinitely but rather view the global landscape through the lens of potential for appropriation, imitation, and transfer.

Both Mathews (2002) and Hobday (1995) acknowledge that latecomer firms adopt primary innovations from others out of necessity, not as a strategic choice.

However, in the case of Nintendo and its "Lateral Thinking with Withered Technology," the company's market conditions and situation diverge from the typical profile of a latecomer firm, aligning more closely with Mathews's (2002) description of a late entrant.

Founded in Japan, by the time Nintendo ventured into the electronic gaming market in 1975, Japan was the world's third-largest economy, a status it maintains today, according to the International Monetary Fund (IMF). Furthermore, in 1980, Nintendo established a subsidiary in the United States, then and currently the world’s leading economy. Hence, Nintendo was not constrained by the lack of resources or access to leading-edge markets, as both Japan and the United States epitomized these conditions.

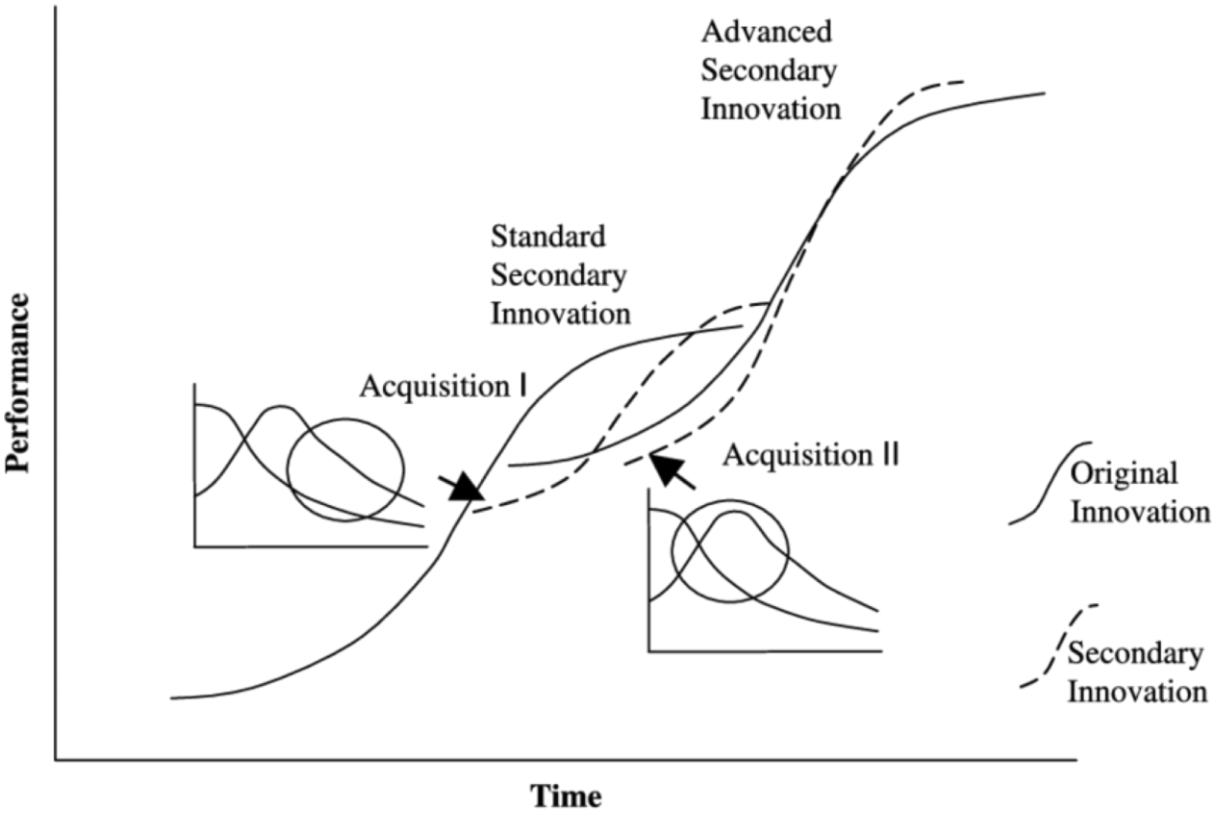
Although Nintendo entered the electronic gaming market later than American companies like Atari, this work will argue that the company's innovation strategy was not a reactionary necessity but a deliberate choice to adopt "withered" technologies.

This strategic approach, in the context of the "secondary innovation" model, necessitates a "lateral" rather than sequential innovation adoption, indicating a parallel process of innovative engagement as discussed in this study.

3.2.2 Acquisition Moments

Per the framework outlined by Wu (2009), "secondary innovation" is categorized into two distinct types, each manifesting at different stages, as depicted in Figure 3.

Figure 3 - Standard and Advanced Secondary Innovation



Source: WU *et al* (2009)

The initial type unfolds during what is termed "Acquisition 1," occurring at the maturation phase of a specific technology. This technology is then procured by a latecomer company and subsequently refined and tailored for the local market. This phase transcends mere replication for direct application; it involves an acquisition necessitating a period of learning and adaptation, leveraging the technological proficiency of the latecomer firm. This phase is referred to as "standard secondary innovation."

The second variety arises during "Acquisition 2," taking place when a technology has not yet fully matured and is acquired by the latecomer firm, that is, when the technology starts to stabilize within a standard but retains potential for further development. This cycle of procurement, education, and advancement with nascent technologies is termed "advanced secondary innovation."

An essential observation made by Proença *et al* (2015) is:

> "The NIIM model does not account for the potential co-creation of primary innovations, where emerging technology could be developed alongside a more advanced partner organization -

> typically, within the Chinese context, a multinational corporation with a strong tradition in technological innovation. This scenario might also be considered by the latecomer company once its innovation capabilities reach a level where such collaboration could serve as a means of technology acquisition, possibly delineated as a third type, albeit already representing a primary innovation. This would essentially be learning through co-development."
>
> Proença *et al* (2015), p.39

This hypothetical form of "secondary innovation," predicated on cooperation with other firms, is a trait observed in Nintendo, particularly during and after the tenure of Satoru Iwata, extending to the present.

In terms of the other two variants of "secondary innovation" proposed by Wu *et al* (2009), there are identifiable parallels with "Lateral Thinking with Withered Technology," especially concerning the maturity phases at which technologies are adopted.

Nonetheless, there are notable distinctions from the NIIM model, both in depicting Nintendo as a latecomer firm and in the model's linearity and sector-specific approach. That is, technological maturity at either juncture (Acquisition 1 or Acquisition 2) implies sequential steps within the same industry according to the NIIM model.

In Nintendo's scenario, "Lateral Thinking with Withered Technology" suggests technological acquisitions from sectors beyond the company's core focus, challenging not only industry-specific verticality but also a presumed linear progression of technological phases. An instance of this is the development of the "Game & Watch" by Nintendo, where a gaming device was innovated using mature technology from a different field, namely, the liquid crystal display technology of calculators.

Hence, the mature (withered) technology from one sector was utilized by another, not for adaptable and developmental purposes within the same function, but rather for the innovative, disruptive creation of a completely different product from what the technology was initially designed for (games instead of calculators). Consequently, lateral thinking, as a strategic approach towards adjacent segments, enables the firm to navigate two parallel and autonomous timelines, potentially accelerating innovation within its original domain by leveraging maturity achieved in external sectors.

3.3 Business Model Innovation (BMI)

According to Osterwalder (2011), a business model is defined as a framework that outlines the method by which an organization creates, delivers, and captures value. This concept is intrinsically linked to customer experience and is predicated on the understanding that external demands on a company are in constant flux, necessitating innovation within the business model to sustain competitive advantage.

Amit and Zott (2021) examined business model innovation (BMI) as a pivotal strategy for value creation and capture, particularly pertinent during periods of economic fluctuation. They posit that innovation in business models encompasses decisions made by leaders of both established firms and startups, within both for-profit and non-profit organizations, concerning various strategic dimensions. These dimensions may include the business model's structure and governance.

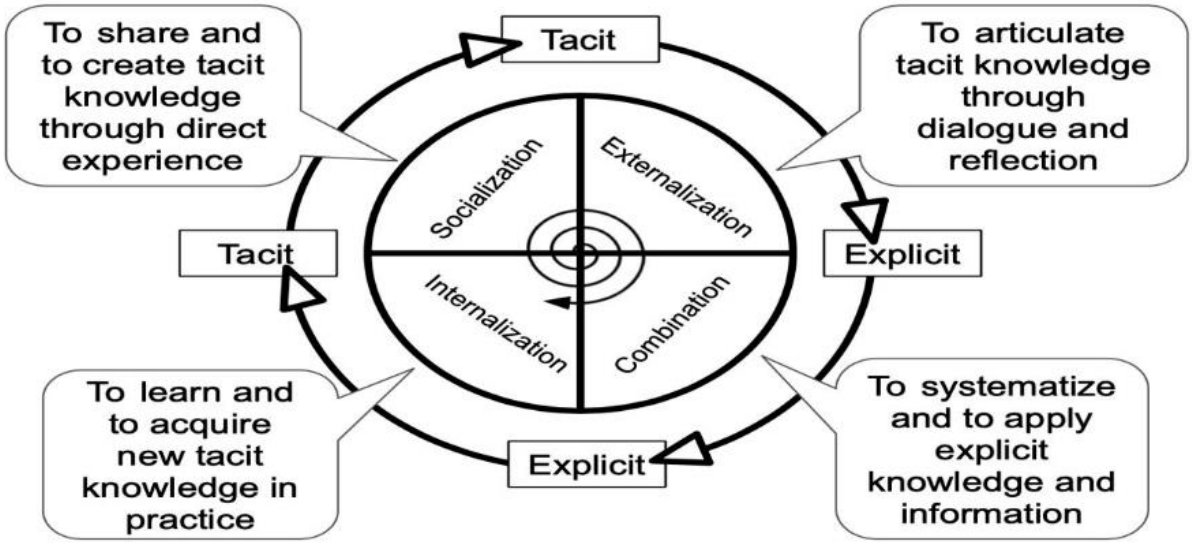
Nintendo's historical path demonstrates that the company has innovatively adapted its business model in response to market shifts, strategically choosing to concentrate on capturing the core value of entertainment. This focus is realized through games that engage and retain consumers, circumventing the necessity to invest heavily in leading-edge technologies. Utilizing "Lateral Thinking with Withered Technology," Nintendo has shown that its value proposition remains robust, with innovation manifested in how value is captured and delivered.

3.4 Knowledge Spiral

The Knowledge Spiral model, introduced by Ikujiro Nonaka and Hirotaka Takeuchi in 1995 and also referred to as the SECI model (Socialization, Externalization, Combination, and Internalization), focuses on the management and generation of knowledge within organizations. This model is designed to assist in the transformation of tacit knowledge to explicit knowledge and vice versa, with the goal of fostering the creation and proliferation of organizational knowledge.

The SECI model encompasses the following components, as illustrated in Figure 4:

Figure 4 - SECI model



Source: Nonaka and Takeuchi (2008)

Socialization (S): This stage involves the sharing of tacit knowledge among individuals via social interactions and firsthand experiences.

Externalization (E): This phase is characterized by the transformation of tacit knowledge into explicit knowledge, facilitating its broader communication and dissemination.

Combination (C): During this segment, various types of explicit knowledge are amalgamated and organized to generate new explicit knowledge.

Internalization (I): This part describes the assimilation and transformation of explicit knowledge back into tacit knowledge by individuals.

The model delineates the process through which knowledge is augmented and enriched by the cyclical conversion of tacit to explicit knowledge and back again. This ongoing transformation is conceptualized as a spiral, signifying the perpetual creation, sharing, and expansion of knowledge within an organization.

Within the context of the SECI model, the initial goal was to examine how Gunpei Yokoi's tacit knowledge, the progenitor of the "Lateral Thinking with Withered Technology" philosophy, was converted into explicit knowledge. Subsequently, it looked at how Satoru

Iwata, through interviews with Nintendo's innovators, further made this knowledge explicit. This facilitated the utilization of these insights for innovation and the continual enhancement of Nintendo's operations.

3.5 Digital Platforms

Companies of the platform type are distinguished by their role in facilitating value creation through mediating transactions between producers and consumers (Parker, 2017).

Cusumano (2020) identifies three distinct categories of platforms:

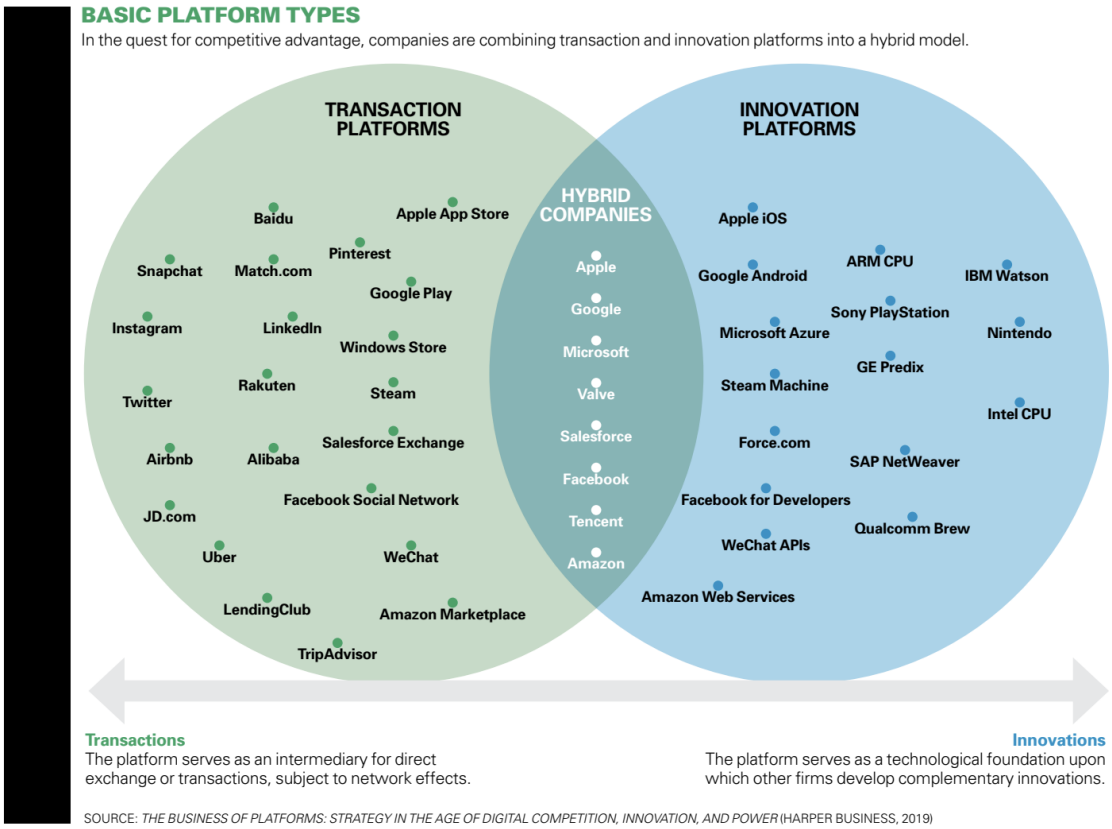
i) Transactional: These platforms serve as intermediaries connecting buyers and sellers of specific products and services. Examples of businesses operating within this model include Amazon, Facebook, Uber, and Airbnb.

ii) Innovation: Platforms in this category act as connectors between the creators of complementary innovations—both products and services—and their consumers. Firms that exemplify this model encompass Google Android, Apple iOS, and Microsoft Windows. App stores, for instance, offer a venue for innovation by permitting the development of products and services (apps) within a regulated environment, with a fee levied on each transaction. This model may coexist alongside the platform's own product and service offerings. However, as seen with app sales, products offered by Apple and Google are available on the same platform as those from other companies, including competitors.

iii) Hybrid: This model merges aspects of both the Transaction and Innovation platforms. According to Cusumano (2020), adopting a hybrid strategy can significantly enhance growth and value creation but also introduces strategic complexity and regulatory challenges.

Moreover, Cusumano (2020) classifies Nintendo as an innovation platform, as illustrated in Figure 5.

Figure 5 - Platform types



Source: Cusumano *et al*, 2019

Nintendo's foray into the digital platform realm marks a relatively new chapter in the company's extensive history. Yet, it is crucial to examine how Nintendo has assimilated into this novel business model and the continued relevance of "Lateral Thinking with Withered Technology" to its operational success.

Viewed from this angle, a comparison of Nintendo with its contemporaries reveals that its strategy of leveraging mature technologies for innovation—instead of focusing on the latest cutting-edge technologies—maintains the company's competitive edge.

4. NINTENDO

Nintendo, a company with over a century of history, is renowned for its electronic games. Yet, gaming was not its primary focus at inception. Despite the myriad changes it has undergone, a consistent theme can be traced: a focus on the games themselves, irrespective of the enabling technologies.

Grasping market dynamics and the advent of new technologies is essential to understanding the strategy behind "Lateral Thinking with Withered Technology."

4.1 Timeline

Founded in 1889 in Japan, Nintendo began as a modest playing card company, initially targeting adults before expanding its product range to include games for children. In the early 20th century, Nintendo ventured into other industries, like transportation, but these endeavors did not meet with success.

By the 1960s, Nintendo had identified its core business in the manufacturing of games, particularly those incorporating electronic components. It was in 1963 that the company adopted the name it still holds today: Nintendo Co.

The 1970s marked Nintendo's entry into the video game console market as the distributor of the Magnavox Odyssey, followed by the launch of its own home console developed in collaboration with Mitsubishi Electronics.

The 1980s saw Nintendo introducing portable gaming devices, most notably the Game and Watch and the Game Boy, alongside establishing a United States subsidiary, Nintendo of America.

During the 1990s, Nintendo fortified its status as both a hardware manufacturer, producing consoles and handheld devices, and a software developer, creating operating systems and games.

Entering the 2000s, Nintendo continued to innovate in both the home and portable gaming sectors, alongside developing internet-connected platforms and compatible external devices, with the Wii and later the Switch being notable examples.

Today, Nintendo competes across multiple fronts, encompassing mobile devices, home consoles, and a broad selection of online games offered through digital platforms as applications.

4.2 Electronic Gaming Market

The electronic gaming industry, which began its significant expansion in the 1970s, has consistently demonstrated remarkable dynamism. This vibrancy is evident not just in the innovation of products and services but also in the shifting leadership among key market players, including Nintendo.

The history of the electronic gaming sector can be divided into various distinct eras.

PHASE	**PERIOD**	**FEATURES**	**ENTRANTS**
1	1970/1980	First home consoles. American dominance.	Atari and Magnavox Odyssey
2	1980/1990	Asian entrants and Nintendo dominance.	Nintendo and Sega
3	1990	Graphic evolution (64 bits) and arrival of CDs	Sony
4	1990/2000	Sony's dominance and Microsoft's entry	Microsoft
5	2000/2010	Arrival of internet-connected games and emergence of new companies focused on PCs (smartphones and tablets). Games through apps. Digital platforms.	Blizzard, Valve and Electronic Arts. Apple and Google
6	2010/2023	Consolidation of new technologies with Augmented Reality and Virtual Reality. Online	Facebook/Meta (Oculus/Quest) and Apple (Vision Pro)

		games supported by cloud computing.	

i) During the 1970s and early 1980s, the electronic gaming industry was dominated by two main companies: Magnavox and, more notably, Atari. The proliferation of unauthorized games led to market saturation, especially in the United States.

ii) In the latter half of the 1980s, two Japanese companies, Sega and Nintendo, emerged as significant competitors. Nintendo adopted a stringent licensing policy, requiring exclusivity from game developers, which propelled the company to the forefront of the industry, outperforming Atari's 7800 and Sega's Master System.

iii) The 1990s introduced new contenders with the advent of 16-bit and later 64-bit consoles. Sega's Genesis and NEC's TurboGrafx were among the first, followed by Nintendo's release of the Super Nintendo Entertainment System (SNES). Subsequently, Sony entered the market with the PlayStation, challenging Sega's Saturn and Nintendo 64.

iv) Transitioning from the 1990s to the 2000s, Sega withdrew from the console race, making room for a new major player: Microsoft with its Xbox. Sony responded with the PlayStation 2, and Nintendo introduced the GameCube. During this period, Sony captured approximately 70% of the market share.

v) The first decade of the 21st century saw the emergence of internet-connected gaming. New companies specializing in online gaming, such as Blizzard, Valve, and Electronic Arts, made their mark. Nintendo unveiled the Wii, featuring advanced controls with a gyroscope and accelerometer.

vi) The 2010s witnessed a surge in app-based gaming across various devices, including smartphones and tablets, facilitated by mobile internet which offered greater player mobility and cloud gaming. The era also saw the introduction of the first Virtual Reality games. These trends continue to shape the industry in the current decade.

4.3 Gunpei Yokoi and his trajectory at Nintendo

To comprehend the principle of "Lateral Thinking with Withered Technology," an overview of Gunpei Yokoi's life and his contributions to Nintendo is essential, as he originated the concept.

Gunpei Yokoi was born on September 10, 1941, in Kyoto, Japan. After graduating from Doshisha University with a degree in electronic engineering, he joined Nintendo in 1965, recruited by then-president Hiroshi Yamauchi.

Initially, Yokoi's role was that of an electrician on the playing card production line, reflecting Nintendo's primary focus before its pivot to the electronic gaming sector. Yokoi's career trajectory shifted dramatically following his invention of the "Ultra Hand," a mechanical device designed to grasp objects. This invention, inspired by his tinkering in Nintendo's workshops and his own school-day creations (including a high school project that caught the attention of a model company), led to sales of 1.4 million units. This success prompted Nintendo to diversify beyond playing cards into other gaming ventures.

Following this triumph, Yokoi was appointed to lead Nintendo's inaugural research and development department, a testament to the president's confidence in his innovative capabilities. In this new role, Yokoi developed a range of toys, including the "Ten Billion Barrel" puzzle and the "Nintendo Love Tester." His most notable contribution, however, was the "Game & Watch," a precursor to portable gaming consoles and a commercial hit. Yokoi also played pivotal roles in the development of iconic games such as "Donkey Kong" and "Mario Bros." His crowning achievement was the "Game Boy," a handheld gaming device that sold 120 million units. Despite these successes, Yokoi's final major project, the "Virtual Boy," was deemed a commercial failure.

Yokoi resigned from Nintendo on August 15, 1996, and subsequently founded Koto Laboratory, where he developed the "WonderSwan" console. Tragically, Yokoi died in a car accident on October 4, 1997, before the console's release.

Despite Yokoi's significant impact on the gaming industry, comprehensive literature on his work is scarce. The primary source for this research, "Gunpei Yokoi's Game Hall: The Imagination that Built 'Nintendo of the World,'" remains one of the few detailed accounts of Yokoi's perspective on product creation and development. Unfortunately, this resource has not been translated into English or Portuguese.

4.4 Satoru Iwata and his trajectory at Nintendo

Satoru Iwata assumed the role of CEO at Nintendo a few years following Gunpei Yokoi's passing, marking a period of significant change for the company.

Born on December 6, 1959, in Sapporo, Japan, Iwata demonstrated an early interest in video games, developing his first simple game during his high school years. He later graduated with a degree in computer science from the Tokyo Institute of Technology. In 1980, while still

a university student, Iwata joined HAL Laboratory, a Japanese game developer that frequently collaborated with Nintendo, releasing his first commercial game in 1983. HAL Laboratory became a subsidiary of Nintendo in 1992 after closely working together on numerous video game projects.

In 1993, during a challenging time for HAL Laboratory that nearly led to its bankruptcy, Iwata was appointed president at the behest of Hiroshi Yamauchi, the then-president of Nintendo, successfully steering the company back to profitability. He played a key role in the creation of the "Pokémon" and "Super Smash Bros." series in the subsequent years.

Iwata joined Nintendo in 2000 as the head of its corporate planning division. Following Yamauchi's retirement in 2002, Iwata became the president of Nintendo, leading the company through the launch of the Nintendo DS and Wii consoles, which were met with significant financial success. His strategy aimed to broaden the appeal of video games to new demographics, resulting in record profits for Nintendo until 2009.

However, later consoles, such as the Nintendo 3DS and Wii U, failed to replicate the Wii's success, leading to a decline in sales and Nintendo's first operating losses in three decades between 2009 and 2012. Iwata responded by voluntarily halving his salary twice, in 2011 and again in 2014.

In 2015, recognizing the potential of the mobile gaming market, Iwata spearheaded a pivotal partnership with the mobile company DeNA in March of that year.

Iwata was celebrated not only for his strategic insight and product innovations but also for his engagement with Nintendo's fan base through social media and appearances in "Iwata Asks" and "Nintendo Direct," becoming a beloved figurehead of the company until his death on July 11, 2015.

His influence extended to the development of the Nintendo Switch, which was released posthumously and achieved great success. Iwata's contributions to the console's design underscore his lasting impact on Nintendo, fostering continued innovation that appealed to both loyal and new audiences.

Iwata's legacy includes solidifying Nintendo's stature in the global gaming industry. His "Iwata Asks" interview series, conducted between 2006 and 2015, serves as a valuable resource for understanding Nintendo's approach to innovation.

4.5 Innovation Indicators

Based on the material reviewed, Nintendo is identified as an innovative company across various dimensions, a conclusion that aligns with the frameworks and criteria delineated in the Oslo Manual.

Innovation, as defined by the manual, is characterized by novelty (representing an improvement over existing market offerings), relevance (the impact of the innovation), and implementation (market acceptance and the economic benefits accruing to the innovating company).

Applying these criteria across the four principal axes of innovation (management, processes, products and services, and marketing) demonstrates that Nintendo has consistently innovated, maintaining its position as a market leader in the electronic gaming industry, even after more than a century of operation.

In the realm of products and services, one of the company's notable recent achievements is the Nintendo Switch, launched in 2017. By 2021, it had sold approximately 91 million units, becoming the top-selling console in the North American market for that year, according to STATISTA (2022).

Another innovative venture, spanning both products and services and marketing, was the inauguration of the “Super Nintendo World” amusement park at Universal Studios Hollywood in California, USA. This initiative further strengthens the brand's engagement with its consumer base.

In terms of management and processes, Nintendo has showcased a variety of innovative practices, particularly in its collaborations with other companies, including those outside the electronic gaming sector. These instances of innovation will be discussed further in relation to the concept of "Lateral Thinking with Withered Technology".

5 CONTENT ANALYSIS RESULTS

From the examined material, distinct innovation patterns at Nintendo are observable through the lens of "Lateral Thinking with Withered Technology." This analysis predominantly covers two key eras under the leadership of prominent figures: designer Gunpei Yokoi (1965 to 1996) and CEO Satoru Iwata (2002 to 2015).

Gunpei Yokoi, who served as Nintendo's lead product designer for 31 years, is acknowledged for coining the term "Lateral Thinking with Withered Technology" and for pioneering an innovation model that continues to influence Nintendo's approach to this day. Despite Yokoi's significant impact, documentation on the so-called "Yokoi pattern" is limited, largely because his tenure predated the widespread use of the internet and social media. Nevertheless, resources such as the book "Gunpei Yokoi's Game Hall" provide valuable insights into the origination and development of the "Lateral Thinking with Withered Technology" concept. The segments pertaining to Yokoi in this discussion have been translated from Japanese.

Satoru Iwata, who helmed Nintendo from 2002 to 2015, generated an extensive body of work regarding the company's development processes for products and services. This is particularly evident in the 126 interviews he conducted with employees and partners in the "Iwata Asks" series, accessible on Nintendo's official website. These dialogues shed light on Nintendo's strategic choice for "Lateral Thinking with Withered Technology" and trace the journey from concept to final product. The content from the "Iwata Asks" series was translated from English and presented in its original format, including the use of interviewees' surnames only.

To manage the wealth of information, the 126 "Iwata Asks" interviews were initially screened for relevance, with those not offering new insights being deemed non-essential. This process resulted in 54 interviews being selected for comprehensive analysis. These interviews were tagged with keywords related to "Lateral Thinking with Withered Technology," with findings detailed in Appendix 3. This selective approach facilitated a more nuanced examination of how Nintendo implements the "Lateral Thinking with Withered Technology" strategy.

The analysis organizes observations from both the Yokoi and Iwata periods, noting a more substantial volume of material from Iwata's tenure. However, this does not detract from the significance of Yokoi's contributions as the originator of the "Lateral Thinking with Withered Technology" concept.

Ideation

Projects at Nintendo originate from gatherings where diverse team members present ideas, or from the singular vision of an individual, which is then shared with the group for feedback. This process was highlighted in a discussion between Satoru Iwata and Seita Inoue and Hisashi Nogami, who are part of Nintendo's Production Department within the Entertainment Analysis and Development Division:

> **Iwata**
> So you all got together to make a new kind of game, something that wasn't Super Mario Bros. or The Legend of Zelda.
>
> **Nogami**
> Right. Of course there were other members of the team who aren't here right now. All of us got together almost every day and brainstormed ideas for a new game. I think we had over fifty ideas...
>
> **Inoue**
> We had at least seventy ideas.
>
> **Iwata**
> Seventy ideas? How long did it take you to think of that many?
>
> **Nogami**
> About six months.
>
> **Iwata**
> That's a lot of ideas.
>
> **Nogami**
> We were all pretty competitive about our brainstorming.
>
> **Amano**
> And sometimes we would be inspired by someone else's idea, and think, "Here's how I'd do it, if I did that."
>
> **Iwata**
> Like, "If that's what we're doing, I'd do it this way."

Sakaguchi

Right. Our ideas really branched out like that.

Nogami

So we all brainstormed ideas and gave a few presentations, and the idea that made it all the way to the end was the idea that grew into Splatoon.

Source: Iwata Asks

Another feature of the ideation phase at Nintendo involves refraining from constraining a project with technical specifications at the outset, as reported by Satoru Iwata:

Iwata

Actually, drawing up detailed specifications before development starts is not necessarily the main way of doing things even for internal Nintendo projects. Personally, I don't think you can say that specifications are necessarily a good thing or a bad thing. I think the appropriate approach varies depending on the composition of the development team and the game they are making. As opposed to the method of having a complete vision in mind from the beginning and creating the game according to those specifications, there are lots of things in game-making that you have to try creating, or try getting a feel of, before you understand them. Nintendo has been making games in this way, which is why I know that detailed specifications aren't always the best approach.

Source: Iwata Asks

In the ideation phase, the objective is to identify the most straightforward and comprehensive solution. As articulated by game producer Shigeru Miyamoto: "An idea is a single solution that addresses multiple problems simultaneously." This aim is intrinsically linked to the pursuit of mature technologies, aiming to minimize both time and costs.

Laterality

Gunpei Yokoi's perspective on the creative process frequently touches on the distinction between generalists and specialists. Yokoi categorically identified himself as a generalist, not to diminish the significance of specialists but to underscore the vital role generalists play in envisioning the broader context. He advocated for generalists' ability to forge initial innovative

connections through lateral thinking, before entrusting the detailed development to specialists within each domain of the product's creation.

> “Among the readers of this book, there are likely many individuals who aspire to the same type of planning and development work as Mr. Yokoi, or who are trying to become game creators. When all industries have matured as they have today, people wanting to make their mark in the world face significant obstacles. That is, the amount of knowledge that needs to be acquired has increased enormously. "Don’t be a specialist. Be a generalist." Without a certain amount of experience, you can’t do even a small job, let alone a big one. On the other hand, if you absorb only specialized knowledge, you become a specialist idiot. It’s very difficult to find a balance in this area.
>
> YOKOI, G; MAKIN, T. (2015) p.197

and:

> “Technical skills are not really about studying. You have to understand the reasoning behind things. If you understand the theory, you will find more and more applications. It’s not great to be able to do difficult calculations, but it's important to understand what the calculations are useful for. It’s not that I know the details.”.
>
> YOKOI, G; MAKIN, T. (2015) p. 201

Framing

After ideas are presented and chosen, they undergo a series of evaluations during the production phase. One method used to determine the feasibility of ideas, especially in game development, involves categorization along what Nintendo internally refers to as the X and Y axes: The X axis signifies the system, the gameplay mechanics, whereas the Y axis denotes the story, the game's narrative. This approach to assessment is exemplified in a conversation between Satoru Iwata and Tetsuya Takahashi, the director of Monolith Software:

> **Takahashi**
> Yeah. I talked about the last game with you in the Iwata Asks interview we had the other day. With the last game, even though we balanced out the y-axis (story) and the x-axis (game system), it was still quite a linear role-playing game.
>
> **Iwata**
> It was by no means a single-path game, but the direction of the game was mostly predetermined.

Takahashi

But not this time. We took everything we had at Monolith Soft to make a non-linear game with a strong focus on the x-axis.

Iwata

By making it an online game, it became non-linear, and as a result of that you now have a lot more freedom.

Takahashi

Right. I also think we were able to express a game with a great sense of abundance. For example, the main story itself is actually shorter than Xenoblade Chronicles. But when you combine all the story elements including the side quests, the amount of text in the new game far surpasses that of the previous game.

Source: Iwata Asks

In the development of "The Legend of Zelda: Ocarina of Time 3D" for the Nintendo 3DS, a conversation between Satoru Iwata and Nintendo's game director, Shigeru Miyamoto, effectively highlights this approach:

Miyamoto

Yes. And I am not talking about budget or development period that I just touched on, but because the memory size we could use with the Nintendo 64 system was fixed, I was not able to tell how vast a game could be developed within that capacity.

Iwata

Back then, the limits of the hardware weren't that high, so you could only do so much.

Miyamoto

Right. So rather than start by determining a story, we started by making the system.

Iwata

That's how you always do things. I remember you saying you couldn't make a Zelda game until you had become familiar with the new hardware.

Source: Iwata Asks

Innovative Balance

A prevailing focus in game development at Nintendo is to foster innovation without alienating existing customers by deviating too drastically from what they are familiar with, while simultaneously enhancing ease of use for new customers. Thus, the rate of technological adoption is a factor that is carefully weighed throughout the production process, including in collaborative efforts, as evidenced by insights from Schuishiro Nishia, the head of the Engineering and Development Department at Nd Cube:

> **Nishiya**
> That's right. We had always wanted to make Mario Party a game that families could enjoy together during the holidays, so we needed rules that would be easy for anyone to understand. Of course, we had to keep things fresh, but we wanted to preserve the basic form as well. Keeping it familiar and comfortable was important to us.
>
> Luckily, a new person came forward each time with a new idea to serve as the core and highlight of the game. I think we've been able to continue the series for so long because players could always say, "This is a little different and new."
>
> **Source: Iwata Asks**

Within the context of Nintendo's business model, the emphasis on preserving fundamental aspects of games, independent of technological advancements, is considered a key contributor to the company's success. This approach is underscored by software developer Kensuke Tanabe during a discussion with Satoru Iwata:

> **Iwata**
> I wonder why a game design created more than 25 years ago is still so much fun today.
>
> **Tanabe**
> I think the basic elements that make games fun or exciting don't change, regardless of how many years have passed. However, as games have become increasingly complex and many games have lost sight of the simple and enjoyable experience, I think a game like this seems even fresher. Things that are fun are still fun, no matter how much time passes.
>
> **Source: Iwata Asks**

Experimentation

For every project launched, Nintendo engages in iterative testing to refine the concept to its final form. Prototypes are typically crafted using a straightforward approach, integrating existing components to blend technology with user experience effectively.

Satoru Iwata, Nintendo's former CEO, articulated this process by stating, "The way Nintendo creates hardware is by taking an emerging idea, constructing a provisional model, and thoroughly testing it." In the case of developing the Wii U GamePad, approximately 30 prototypes were created, as revealed in a conversation between Satoru Iwata and Takayuki Shimamura from the software development, analysis, and entertainment development division.

> **Iwata**
> The way that Nintendo makes hardware is to take an idea that has arisen and make something makeshift and actually try it out.
>
> **Shimamura**
> Right. The next makeshift thing we made for Wii U GamePad concept—a second prototype—is this.
>
> **Iwata**
> Behold the original form of the Wii U GamePad! (laughs)
>
> **Shimamura**
> It's very high-tech—a monitor and controllers stuck together by double-sided tape. (laughs)
>
> **Iwata**
> I remember that you made a lot of prototype software with this.
>
> **Shimamura**
> Yeah. If we made a list, I think there'd be about 30.
>
> **Source: Iwata Asks**

Therefore, the principle of "Lateral Thinking with Withered Technology" is also applied in the stage of developing a Minimum Viable Product (MVP).

Incremental Innovation

Numerous products developed by Nintendo have been realized through incremental innovations, making use of mature technologies. A conversation between game designer Shigesato Ito and game director Shigeru Miyamoto sheds light on the process of technological assimilation:

> **Miyamoto**
> Looking back, what's been easy about making the Mario games is that they could naturally change along with the progress of technology. For example, when you make live action SFX movies and as special effects technology advances, then you have new methods at your disposal. In the same way, as technology advances, the Mario games change, too. On the contrary, books have basically always been made the same way. If it had been necessary to keep making Mario games in the same way like that, we couldn't have done it. In that way, making the Mario games has been easy.
>
> **Itoi**
> Surely not easy! (laughs)
>
> **Miyamoto**
> Yeah, really. (laughs)
>
> **Itoi**
> Well, I think that's because of your work method.
>
> **Miyamoto**
> But the technology changes, so we just have to adjust to that. And as technology changes, so does what you want to do. If it weren't for that, I don't think I could have stuck with it this far.

Source: Iwata Asks

Radical Innovation

Many of Nintendo's offerings center on incremental innovations, particularly within its gaming portfolio. Yet, there exists potential for exploring disruptive innovations, as disclosed by Ryuji Umezu, the director of the company's engineering and research department, during a discussion with Satoru Iwata:

> **Iwata**

In other words, when you begin SoC design, the people around you aren't telling you what kind of functions they want in the new system or giving you any hints for development.

Umezu
Right. I have to imagine what kind of functions will be necessary for a handheld gaming system that will go on sale years in the future.

Iwata
You think about what may be possible years down the road and structure it accordingly.

Umezu
Yes. It doesn't mean that we can keep it the way it is because what we released in the past is currently selling. Rather, it's difficult because I have to purposely abandon the current situation and think of the next new thing.

Iwata
While the software developers are working as hard as they can on games for the hardware that's now on sale, you are all alone thinking up the next hardware.

Umezu
I am! (laughs)

Source: Iwata Asks

Teams

For every project, a tailored team is formed, drawing from diverse departments within or outside Nintendo, depending on the project's scale and demands.

Teams are often expanded to fulfill the specific needs of the project. An example of this can be seen in the conversation between Satoru Iwata and Koishi Hayashida, from the software development, analysis, and entertainment development division, regarding the development of "Super Mario 3D World".

Iwata
About how many people were on the team?

Hayashida
At first, about 40 to 50, but there were about 100 in the end. When that many people threw out ideas, there was about three times more than ever before. In any case, there was a ton.

Source: Iwata Asks

Transversality

In the development of specific products, the involvement of a large number of individuals, departments, and various technologies emerges as a trait that fosters innovation at Nintendo. Conversely, simplifying these complex elements to enhance the consumer experience poses a challenge.

To tackle this, Satoru Iwata, in a conversation with Tomoaki Korume from the Software Development and Design Department, mentions the existence of what he refers to as a "cross-sectional department," whose purpose is to centralize and streamline creative efforts:

> **Iwata**
> Like you, Kuroume-san, Furukawa-san has been involved in UI (User Interface) for a long time, so he's well aware of how important unity is.
>
> **Kuroume**
> I think you're right. It's very important on a project like this, where you've got so much built-in software with so many abundant variations, and you have to pull it together into one product and ensure that players won't get confused.
>
> **Iwata**
> The people from the "cross-sectional department" took all these disparate things and bound them together neatly.
>
> **Source: Iwata Asks**

Partnerships

In forming partnerships, Nintendo looks for companies recognized as technology specialists in the area to be developed. This strategy aligns with the "Lateral Thinking with Withered Technology" philosophy, given that partner firms, specializing in certain products and services, are likely to utilize mature technologies. Nintendo grants its partners creative freedom, albeit within strict guidelines established by the company.

The collaboration on the "Fit Meter" project with Panasonic serves as a case in point. During a discussion with Satoru Iwata, software developer Yugo Hayashi remarked, "I presented Panasonic with the specifications I had compiled, but initially, I was unsure of how to structure them and did so as if they were for a game, which caused some confusion." Subsequently, Panasonic's chief engineer, Tadaharu Kitado, noted, "Differences in corporate culture may exist, but once we decide on specifications, we seldom alter them. However, it

seems that Nintendo continuously refines product specifications throughout the development process."

Projects often occur across different locations, sometimes internationally. For a sense of the scale of collaboration with partner companies, consider the development of "Mario & Sonic at the London 2012 Olympic Games." Sega's project leader, Osamu Ohashi, disclosed that the project involved over 100 professionals:

> **Iwata**
> Right. The London Olympic Games will be held in July 2012.
>
> **Ohashi**
> We had to release it before then, so the 100 people we started with rapidly increased to 130 and then 150.
>
> **Iwata**
> That's 150 developers just at Sega?
>
> **Ohashi**
> Yes. At its largest point, I think it was over 150.
>
> **Source: Iwata Asks**

The extensive number of participants presents several challenges for Nintendo, including ensuring the final product's cohesive unity. This issue is illustrated by the development of "Go Vacation." Masaya Kobayashi, the head of production at Namco Bandai Games, a collaborating firm with Nintendo, comments:

> **Kobayashi**
> That said, from beginning to end of development, our biggest problem was how to make something that was so huge. Our in-house staff wasn't going to be enough, so we asked for help from four outside game production companies.
>
> **Iwata**
> That means you had a really large team. Wasn't it hard to create a sense of unity and consistency?
>
> **Kobayashi**

Yes! It was really difficult. It was a first for my team to work with people from another company. And we had to combine their work with what was made in-house to make one final product. We ran into all kinds of small issues that we hadn't expected which brought a lot of first-time internal challenges to us.

Iwata
What was the total number of people who made the game?

Sakagami
100 people in house and including out of house…I think the total number was about 200.

Source: Iwata Asks

Costs

"Lateral Thinking with Withered Technology" has a direct connection to production expenses. The more established a technology is, the more readily available it tends to be in the market—including in related sectors—making it a strategic choice for innovation while minimizing expenditure. This approach is reflected in the conversation between Masato Kuwahara, the project leader of the research and engineering department, and CEO Satoru Iwata:

Kuwahara
That's right. Then at that point, we found we were able to use 4.2 inch LCD screens.

Yoneyama
With LCD screens, the cost is decided by calculating how many screens you can get out of one large sheet.

Iwata
LCD displays are originally manufactured on single large sheets of glass, which are then cut into individual panels.

Yoneyama
Right. That's why it's vital to select a size that means you don't waste any.

Kuwahara
But even though we were able to use 4.2 inch screens, there were quite a few people who voiced concerns, saying: "Won't the image on the screen look grainy?"

Iwata

Actually, at the time of the announcement of Nintendo DSi XL, there were a lot of people who were incredibly worried that if we made the screens bigger while keeping the same resolution, you'd be able see blocky pixels on the LCD screens and the quality of the image would deteriorate greatly.

Kuwahara

There were actually a lot of people who had the same concern within the company. So we had the LCD manufacturer come and give us a demonstration. After that, we realized: "It's fine, there's absolutely no problem!" Things also changed a lot when we decided to use the wide-viewing angle LCD displays.

Iwata

Didn't you consider using wide-viewing angle LCD two years before when you were making the large version of DS Lite?

Kuwahara

At that time, the cost of using it would have been prohibitive. But the price has come down in the last two years and it doesn't actually vary all that much in cost compared to LCD displays that don't allow a wide-viewing angle. So we decided to use it this time and when we actually tried it, we found that even when you look from the side, you could see the screen clearly, which was really great.

Iwata

So the large screen and the wide-viewing angle LCD display are both a really good fit for the Nintendo DSi XL system.

Kuwahara

Yes, they are.

Source: Iwata Asks

Gunpei Yokoi also embraced "Lateral Thinking with Withered Technology" aiming to lower costs, as mature technologies affect pricing through greater supply or diminished demand. Furthermore, there's a decrease in the energy required to develop new technology, which, beyond financial savings, translates into time and a concentrated effort on the business model. This strategy is detailed by Takefumi Makino:

> "Products that use advanced technology naturally have a high cost. Moreover, the products that emerge from it tend to compete on prices with other companies in many cases. However, if the technology becomes widespread and matures, it will be possible to manufacture products at an absurdly low cost. Therefore, let's add a twist to the use of technology and market it. This is the Yokoi way of thinking, “lateral thinking with withered technology.”
>
> YOKOI, G; MAKIN, T. (2015) p.40

Another instance of employing "Lateral Thinking with Withered Technology" to cut costs while concentrating on entertainment is demonstrated with the 1989 Game Boy. At the time, the technology to produce color games existed, but the move towards color was delayed for years as a strategic decision based on cost-benefit analysis:

> “The resulting Game Boy is a long-selling product that has been a popular toy for more than 10 years. User requests for "color" were not as strong as I thought. It was later colored in Game Boy Color, but this was nine years after the release of the original Game Boy. For nine years, the Game Boy was monochrome. Mr. Yokoi said he had no choice but to choose monochrome as the reason for choosing black and white because "the cost is high and the battery life is short," but beyond that, Mr.'s own game philosophy seemed to be deeply involved. In other words, the idea is that a game is about the fun of the content and that things like color, polygon display, and processing speed”
>
> YOKOI, G; MAKIN, T. (2015) p.153

and:

> “However, it's very difficult to figure out "what users don't want." For example, when it comes to which is better, monochrome or color, everyone will say that color is better. But do users really want that? Few people can explain that the downside is that the battery runs out quickly and the product price increases.”
>
> YOKOI, G; MAKIN, T. (2015) p.207

Innovation environment

Nintendo's management cultivates an atmosphere of innovative security, ensuring employees feel protected while also promoting the understanding that the ultimate success of products and services is a collective achievement rather than the work of individuals. This approach is detailed in the conversation between Satoru Iwata and Genyo Takeda, the general manager of the integrated research and development division:

Takeda

To rephrase Mr Ashida's answer, Nintendo is a company where you are praised for doing something different from everyone else. In this company, when an individual wants to do something different, everyone else lends their support to help them overcome any hurdles. I think this is how we made the challenge of Wii a possibility.

Iwata

That's true. Wii's one-handed controller is not the great idea of a single person, but a fantastic fusion of ideas from all kinds of people. Looking back, I think that it was destined to turn out this way. We've seen that the sequence of events leading up to this moment unfolded in a truly unimaginable fashion.

Source: Iwata Asks

Difficulties

Although the strategy of leveraging external technologies frequently offers agility and economic benefits, there have been instances where collaborative development has led to complications. A case in point is the integration of electronic components from various manufacturers in the Wii console. Genyo Takeda, the director of Nintendo's development division, explained that because the LSI chips were sourced from different companies, pinpointing the source of any defects became challenging. He mentioned that identifying the issue was exceptionally difficult:

Iwata

A big challenge this time was putting silicon chips made at different semiconductor plants into one package. Shiota-san, as the person who actually had to make that happen, what hurdles did you encounter?

Shiota

The LSI chips were made at different companies, so when a defect arose, it was difficult to isolate the cause. In defect analysis, it was inside the MCM, so figuring out the problem was incredibly difficult.

Iwata

When it's actually running, it's all inside a single box, so you can't easily observe what is happening.

Shiota

Right. We really drew on the wisdom of Renesas11, IBM12 and AMD13, who cooperated with us. To isolate the problem we devised a way to have a minimum amount of signal travel outside of the MCM, so we could verify the problem with the minimum amount of overhead.

Source: Iwata Asks

Fail

Not every Nintendo product has met with success. The "Virtual Boy," released in 1995, serves as a notable example of failure. The reasons for its lackluster performance are believed to stem from a departure from the "Lateral Thinking with Withered Technology" strategy. The "Virtual Boy" was developed using advanced, three-dimensional technologies that were not yet mature, leading to an uncomfortable gaming experience. Initially envisioned as a portable device, it evolved into a cumbersome unit that required users to lean forward to use, contributing to neck discomfort. Additionally, the "Virtual Boy's" display, limited to a red and black color scheme, caused eye fatigue. Nintendo issued warnings about the potential for headaches, nausea, and seizures. These health and usability concerns significantly tarnished the public's perception of the product. In a conversation with game designer Shigesato Itoi, Satoru Iwata reflects on the "Virtual Boy's" failure:

Iwata

Virtual Boy was, I think, a commercial failure. Normally, I think it would have been understandable if Nintendo experienced a kind of trauma with regard to the whole 3D genre. But Nintendo continued to doggedly make attempts in 3D technology. And you could say that those attempts have now finally borne fruit. I feel like that is an interesting progression of topics.

Itoi

I'm not sure how to put it, but there was no way for the Virtual Boy game console to permeate daily life. Put another way, Nintendo's products were entertainments that had always been able to enter into everyday life. There isn't anything particularly strange about viewing Virtual Boy as a slightly unusual toy that you can enjoy apart from everyday life, but when lined up with Nintendo's other products, I imagine it didn't quite fit in.

Source: Iwata Asks

Competitive Advantage

Despite the innovation present in its products and services, Nintendo prioritizes entertainment. This distinction from other companies is primarily attributed to the strategy of leveraging mature technologies for optimization, as CEO Satoru Iwata points out in a comparison with Apple:

> **Iwata**
>
> I think Nintendo's attitude in trying to fulfill its mission of creating entertainment that will be fun for anyone regardless of age, sex or experience shares a common element with Apple's philosophy-or the set of values put forth by Steve Jobs-of making features as straightforward as possible, as easy to understand as possible, and as simple as possible because if there are too many options users will be confused.
>
> However, Apple is clearly a hi-tech company, whereas Nintendo is an entertainment company, so the ways we order our priorities are quite different. For example, we won't hesitate to choose making something more durable over making it 0.5 millimeters thinner. By contrast, I don't think Apple needs to perform repeated endurance tests dropping iPods from the exact height of a bicycle basket.
>
> If Apple and Nintendo have a similarity, I think it is enhancing appeal through simplicity. When you really pursue something, it rapidly gets simpler. But I do think there are differences between us. Because our priorities are different.
>
> **Source: Iwata Asks**

Another discussion, this time between CEO Satoru Iwata and Nintendo's game director, Shigeru Miyamoto, further underscores the deliberate preference for utilizing mature technologies over engaging in competition based on the latest technological advances:

> **Miyamoto**
>
> Some might say that cell phones are enough. To that, all I can do is respond, "No, take a look at the final product. It's completely different." We want to make something you can play with, something fun, and we dedicate ourselves to that end.
>
> I'm not just talking about cameras and music as "features." We ask ourselves, Are we making something that will be fully satisfying to use? Would you really want to use this on the train? Is it easy enough for anyone to use? We really devote ourselves to these questions. For example, when deciding how many icons to place on a menu, we think, Will this make it easiest for users? We brood over these things. However, the quickest way to notice the consideration we put into

> something-toward its convenience, usability and simple layout-is to actually pick it up and use it.
>
> **Iwata**
>
> That's right. Nintendo doesn't have any intention of directly competing with existing products, but the mass media has a tendency to portray everything as a rivalry between opposing companies. It seems some people have the impression that we want to compete with cell phones or the iPod, that putting cameras or music players in our devices is out of character for us. I hope those who have such an impression will take an interest in what Nintendo can make when it dedicates itself to pleasing as many people as possible who pick up a DS, and I hope they'll actually pick one up themselves.
>
> **Source: Iwata Asks**

Business Model

"Lateral Thinking with Withered Technology" represents a strategic business philosophy from its very foundation. Originated by Gunpei Yokoi, innovation within this framework extends beyond mere invention or the creation of products without considering consumer demand.

Takefumi Makino reflects: "I started to focus on the question, ‘How can I transform a product into one that can be mass-produced?’ This approach might be at the heart of Yokoi's methodology, which goes beyond mere ideation." YOKOI, G; MAKIN, T. (2015). And:

> “I once asked Mr. Yokoi, 'What do children find fun?' At the time, it was considered a problem to see children locked in their rooms, entertained by play. The response was immediate. "It hasn't changed. It's been the same since the Heian period. Thinking about it, it's true, and I'm sure that in the past, children used to play Donkey Kong with the bugs and stones they collected. Many of the games Mr. Yokoi created use modern technology, but the underlying "fun" that permeates them has something in common with traditional children's games. The essence of play is not removed.” YOKOI, G; MAKIN, T. (2015) p.233

Gunpei Yokoi

In this chapter, the principles of "Lateral Thinking with Withered Technology" have been explored through the experiences of individuals who have worked with and outside Nintendo, particularly during the tenure of Satoru Iwata (2002 to 2015). As such, many of the

accounts examined do not directly address the era of Gunpei Yokoi's involvement with Nintendo (1965 to 1996).

Nonetheless, several individuals had either direct or indirect interactions with Gunpei Yokoi, affirming that both the inception of "Lateral Thinking with Withered Technology" and the establishment of a Nintendo "standard" for development can be traced back to Yokoi's innovative concepts. This connection is highlighted in the conversation involving Satoru Iwata, engineer Masao Yamamoto, game designer Takehiro Izushi, and game designer Makoto Kano:

> **Kano**
> Yes. I was a sort of jack-of-all-trades. But back then everyone was.
>
> **Iwata**
> Back then, the work wasn't clearly divided up among programmers, planners and hardware developers.
>
> **Izushi**
> No, not at all.
>
> **Iwata**
> A strange fate drew you, my predecessors, toward making Game & Watch.
> By the way, I heard that (Gunpei) Yokoi-san9 hit on the idea for Game & Watch when he saw someone playing with a calculator on the Shinkansen. What did he say to you when development of Game & Watch began?
>
> **Kano**
> Unfortunately, I don't know much about that. I didn't get called from the Creative Section to Research & Development 1 and begin working on Game & Watch until the first title, Game & Watch: Ball, was already underway. At that point, Yokoi-san and (Satoru) Okada-san8 were already making the prototype.
>
> **Iwata**
> You came in partway through, so you don't know what happened at the start.
>
> **Kano**
> No. But I do think it's true that Yokoi-san was inspired by calculators.
>
> **Izushi**
> The chip used in Game & Watch was the same as in calculators. A single number on a calculator display is composed of seven segments, so…

Iwata

Each number from 0 to 9 is made of seven parts called segments. In other words, it's a way to display numbers using seven component parts.

Izushi

Right. So if a chip can calculate eight digits, that's 7 segments times 8 digits for a total of 56 segments. And there's the decimal point and symbols like the minus sign. We made the Game & Watch: Ball game using a chip that could display 72 segments.

Iwata

You could turn each of those 72 segments on or off, and used them to represent objects rather than numbers.

Izushi

Exactly.

Iwata

After an idea came together, what was the next step?

Kano

After we all brainstormed and the basic situation of the game had been determined, Yokoi-san would say, "The rest is up to you." (laughs)

Iwata

So you didn't just make the test model once?

Izushi

No. And Yokoi-san would check it. We talked about the "Yokoi standard" back then. We could hardly get anything past him.

Source: Iwata Asks

Innovation with Lateral Thinking with Withered Technology

The aggregation of elements discussed in this chapter reveals "Lateral Thinking with Withered Technology" as a widespread method of innovation within Nintendo, permeating from top management down to the frontline developers. It's underscored that "Lateral Thinking with Withered Technology" represents, foremost, a strategic decision by Nintendo, as clearly

articulated in the conversation between Satoru Iwata and Genyo Takeda, the general manager of the integrated research and development division:

Takeda

We started developing Wii right after Nintendo launched the GameCube. You know, as soon as we complete one system, we start thinking about the next one. Needless to say, we don't design new components or technologies from scratch. Rather, we have to base our designs on existing technologies. In the world of technology, there are so-called Roadmaps (overviews of proposed technologies/products) that are used by each industry in order to make general forecasts about where semiconductor technology is heading, as well as the evolution of disc and wireless technologies. Engineers and developers normally refer to these Roadmaps while developing hardware that they plan to release in the future. Looking again at the completed Wii, I feel that it has turned out to be something completely different from what was predicted in the mainstream technology Roadmaps.

Iwata

What gives you that impression?

Takeda

This may sound paradoxical, but if we had followed the existing Roadmaps we would have aimed to make it "faster and flashier." In other words, we would have tried to improve the speed at which it displays stunning graphics. But we could not help but ask ourselves, "How big an impact would that direction really have on our customers?" During development, we came to realize the sheer inefficiency of this path when we compared the hardships and costs of development against any new experiences that might be had by our customers.

Takeda

Of course, the issue of performance was not secondary. Anyone can realize “low performance with low power.” Others tend to aim for “high performance with high power.” With Wii however, Nintendo alone has pursued “high performance with low power consumption.” So, while Wii embraces cutting-edge technology and high performance, the direction it is aiming in is completely different from that of previous systems. When we look at the automobile industry, not every car is following the same evolutionary course. While some are trying to make faster cars, others are gathering public attention around the world with their hybrid engines. If automobiles can be used as a metaphor, our industry has always been trying to compete over horsepower, even though not all cars are made to compete in F1 races.

Shiota

Just as hybrid cars have created a new emphasis on “environmental performance,” I believe that Wii has also discovered new values. Having said that, however, Nintendo has never shied away

from technological competition. On the contrary, we have integrated a number of highly technological elements into Wii.

Takeda

Using state-of-the-art technology in unprecedented ways is far more complex, difficult, and requires more technological know-how than simply using the technology to improve performance. The Wii system is far more complex than that of the Nintendo 64 and GameCube. Furthermore, since Wii is compatible with GameCube software, we have not only tried to create something new, but we have also retained some of the old functionality. Honestly, this was not an easy task, but I think we can proudly present to the world a new console that will have so much appeal for so many.

Source: Iwata Asks

6 NINTENDO'S INNOVATION MODEL

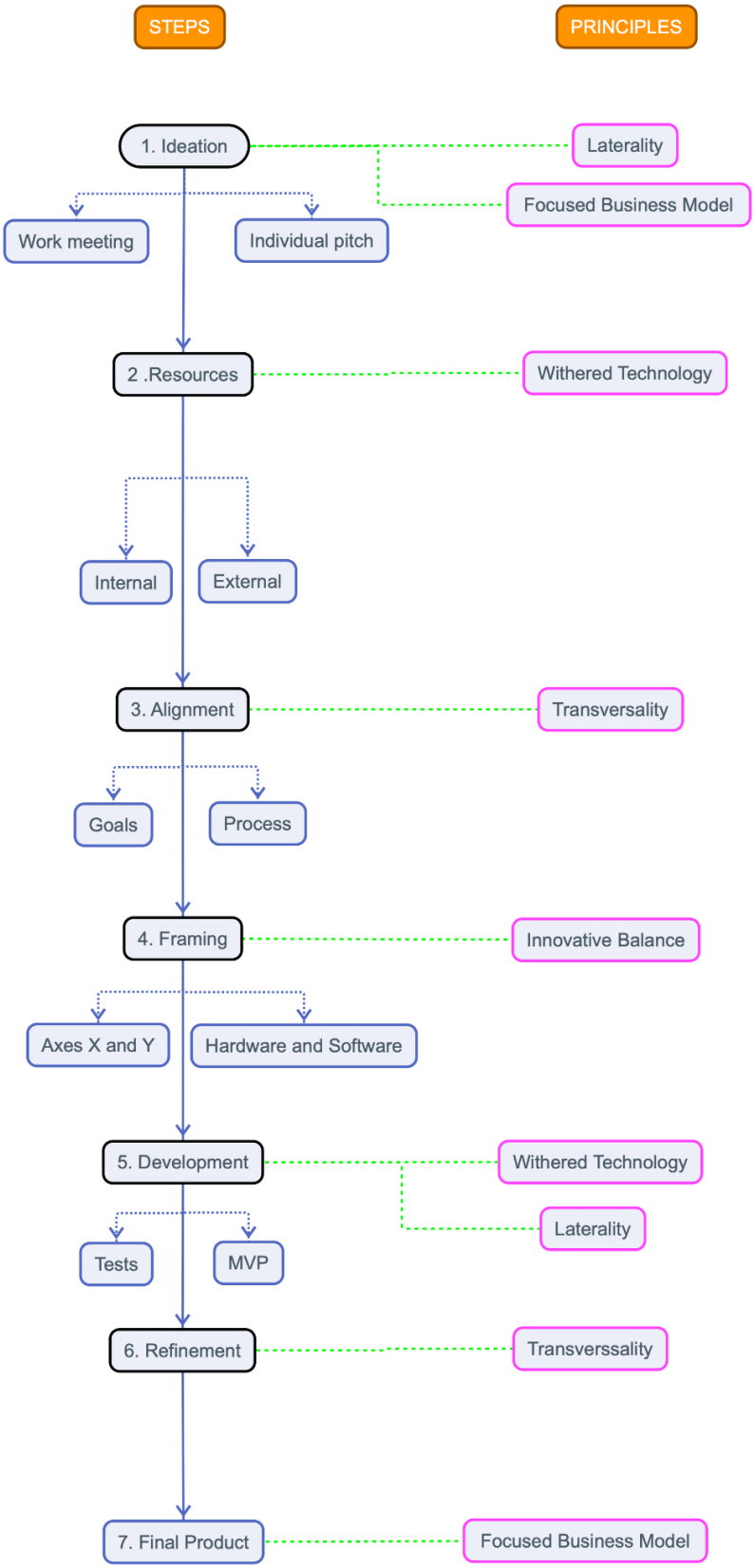
The details presented in Chapter 5 largely elucidate how innovation is structured internally at Nintendo, as well as the strategic connections with other companies, all aimed towards a shared goal. Although it is impossible to map out all stages and strategies comprehensively, the analyzed material suggests a structured path that offers a close representation of the internal operations within the company.

This study chose to focus on two visual models, both viewed through the lens of the main axes of the Oslo Manual, namely the perspectives of products and services, processes, and management. These models facilitated a detailed analytical investigation into the type of innovation employed by Nintendo, exploring the potential parallel with the concept of secondary innovation.

6.1 Innovation through Lateral Thinking with Withered Technology Framework

Based on the findings of this study, a visual model of innovation through "Lateral Thinking with Withered Technology" was developed, as illustrated in Figure 6.

Figure 6 - Principles and Steps Framework



Source: Author

This model outlines the key stages typically identified throughout a product's development and links each stage to Nintendo's innovative principles.

Throughout this work, five major principles were highlighted: Focused business model, Laterality, Withered Technology, Innovative Balance, and Transversality. These principles guide and drive Nintendo's innovation, systematically found across all materials analyzed in this study.

1 - Focused Business Model

A central principle in Nintendo's strategy is to innovate the business model without changing its core focus, based on entertainment. Nintendo does not create products and services that might lead the company to expand into non-gaming segments, aiming instead to entertain multiple generations of consumers simply and efficiently.

It's common for technology-driven companies to partially or completely change their business models to explore new revenue streams or adapt to external changes, such as shifts in consumer behavior or the emergence of disruptive technologies.

As described on Nintendo's website, the company's mission has remained consistent over time: "Nintendo's mission is to put smiles on the faces of everyone we touch. We do so by creating new surprises for people around the world to enjoy together. We've forged our own path since 1889, when we began making hanafuda playing cards in Kyoto, Japan. Today, we're fortunate to be able to share our characters, ideas, and worlds through the medium of video games and the entertainment industry."

This principle is not just a branding position but concretely determines the boundaries of Nintendo's innovation. It is not about creative restriction or censorship but about setting innovative parameters that keep the company focused on entertainment gaming. The focus on the business model also means that Nintendo continually renews it, not just in how it generates and captures value but mainly in how it delivers the generated value, such as through new devices.

This principle has also proven effective from a competitive standpoint, preventing Nintendo from entering a "red ocean" of companies that choose to expand their business scope.

2 - Laterality

Laterality is seen as a strategy to seek alternatives outside the product development segment, both internally and externally. Internally, this process occurs through the cross-pollination of ideas and technologies from various departments. Externally, "laterality" is observed in the context of open innovation, in partnership with other companies that can provide withered technology or co-create based on Nintendo's internal alignment.

In contrast, verticality refers to creating a product or service within the same segment or with internally developed technologies. Notably, in Nintendo's case, these strategies are not mutually exclusive and can be explored simultaneously or alternately, depending on the product or service being developed.

Strategically, the principle of laterality is intrinsically linked to withered technology, aiming to gain a competitive edge based on saving time and money, thus closely related to the concept of secondary innovation.

3 - Withered Technology

The pursuit of withered technology is central to Nintendo's development strategy. This approach allows the use of such technologies, especially in the initial stages of innovation, to cut costs and development steps.

It's also crucial to note that employing withered technology broadens the creative space for innovation. Combined with laterality, technologies not considered in traditional innovation—using entirely internally developed technologies or those from the same sector—offer the opportunity for fresh perspectives and ideas from new elements.

This principle gives Nintendo a unique differentiator, as it possesses a unique combination of elements that can result in innovation. This not only prevents competitors from understanding Nintendo's development phase actions but also creates a barrier to entry post-product or service launch, as competitors would need to undertake a complex re-engineering process to understand the used withered technologies and how they were integrated with other internal technologies.

4 - Innovative Balance

The principle of innovative balance is characterized by Nintendo's efforts to create new products and services without compromising the consumer experience. Innovations occur both technologically and within game narratives, ensuring that the incorporation of something new does not require users to relearn how to use the product or service. Thus, the goal is to innovate maximally while simplifying as much as possible, so that innovation is perceived positively.

This balance is crucial for both recurring and new Nintendo users. As a long-standing company intending to remain relevant, innovative balance allows consumers unfamiliar with Nintendo's products and services to easily use them from the start. Hence, even as electronic devices gain new functionalities, they do not radically differ from previous models and remain as straightforward as possible, easily accepted by old and new generations alike. The same applies to narrative levels, with Nintendo creating characters and universes that evolve without losing their core characteristics.

5 - Transversality

Transversality is crucial to Nintendo's innovation strategy, requiring the coordination and concrete materialization of various points throughout the product and service development process, including other major principles presented here. Innovative projects often open up a wide range of options for combining material elements and human resources, necessitating clear direction management on the set objectives for a new product or service.

From a managerial perspective, project leaders are responsible for keeping the central idea on the predetermined path, including internal and external teams from different departments. A misalignment here could mean a loss of innovation agility. The same goes for technological resources; when they come from different sectors or are at different maturity stages, they must be adapted to work at the same pace and interact with each other.

In conclusion, transversality requires innovation to be examined by various internal departments, ensuring the highest quality in the final product or service delivery.

Based on the analyzed material, it was possible to establish a visual model of Nintendo's innovative process for a product or service, as illustrated in Figure 6. This model outlines, in broad terms, the development stages, incorporating both internal and external steps, across

seven phases: Ideation, Resources, Alignment, Framing, Development, Refinement, and Final product.

To enhance understanding, five key principles were integrated into the visual model to highlight their significance at specific points in Nintendo's innovation process. It is crucial to clarify that while both Nintendo's five key innovative principles and the seven-step process can be replicated by other companies, the seven stages are deeply embedded in Nintendo's operational structure, including infrastructure, technologies, and human resources, making them more challenging to replicate. In contrast, the five key principles, as strategic guiding components, can be more readily adopted by other companies, even those in sectors vastly different from Nintendo's.

Regarding the visual model, it is important to note that it is not a fixed or permanent template. Both the stages and their sequence can vary depending on the situation. The visual model identifies a standard pathway from idea to final product but allows for variations.

It is also pertinent to acknowledge that the visual model was developed from a qualitative study based on analyzed interviews, hence it is subject to data limitations and confined to the author's interpretation. The aim is to enable other companies to assess the need for this type of innovation and use it as an internal guide.

In addition to the five key principles, the seven stages of Nintendo's innovation process are:

1 - Ideation

The ideation phase can manifest through two avenues: collective brainstorming sessions or individual proposals. At this juncture, the focus isn't primarily on mature technologies but on devising solutions that resonate with Nintendo's clientele, both existing and prospective. A crucial element is that this phase unfolds internally, allowing Nintendo to retain strategic oversight, though external entities might contribute to product development in subsequent stages.

The concept of laterality is evident at this point, as it involves scouting for ideas and solutions without confinement to any particular sector or technology.

2 - Resources

After the initial concept is established, Nintendo evaluates its internal capability to develop the proposed product, encompassing both human and technological resources.

At this point, a strategic cost-benefit analysis is conducted, comparing internal capacities with external opportunities. The decision is guided by the level of maturity in available resources, allowing for an integration of both internal and external assets to proceed with development.

3 - Alignment

Following the decision on the utilization of specific human resources and technologies, whether from within the organization or outsourced, the next step involves synchronizing all involved parties to ensure the product's development adheres to specified features and timelines. It's important to highlight that adjustments to these initial plans, regarding both team composition and deadlines, are often necessary, yet they do not substantially hinder the project. Instead, a degree of adaptability to such changes is recognized as beneficial, provided the end goal remains transparent to everyone involved.

During this phase, there's also a concerted effort to align the capabilities of both vertical and lateral sectors, with the aim of integrating generalists and specialists in a cohesive manner to fulfill the set objectives.

4 - Framing

The subsequent stage, known as framing, aims to establish a twofold equilibrium. The first pertains to what Nintendo internally designates as the "X and Y axes," which, in the context of video games, involves crafting the optimal narrative within the best possible gameplay framework. Essentially, a compelling story is insufficient if players encounter challenges in gameplay.

The second equilibrium relates to the interaction between physical devices (hardware) and programs (software), emphasizing that software development must align with the technological capabilities at hand.

In both instances of balance, there's a discernible connection to mature technologies. These technologies not only render the conceptualization technically feasible but also tend to

streamline gameplay for consumers. This is because users are generally more familiar and comfortable with mature technologies, even those originating from sectors adjacent to gaming.

5 - Development

The development phase adheres to a process akin to those observed in other companies. During this stage, the project teams experiment with various components that align with the primary goal until they construct a Minimum Viable Product (MVP).

Throughout this period, all accessible mature technologies are employed to enhance outcomes in line with the initial objectives.

Additionally, this phase is characterized by a significant level of verticality, where specialists across different fields work to address particular challenges associated with specific functions and technologies.

6 - Refinement

As the product nears completion, it undergoes reevaluation by a multidisciplinary team, informally known as the "Cross-Department" within Nintendo. Although this team does not formally exist, it effectively consists of internal experts and strategic decision-makers from Nintendo.

At this juncture, an approach that integrates both laterality and verticality is employed to ascertain whether the final product aligns with the overarching goal of creating something simple, effective, and appealing to the consumer.

This final stage of alignment is crucial, as the involvement of numerous teams and individuals, both from within and outside the organization, can sometimes lead to a divergence of objectives. This, in turn, may culminate in both technical and gameplay shortcomings.

7 - Final Product

Following the completion of all preceding phases, a final assessment is conducted to determine if the product is prepared for launch. This crucial decision rests with Nintendo's senior management. This means that, even in projects involving partner companies—where external entities may have significant involvement, to the extent that projects are virtually

outsourced and managed remotely—Nintendo initiates and concludes the development cycle. This approach ensures that Nintendo retains strategic oversight of its products.

6.2 Organizational Strategic Framework

This study not only facilitated the creation of a visual model detailing the innovation processes via "Lateral Thinking with Withered Technology" but also enabled the depiction of Nintendo's organizational strategy and its interactions with the external environment.

Like the visual model previously introduced, this proposal is derived from a qualitative study based on the interviews analyzed, hence subject to data limitations and the author's interpretative lens.

In this visual model, the strategic use of both laterality and verticality in innovation is highlighted.

Internally, Nintendo's decision-making structure includes the CEO and a team of directors at the top, tasked with maintaining the profitability of the core business model (gaming) and setting the company's strategic direction.

This is followed by regional business units responsible for representing these objectives on a regional scale. Nintendo operates headquarters in various countries and regions, including the United States, Canada, Europe, Spain, Australia, South Korea, and China (Hong Kong).

Each regional unit comprises departments and their respective leads.

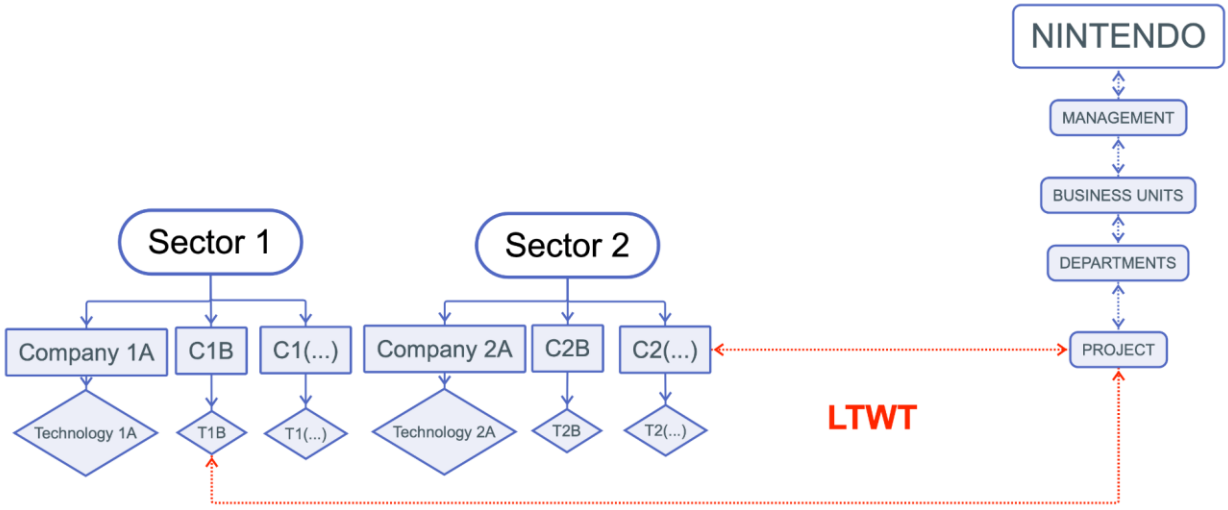
Strategically, the process of "Lateral Thinking with Withered Technology" starts with the initiation of a new project. The next step is forming a team and assessing whether Nintendo possesses the necessary specialized labor or mature technologies.

The evaluation considers the cost-benefit ratio for Nintendo. In certain scenarios, such as game development, the decision may be to collaborate directly with other companies, recognizing that their specialization can lead to faster, more precise development, often at a reduced cost. It's crucial to note that, even in collaborative ventures, Nintendo retains initial and final control over the project, with partner companies participating in co-creation and execution as directed.

Alternatively, if it's determined that the required resources are not immediately available, Nintendo searches the market for mature technologies to facilitate either incremental or radical innovation internally. This search isn't limited to a single company, industry segment, or the gaming sector exclusively. The aim is to identify established solutions that can fast-track innovation.

The strategies of forming direct partnerships with "mature companies" and acquiring "mature technologies" afford Nintendo a competitive edge by saving costs and, more importantly, time, allowing the company to embark on innovation almost instantly.

Figure 7 - Organizational Strategic Framework



Source: Author

6.3 Examples of "Lateral Thinking with Withered Technology"

Below are examples of products developed by Nintendo during the tenures of Gunpei Yokoi (1965 to 1996) and Satoru Iwata (2002 to 2015), which, according to this study, exemplify the concept of "Lateral Thinking with Withered Technology." The summaries provided are derived from analyses of the book "Gunpei Yokoi's Game Hall" and the 126 interviews featured in the "Iwata Asks" series.

Love Tester (1969)

The "Love Tester" device was crafted to gauge the "love level" between two individuals based on the conductivity of their skin. It featured two metal sensors linked by a wire, with users each holding a sensor and then connecting their fingertips. The device assessed the electrical resistance between the hands and calculated a "love score" from this measurement. For Takefumi Makino, the Love Tester epitomizes the initial instance of a toy fashioned through "Lateral Thinking with Withered Technology":

> This example underscores Yokoi's application of "Lateral Thinking with Withered Technology". Essentially, the "Love Tester" is merely an ammeter. Utilizing it solely as a current measuring tool would not have been captivating. Thus, Yokoi repurposed it as "a means to legitimately hold a girl's hand", transforming an outdated technology into a novel context. This demonstrates how an old technology, like the ammeter, was innovatively applied in a completely different domain, creating a new concept.
>
> YOKOI, G; MAKIN, T. (2015) p.39

Game & Watch (1980)

The Game & Watch series represents one of Nintendo's most significant successes. The inception of the first device model was inspired by Gunpei Yokoi witnessing a commuter using a calculator to pass time on a train. Yokoi recounts the moment: "When I saw that, I thought, 'Oh, how about a little game machine that can kill time?'" YOKOI, G; MAKIN, T. (2015) and:

> "At the time, I was the head of the development section, so I had a lot of pride. You say I'm not a driver. So, when I went to pick up the president, I had to talk about work, so I talked about getting bored on the Shinkansen. 'I think it would be interesting to make a game machine that

> looks like a small calculator.' 'Until now, toys were based on the idea of ‘make them bigger and sell them for a higher price.'
>
> YOKOI, G; MAKIN, T. (2015) p.106

The concept progressed through a collaboration with Sharp, the premier calculator manufacturer of that era, which possessed mature liquid crystal display technology. Nintendo was then able to repurpose this established technology, fostering innovation within the emerging field of portable electronic games.

> "However, at the end of the meeting, it seems that (Asahi) Saeki, president of Sharp, was sitting next to the president. At that point, as Sharp is the number one calculator in the world, I heard they talked about the calculator-sized game machine I mentioned. Then, about a week later, a top executive from Sharp suddenly appeared at Nintendo. I didn't know what to do. Then the president said: 'I called you because the calculator-sized game machine you mentioned is good in shab'. Suddenly, it became a reality.
>
> YOKOI, G; MAKIN, T. (2015) p.107

Wii Web browser (2006)

Nintendo collaborated with two companies to create a browser for the Wii. The first company was Access Co., which specialized in cloud services and was involved in the research and development of software and integrated browsers for mobile phones and specialized devices. The second was HAL Laboratory, a video game developer. Both companies possessed mature technologies that could be adapted to fulfill Nintendo's requirements.

Donkey Kong Country Returns (2010)

The game was created in collaboration with Retro Studio. The developers noted that the technological advancements enabled them to design the game's background in real time, a feat unachievable in the past when only static images were possible due to the absence of technological maturity.

Wii MotionPlus (2010)

During the development of a new remote control for the Wii console, the integration of a small gyroscope into the device was facilitated by mature technology, previously utilized in sectors like navigation and aviation. This technology, initially large, experienced significant miniaturization through Microelectromechanical Systems (MEMS), making its implementation feasible for Nintendo in the production of the remote control. This development process is highlighted in a conversation between then-CEO Satoru Iwata and Junji Takamoto from the Product Development Department:

Iwata
I suppose the obvious question is: if it offers such huge advantages, why didn't you use it in the Wii Remote from the very start?

Takamoto
We actually looked into the idea of including a gyro sensor at the very start of the Wii Remote controllers's development. But the idea was rejected due to issues of both space and cost which attaching a gyro sensor would entail.

Iwata
I see. But gyro sensors are measuring devices that have actually been around for a considerable amount of time, aren't they?

Takamoto
That's right. They were originally called gyroscopes and were used to measure angle and rotation speed in rockets and the navigation systems of ships. But they were very bulky instruments indeed.

Iwata
They're fitted in the noses of airplanes as well, aren't they?

Takamoto
Right. That's the sort of size we're talking about. And let's not forget that they were also extremely expensive. However, with advances in MEMS technology, they have become smaller and smaller while at the same time becoming cheaper…

Iwata
You used the term MEMS just now. Could you explain what that means?

Takamoto

It stands for "Micro-Electromechanical Systems" and refers to micro fabrication techniques that use applied semi-conductor technology to produce extremely small mechanical structures.

Iwata

So thanks to MEMS technology, it has become possible to put a gyro sensor inside a small remote control. As I recall, WarioWare: Twisted!3 also made use of a gyro sensor.

Source: Iwata Asks

Nintendo 3Ds (2011)

A feature of the Nintendo 3DS enabled users to utilize the device as a photo viewer. This capability, as discussed between Satoru Iwata and Nintendo's game director, Shigeru Miyamoto, was introduced only after the widespread adoption of photo capture technology through other devices. This decision underscores Nintendo's approach of employing mature, or "withered," technology as a basis for innovation, as illustrated in the dialogue between then-CEO Satoru Iwata and Nintendo's game director, Shigeru Miyamoto:

Iwata

Of course, 3D photo-taking existed in the past, but it had never been so readily available to so many people and they would be able to so easily pick it up and enjoy.

Miyamoto

You don't have to buy a special camera or use a special printing process. You can take the pictures and see them on the spot to get surprised. That entire experience is a fun entertainment.

Iwata

Yes. You can enjoy using the Nintendo 3DS system even just as a viewer for 3D photos.

Source: Iwata Asks

Nintendo TVii (2012)

The application was developed for Nintendo by i.TV, adding a new layer of functionality atop an existing mature market. Brad Pelo, the then-CEO of i.TV, explained: "i.TV was founded on the belief that television was ripe for reinvention. Our goal was to assist people in discovering what to watch from an expanding array of choices, make it easier for them to

access or tune into their chosen programs, and allow viewers to interact with the content and other viewers through second screens, such as the Wii U GamePad."

Wii U Chat (2012)

The audio and video chat feature was developed with the help of the American company Vidyo, which specializes in videoconferencing systems, in collaboration with NTD (Nintendo Technology Development Inc.). According to former CEO Satoru Iwata, this type of technology had been on Nintendo's radar for fifteen years prior to the launch of Wii U Chat. Its implementation became feasible only after the technology had sufficiently matured. Atsushi Watanabe, from the Nintendo Design and Technology Department, elaborated: "As the Wii U's development advanced and we began to consider incorporating a camera, we started exploring communication technologies with NTD and Vidyo, an American firm known for its video conferencing solutions. By the end of last year, we determined that we could make it work."

Wii U Gamepad (2012)

During the development of the device, reducing the latency (response time) of the wireless component posed a significant challenge. To overcome this, Nintendo enlisted the expertise of established firms in the industry, such as the American Broadcom Corporation. Leveraging the mature technology of these companies enabled the appropriate development of the device.

Nintendo 3Ds Guide Louvre (2012)

In some museums, like the Louvre in France, audio guides were offered on devices available for rent on-site, typically CD players. Nintendo opted to repurpose the Nintendo DS as an audio guide, offering a more convenient option for the device's owners. The discussion between then-CEO Satoru Iwata and Nintendo's game director, Shigeru Miyamoto, effectively demonstrates the application of "Lateral Thinking with Withered Technology":

> **Miyamoto**
> That's true. But actually the audio guides available at museums were the jumping off point for the idea of using the Nintendo DS in public spaces.

Iwata

Audio guides, in this case, are devices that you can rent at museums that give an audio explanation of the various exhibits.

Miyamoto

Yes. I always rent an audio guide to look at exhibits when I go to museums. It gives you a much richer experience because it provides insights and discoveries that you wouldn't have made otherwise.

Iwata

Looking at an exhibit with an audio guide is such a different experience than viewing it without any knowledge.

Miyamoto

It's completely different. But most audio guides were like portable CD players where you had to enter numbers that are displayed by each exhibit in order to hear the explanations, and they weren't very easy to use.

Iwata

Well, there weren't what we call smart devices6 back then.

Miyamoto

Those didn't exist then. And then when the Nintendo DS came out, I started thinking, "Couldn't we use the Nintendo DS like an audio guide? It'll be much more convenient!"

Iwata

At the same time, we began to get inquiries at Nintendo from public institutions like schools and hospitals asking us if they could do something with the Nintendo DS.

Miyamoto

So then, around the time I started thinking that I wanted to figure out the specifics, we had the opportunity to meet with Oriental Land.7 After several discussions with them, we decided to offer some services as a trial at Ikspiari8, the large shopping facility in the Tokyo Disney Resort in Maihama.

Iwata

The Ikspiari Nintendo DS Guide.

Miyamoto

Yes. One of the concepts behind Ikspiari was to make it a fun adventure for guests to hunt for different stores, so the architecture is purposefully a bit complicated.

Iwata

I took a looked at a map myself, and it really did look like a dungeon from a video game! (laughs)

Miyamoto

So we put in an automatic mapping system along with a shop guide. We set up wireless LAN access points at various places inside Ikspiari as well as Nintendo DS systems to download the software, so that a user could see their current location in real time.

Iwata

It was a system where it calculated its location by estimating the signal strength10 from the various wireless LAN antennas and Nintendo DS systems, right?

Miyamoto

While in the museum, the guide changes automatically based on where you are standing. With a conventional guide, you listen to a description by putting the corresponding number, but if you use this software, the guide automatically plays the right description corresponding to where you're standing once you select the museum tour mode.

Iwata

Oh, so that's where the know-how from the location detection at Ikspiari came into play.

Miyamoto

Yes. There are systems out there that are being tested at other museums where the guide changes automatically as you walk, but most of them use infrared and many of them are unstable.

Miyamoto

The user experience does feel a lot like a game. If you're using it in the museum, and you search for a work of art you want to see, it will show you the shortest route there, and you can also use it to play a game like "Find the works of art in the Louvre!"

Iwata

The Louvre Museum itself is a bit like a maze, after all.

Iwata

By the way, how did you do the 3D scanning used in the 3D photos of the statues?

Miyamoto

> There are various types of scanners. The easiest way out of the latest available technology was to use a handheld scanner and scan the statues that way. For the larger statues, we used a stepladder and scanned from directly above the statues. Then we put texture on the models we made to make the 3D model look like the original. The 3D designers had the task of perfectly matching the 3D models with pictures of the real thing.
>
> **Source: Iwata Asks**

Fit Meter (2013)

The "Fit Meter" accessory, intended to complement the "Wii Fit U" game by tracking steps and estimating calorie burn, was conceived without the necessary technology in-house at Nintendo. Consequently, Nintendo sought collaboration with Panasonic, which already possessed analogous technologies, such as those used for sleep monitoring. Panasonic provided Nintendo with the algorithms it had developed for these purposes.

Wii Street U (2013)

Wii Street U was an application enabling users to explore maps via the Nintendo device. Former Nintendo CEO Satoru Iwata noted that the maps, already developed by Google, facilitated the rapid development of the application for Nintendo. He stated, "This time, however, all the scenic image data from places around the world are waiting on Google's servers, so once a system that is compatible with web technology is operational, things will quickly progress from there. We've seldom experienced such swift development until recently, which is quite thrilling."

Nintendo 3Ds XL (2014)

Nintendo leveraged the decreased cost of LCD screens, a result of mass production advances in the television industry. Nevertheless, choosing a larger screen for the device introduced the challenge of conserving energy since a bigger screen size equated to greater electricity use. The company succeeded in lowering power consumption and additionally engineered a more effective anti-reflective screen.

In general, all of Nintendo's key innovation principles are observed across the company's products and services. To emphasize the principles that stand out most in the

examples mentioned above, Table 1 synthesizes and highlights the two most evident principles for each case, without implying the exclusion of others.

Table 1 - Main Principles

	Focused Business Model	Laterality	Withered Technology	Innovative Balance	Transversality
Love Tester (1969)		X	X		
Game & Watch (1980)		X	X		
Wii Web browser (2006)			X		X
Donkey Kong Country Returns (2010)	X			X	
Wii MotionPlus (2010)				X	X
Nintendo 3Ds (2011)		X	X		
Nintendo TVii (2012)		X	X		
Wii U Chat (2012)		X			X
Wii U Gamepad (2012)		X	X		
Nintendo 3Ds Guide Louvre (2012)		X		X	
Fit Meter (2013)	X	X			
Wii Street U (2013)		X	X		
Nintendo 3Ds XL (2014)	X		X		

Source: Author

Upon analyzing Table 1, it becomes evident that the principles of lateral thinking and withered technology are the most prevalent in the examples highlighted. This observation, however, does not imply that the remaining principles are of lesser importance or are absent from the products and services examined. What is clearly discernible is that lateral thinking and withered technology stand out as particularly essential principles in comparison to the others, forming the cornerstone of Nintendo's innovation strategy. As we will explore further, these principles demonstrate a decisive competitive advantage due to their unique characteristics.

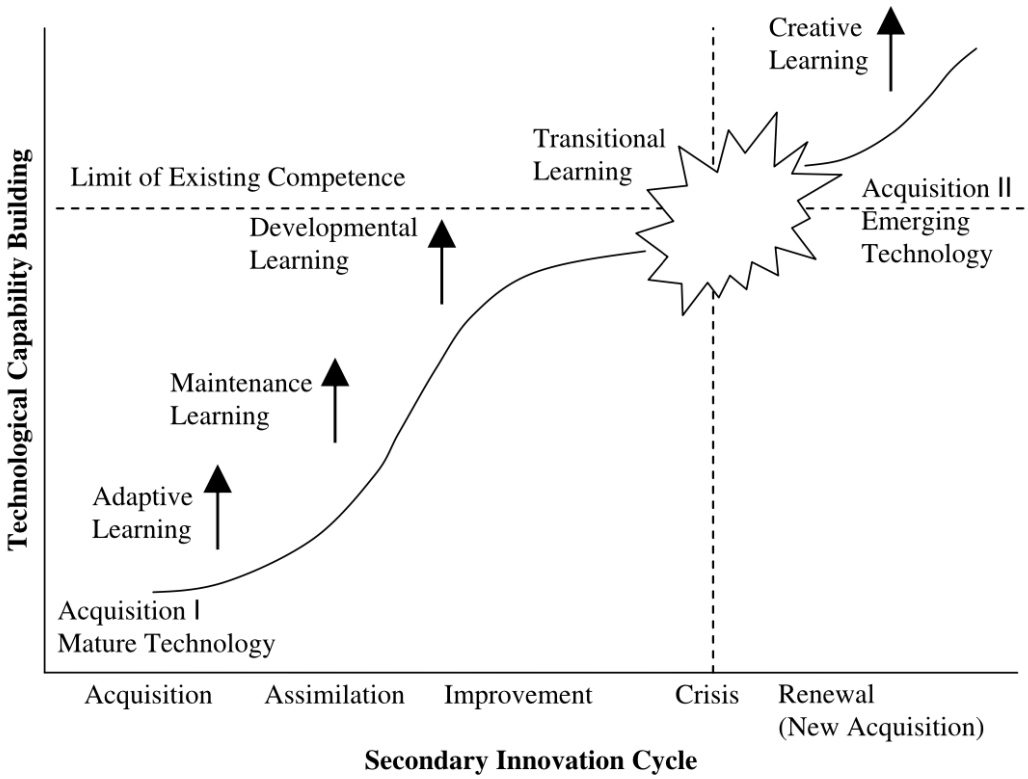
6.4 Lateral Secondary Innovation

While closely associated with the electronic gaming industry, the application of "Lateral Thinking with Withered Technology" extends to other technology-driven sectors. This concept shares common ground with "secondary innovation," especially concerning the maturity of technologies, yet it diverges in its strategic approach.

As outlined by Wu *et al* (2009):

> "Secondary innovation is not a closed linear process from importation to assimilation and innovation, but rather an incremental cumulative evolutionary process with quantitative development and qualitative change, a process of balancing from a stable technological state to a new balanced state combining existing technologies and new acquired technologies, and a non-linear learning process, from structural understanding to functional understanding.
>
> Unlike the traditional model of technological learning, the secondary innovation model emphasizes the very important inter-relations and interactions between acquired technologies and the local technological and market environment, which can be called 'understanding.' 'Learning' is a good notion to describe the process of mastering a specific technology involving imitation and some part of adaptation, but it may lead to the mistake of being confined to the definitive conception of the original technology. Mastering the core technologies may be the end of technological learning, but it is just the first step of secondary innovation, followed by 'structural understanding' and 'functional understanding,' combining the acquired technologies with the existing technological systems and even with the requirements of local users."
>
> Wu et al (2009) p.22

Figure 8 - Secondary Innovation Cycle



Source: WU *et al* (2009)

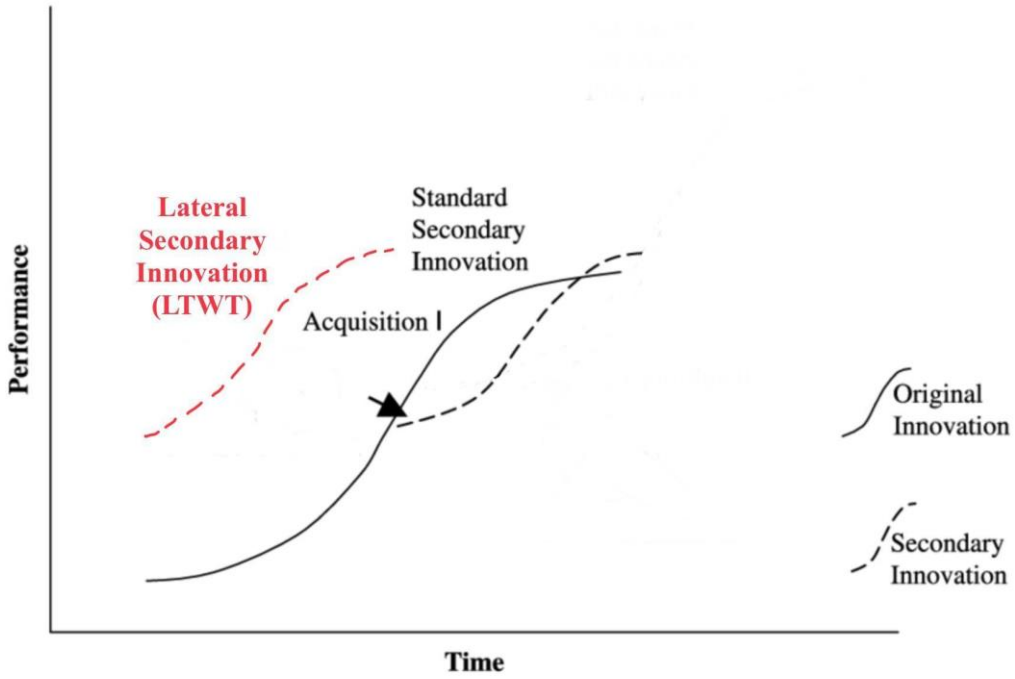
As previously detailed and depicted in Figure 8, "secondary innovation" outlines a trajectory of acquisition, adaptation, and development within the same industry, permitting "non-linearity" in a temporal rather than sectoral sense. This approach predominantly aims for incremental innovation within specific segments.

Conversely, the "Lateral Thinking with Withered Technology" model doesn't strictly adhere to the same principles of organizational learning as "secondary innovation." Its primary objective isn't merely to refine and employ the acquired mature technology but to repurpose it entirely for a novel application. This means that assimilation and further development are unnecessary because the technology, due to its maturity, is ready to be recombined and applied to a different end.

As illustrated in Figure 9, unlike "secondary innovation" which waits for technological maturity within the same industry and follows the process depicted in Figure 8 to achieve desired outcomes, "Lateral Thinking with Withered Technology" initiates innovation at a performance level similar to the maturity of "secondary innovation's" Acquisition Point 1. However, it does so temporally sooner, as it operates in a different sector from where the

technology originated, thereby securing a competitive edge. It's noteworthy that the example focuses on a single "lateral" mature technology, yet the strategy allows for multiple acquisitions across various segments or companies, further amplifying the innovation impact through "Lateral Thinking with Withered Technology."

Figure 9 - Lateral Secondary Innovation



Source: Author (Adapted from WU et al (2009)

Therefore, it's crucial to recognize that "Lateral Thinking with Withered Technology" offers a distinct competitive advantage compared to both standard and advanced "secondary innovation." It doesn't face the immediate threat of enhancements or new technologies emerging in the same sector as the original technology since it involves creating new technology without existing competitors. While it's possible for another company to adopt "secondary innovation" in response to a technology developed through "Lateral Thinking with Withered Technology," the barriers to entry for a novel product are initially higher than for existing products.

This study aimed to clarify that the goals, phases, and competitive edges of "Lateral Thinking with Withered Technology" partially diverge from those of "secondary innovation" as initially conceived. This doesn't preclude the interpretation of "Lateral Thinking with Withered Technology" as a form of "secondary innovation." Rather, there are significant

indications that support classifying "Lateral Thinking with Withered Technology" as a "Lateral Secondary Innovation." This categorization shares the core principle of utilizing mature technologies as a competitive advantage but differentiates itself through its "laterality"—the pursuit of solutions in adjacent sectors, alongside the strategic factors mentioned earlier.

The similarities and differences between "secondary innovation" and the potential new model of "lateral secondary innovation" are succinctly summarized in the following Table 2:

Table 2 - Types of Secondary Innovation

	SECONDARY INNOVATION	**LATERAL SECONDARY INNOVATION**
Technology	Mature	Mature/Withred
Late movement	Necessity	Option
Decision factor	Lack of resources	Save time and resources
Tech capability building	Acquisition, Assimilation, Improvement	Improvement
Source sector	Same (vertical)	Different (lateral)

Source: Author

While exploring "lateral secondary innovation" wasn't the primary focus of this research, the concept holds theoretical potential for further development. This investigation has only begun to delve into "lateral secondary innovation," suggesting that its fuller theoretical implications could be explored in future work.

6.5 "Lateral Thinking with Withered Technology" nowadays

Following the passing of Satoru Iwata in 2015, Tatsumi Kimishima succeeded him as CEO of Nintendo from 2015 to 2018, followed by Shuntaro Furukawa, who has led the company from 2018 to the present.

During this era, Nintendo persisted in its innovative endeavors, launching new consoles and hit games, including the Nintendo Switch (2017), The Legend of Zelda: Breath of the Wild (2017), Nintendo Switch Online (2018), Nintendo Switch Lite (2019), Animal Crossing: New Horizons (2020), Metroid Dread (2021), and Nintendo Switch Sports (2022).

The development of the Nintendo Switch particularly reflects the principles of "Lateral Thinking with Withered Technology," as the console integrates a blend of existing market technologies in a novel manner.

Regarding Nintendo Switch Online (2018), this innovation aligns with the previously discussed themes of Business Model Innovation and Digital Platforms. Nintendo broadens its product lineup in the online domain to stay competitive against new and existing rivals. This strategy introduces a recurring revenue model through subscription services, facilitating global expansion through digital game distribution. This move showcases Nintendo's innovative prowess, anchored firmly in its strategic focus on entertainment.

Shuntaro Furukawa's leadership is marked by a balance between innovation and the preservation of company traditions. Furukawa has expressed in interviews his admiration for the leadership styles of former Nintendo presidents, including Satoru Iwata, and has maintained a collective and decentralized leadership structure. This approach has expedited decision-making and project completion, once more highlighting the "Lateral Thinking with Withered Technology" strategy.

Under Furukawa's direction, Nintendo has ventured into new business areas such as film and theme parks, underscoring the company's commitment to building its future on a foundation of continual innovation.

7 CONCLUSION

The concept of "Lateral Thinking with Withered Technology" was the main focus of this thesis. Originating from a description by designer Gunpei Yokoi, it was crucial to analyze his contributions within the company, especially in the competitive context of the electronic gaming market.

Both the definition of "Lateral Thinking with Withered Technology" and its applicability were not extensively and clearly documented in the past, highlighting the need through this work to elucidate the concept's origin and elements, as well as to identify signs of its application in Nintendo's innovation.

It can be stated that the concept of "Lateral Thinking with Withered Technology" was coined by Gunpei Yokoi through direct and indirect accounts from people who worked with him. This research did not pinpoint an exact date for the term's origin, but estimates suggest the concept emerged between 1965 and 1980.

Translated from Japanese to English, the term is "lateral thinking of withered technology". In some publications, the technologies are also described as "obsolete". This work chose to retain "withered" to reflect Yokoi's intention to work with technologies that had undergone full development and were in a mature stage of use, but not necessarily becoming entirely disposable. On the contrary, "withered" technology could seed significant innovation, even with potential applications in industry segments beyond the original.

The term "Lateral Thinking with Withered Technology" entails seeking existing technological solutions in adjacent segments rather than focusing on developing more expensive cutting-edge technologies. In Gunpei Yokoi's words:

"Products using advanced technology naturally come at a high cost. Moreover, such products often end up competing on price with other companies. However, if the technology becomes widespread and withers, it will be possible to manufacture products at a ridiculously low cost." (Yokoi, 2015, p.40)

This strategy was employed by Nintendo to create several successful products, including the Game & Watch and the Game Boy. Yokoi's strategy also emphasized usability, promoting the simplicity and practicality of products. This approach allowed Nintendo to drive innovation in games themselves, making them popular through more accessible devices compared to competitors. According to Takefumi Makino, co-author of the book "Gunpei Yokoi's Gaming Hall": "To describe Mr. Yokoi in one word, he would be a toy inventor. Interestingly, he has a fondness for 'practical products'." (Yokoi, 2015)

Another relevant aspect of Yokoi's thought was akin to a scale of technological values perceived by consumers. Evaluated in isolation, one technology might be considered more important than another. However, when combined within the same product, perceptions can change. For instance, a high-definition screen, on its own, may seem superior to a low-resolution one. But what if it consumes more power, reducing the product's usage time? Or significantly increases the product's price? Would the high-definition screen still be as relevant? Yokoi noted:

> "It's very difficult to figure out 'what users don't want'. For example, when it comes to which is better, monochrome or color, everyone will say color is better. But do users really want that? Few people can explain that the downside is the battery runs out quickly and the product's price increases."
>
> (Yokoi, 2015, p.207)

Thus, Yokoi believed it was not possible to consider a technology in isolation. A balance between technologies, both cutting-edge and/or withered, was necessary to ensure the final user experience was functional and enjoyable.

Research on Nintendo's innovation found evidence demonstrating the applicability of the "Lateral Thinking with Withered Technology" strategy and its impacts, especially during engineer Gunpei Yokoi's tenure (1965 to 1996) and later under Satoru Iwata's management (2002-2015). There are also indications that this strategy continues to be used today.

Among the main competitive advantages of using "Lateral Thinking with Withered Technology" is agility, as production time is reduced by employing mature, readily available technologies. Similarly, using ready-made technologies saves research and development resources.

It's also important to consider the innovative effect of combining ideas and parts from ready-made technologies from various areas, enhancing the capacity to explore territories adjacent to the core products and services. This characteristic has implications for company management and processes, allowing for more horizontal and flexible structures, tailored to specific situations.

It's observable that these concepts were employed to support Nintendo's growth and openness to cooperate with other companies. The characteristics of Nintendo's strategy suggest that the model could be applicable, at least partially, to other companies, even those outside the electronic gaming sector but strongly related to technology-enabled innovation.

When comparing companies within the same industry, it can be asserted that Nintendo's innovation model, through "Lateral Thinking with Withered Technology," stands as a competitive differentiator. This approach enables Nintendo to remain true and focused on the company's core business model, utilizing fewer resources and saving time compared to its competitors.

Limitations identified in this research include restricted access to Nintendo's innovation model, making this work an external and partial interpretation of the analyzed material. It's also challenging to fully assess the extent of "Lateral Thinking with Withered Technology" employment and to quantify its financial impact on Nintendo's business model. The evidence of using "Lateral Thinking with Withered Technology," though clear by the end of this research, is of an indeterminate partial scale, not total.

Knowledge of the "Lateral Thinking with Mature Technology" strategy appears much more confined to the tacit than to the explicit, systematic realm. The author's development of visual models aims to facilitate understanding of the strategy but does not claim to organize and explicitly describe Nintendo's internal day-to-day operations.

Beyond the gaps identified by this work's limitations, a future research suggestion is to investigate the use of Nintendo's strategy by other technology companies, whether as a primary source or part of a mixed strategy. For instance, Apple, one of the world's largest technology companies, invests heavily in cutting-edge research and development. Simultaneously, Apple seems to employ something akin to "Lateral Thinking with Mature Technology," whether by intentionally delaying the release of cutting-edge products, like the Vision Pro mixed reality glasses, or by incorporating parts and services from other companies, like the Apple Watch. Recently, the company had to halt sales of a model under suspicion of violating patents from a competitor in another sector, the medical field.

Another important future analysis point is the applicability of the "Lateral Thinking with Withered Technology" concept to emerging trends and technologies, such as "Low Code" and "No Code" platforms. These platforms allow for the use of ready-made or semi-ready codes by various types of companies, thus employing mature technologies and, potentially, technologies adjacent to the sector in question.

A new technology that seems to fit the concept of "Lateral Thinking with Withered Technology" is generative artificial intelligence, based on large natural language models capable of generating multimodal content such as text, audio, image, and video. These and other technologies may redefine innovation paradigms across different segments, from the perspective of reusing mature technologies, warranting deeper future analyses.

Expanding the application horizon beyond the business realm, future research could explore potential opportunities for nations like Brazil, which are in a stage of economic development and predominantly lagging in cutting-edge technologies. The strategic application of "Lateral Thinking with Withered Technology" could result in significant time and resource savings in both the private and public sectors.

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APPENDIX

Appendix 1 - Selected texts list

BASE	RESEARCH	FOUND	ANALYZED	USED
Web of Science	Nintendo AND Innovation	55	9	2
Web of Science	Nintendo AND Platform	149	2	0
Web of Science	Nintendo AND Ecosystem	6	2	0
Web of Science	Nintendo AND Lateral Thinking	0	0	0
Web of Science	Lateral Thinking	271	3	1
Web of Science	Lateral Thinking with Withered Technology	0	0	0
Web of Science	Gunpei Yokoi	0	0	0
Web of Science	Gunpei AND Nintendo	0	0	0
Web of Science	Yokoi AND Nintendo	0	0	0
Web of Science	Nintendo Case Study	83	4	1

Appendix 2 - Workflow

STEPS	TASKS	DEADLINE
Preparation	- Problem definition - Sources and data collection	4 months
Collection	- Books - Literary Review - News - Company documents - Interviews	2 months
Analyze	- Data organization - Identifying patterns and themes - Elaboration of hypotheses and interpretation of results	2 months
Sharing	- Case description - Data presentation - Results Analyze - Discussion of theoretical and practical implications - Conclusions	2 months

Appendix 3 - Content Analysis Coding of the “Iwata Asks” interview series

Code	**Results**
LTWT	32
Open Innovation	13
Team work	7
Process	4
Innovation	3
Incremental innovation	3
Ideation	3
Experimentation	3
Framing	2
Radical innovation	1
Laterality	1
Fails	1
BMI	1
Management	1
Costs	1
Difficulties	1
Transversality	1
Competitive Advantage	1

Appendix 4 - List of products and games developed with Gunpei Yokoi´s participation

- Ultra Hand (1966)
- Ultra Machine (1968)
- Love Tester (1969)
- Light Ray Gun SP Series (1970)
- Erekonga (1970)
- NB Block Crater (1970)
- Ultra Scope (1971)
- Light Ray Telephone LT (1971)
- Lefty RX (1972)
- Time Shock (1972)
- Laser Kure Clay Shooting System (1973)
- Wild Gunman (1974)
- Shooting Trainer (1974)
- Light Ray Gun Custom Series (1976)
- Duck Hunt (1977)
- The Chilean Tree (1979)
- Dancing Robot (1985)?
- Robotic Vacuum Cleaner (1978)?
- Game & Watch Series (1980)
- Game & Watch Wide Screen (1981)
- Game & Watch Multiple Screen (1982)
- Computer Mah-Jong (1982)
- Famicom Controller (1983)
- Game & Watch Color Screen (1984)
- R.O.B. (1985)
- NES Zapper
- Gyromite e Stack 'em
- Game Boy (1989)
- Super Scope (1992)
- Virtual Boy (1995)

- Game Boy Pocket (1996)
- WonderSwan (1998, póstumo)

- Metroid (produção, 1985)

- Kid Icarus (produção, 1985)
- Metroid II: Return of Samus (produção, 1990)
- Dr. Mario (1990)
- Super Metroid (produção, 1993)
- Tetris Attack (1995)
- 3D Tetris (produção, Virtual Boy, 1996)
- Fire Emblem: Keisen no Keifu (produção, SNES, 1996)
- Tetris Attack (produção, Game Boy, 1996)
- Galactic Pinball (General Manager, Virtual Boy, 1995)
- Kirby's Block Ball (co-produção, Game Boy, 1995)
- Mario's Tennis (produção, Virtual Boy, 1995)
- Teleroboxer (produção, Virtual Boy, 1995)
- Tetris Attack (produção, SNES, 1995)
- Super Metroid (produção, SNES, 1994)
- Wario Land: Super Mario Land 3 (produção, Game Boy, 1994)
- Metal Combat: Falcon's Revenge (produção, SNES, 1993)
- Battle Clash (produção, SNES, 1992)
- Kaeru no tame ni Kane wa Naru (agradecimento especial, Game Boy, 1992)
- Super Mario Land 2: 6 Golden Coins (produção, Game Boy, 1992)
- Yoshi's Cookie (produção, Game Boy, 1992)
- Yoshi's Cookie (produção, NES, 1992)
- Metroid II: Return of Samus (produção, Game Boy, 1991)
- Balloon Kid (produção, Game Boy, 1990)
- Dr. Mario (Game Boy, 1990)
- Solar Striker (produção, Game Boy, 1990)
- Famicom Tantei Kurabu Part II: Ushiro ni Tatsu Shoujo (Famicom Disc System, 1989);
- Super Mario Land (produção, Game Boy, 1989)
- Famicom Tantei Club: Kieta Kokeisha (produção, 1988)

- Kid Icarus (produção, NES, 1986)
- Metroid (produção, NES, 1986)
- Mario Bros. (produção, arcade, 1984)
- Donkey Kong Jr. (produção, arcade, 1983)
- Donkey Kong (produção / engenharia de hardware, arcade, 1981)