

LIFECYCLE AND THE EVOLUTION OF HIGH-TECH FIRM DECISION-MAKING PROCESS

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Abstract: The evolution of the decision-making process in high tech will be explored through the lifecycle of the high-tech market. A novelty concept, *fuzzy edges*, is introduced to define the decision-making phases in the lifecycle of the high-tech market. Also, the manner in which firms make decisions can be impacted by various factors, ranging from internal discipline groups, rival market competitors to cost leadership and the ever-developing market conditions. The aim of this paper is to explore factors associated with the internal discipline groups as these tend to have the most impact on changes in the decision-making process throughout the lifecycle. Grounded Theory is used to conceptualize the impact of internal discipline groups on the decision-making process throughout the lifecycle and to report findings suggesting that many critical internal and external factors of firms impact the mode, quality, and consequences of the decision-making process.

Key Words: high-tech lifecycle, decision-making process, corporate information boundaries, strategic controls, enterprise evolution

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Introduction

The quality and timeliness of decisions is at the heart of a firm's success. As the market matures, complexity increases until the market shake-out occurs and then it decreases as competitors consolidate or exit the market. This results in a cost-leadership advantage in a competitive market for the remaining surviving firms. As the market continues to mature, mergers and acquisitions will emerge, additional firms will exit the market, and there will be no or fewer entrants into the market. Essentially, market related complexity increases more-or-less uniformly amongst firms from start-up to maturity (Koplyay and Mitchell, 2014b).

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Normally, as market related growth occurs for newly established firms like start-ups, their relative management levels and administrative structures proliferate (Coad et al., 2021). For instance, professional managers entering firms will initiate departmentalization or the creation of business lines. At this point, decisions related to the firms are no longer concentrated amongst its founders and/or early senior management. This increased formality within firms typically stifles their ability to effectively respond quickly to issues emerging within the decision-making process. Another dimension to this dynamic is the *fuzzy edges* concept that defines decision-making phases for which additional information is available in *Factors and Influences on Discipline-Specific Decisions*. For example, delayed market-related responses may negatively impact the decision-making process. Firms that base their decisions on outdated assumptions may heighten the likelihood of missteps and hinder their long-term success in the market. Firms can make use of the high-tech lifecycle to help mitigate such missteps. The high-level evolution of the decision-making process has an impact on how the different functional groups are affected by the firm's decisions, which in turn, can illustrate the impact that other secondary groups may experience due to this dynamic.

Grounded Theory

This paper uses the research methodology Grounded theory (GT) for analytical purposes as GT can help identify relevant elements, such as social relations and group behaviour, which can assist with providing meaningful insights when attempting to understand collective behaviour occurring in relation to the market. GT, is capable of accomplishing behavioural analysis through the development of theories, based on evidence from data that is collected and analyzed systematically (Noble and Mitchell, 2016). Likewise, GT is used to create an in-depth description that can recognize contradictions present in the evidence (University Libraries, n.d., para. 5; Milliken, 2010). Also, GT is a suitable research method for this paper as it can be applied to various studies utilizing diverse research methods (University Libraries, n.d., para. 5; Milliken, 2010). Essentially, GT when compared to other research methods is most suitable at identifying what is occurring within the evidence (University Libraries, n.d.; Milliken, 2010).

The High-Tech Lifecycle and Complexity– An Overview

Generally, there are only minor differences in corporate lifecycles amongst various firms from different industries and organizational structures. In a chronological order, the high-tech lifecycle begins with start-up firms and will progress from early adopters to the chasm, the bowling alley, the tornado, early majority, market growth, standard setting, shake-out, market maturity, late adopters, and finally end with market decline and/or exit (Moore and McKenna, 1995). Figure 1 below illustrates the complexity and the high-tech lifecycle from start-up to market exit and is referenced when identifying the lifecycle observations or explanations.

At the inception of a high-tech firm, the start-up phase, the first signal of the firm's success is the presence of early adopters (Moore and McKenna, 1995), and the firm's pursuit of cutting-edge technologies or designs. Firms at this stage must contend with a market that is normally hostile to the introduction of new products or services as the market tends to be saturated with rival competitors and new customers may be attached to alternative products or services. Although some of the new customers may be attracted to these innovative start-up firms due to their novel approaches with cutting-edge technologies or services and their refinement process, firms are relatively simple and small in scale due to the limited personnel.

As the market grows over time into greater complexity and scale, firms will likewise follow suit and be required to rise to the occasion or experience market decline. Essentially, the chaotic tornado market phase, alongside how firms operate, will determine which firms will reach the next market phase (Moore and McKenna, 1995). During this transition, before the shakeout, firms will normally experience explosive growth that has its own compelling logic as complexity within the market and firm rise (Moore and McKenna, 1995). For example, with market competitors clamoring to dominate market space, there is the need for firms to expand operations and hire additional employees to meet customer demands. This growth explosion reinforces a firm's formalized procedures and policies, employment standards, and legal requirements. Likewise, the firm's professional managers in all disciplines will now be running the day-to-day affairs of the company. Ultimately, this growth will increase the complexity of firms operating with many changes and layers of management, shifting away from an entrepreneurial to a functional structure (Kopyay and Mitchell, 2014a).

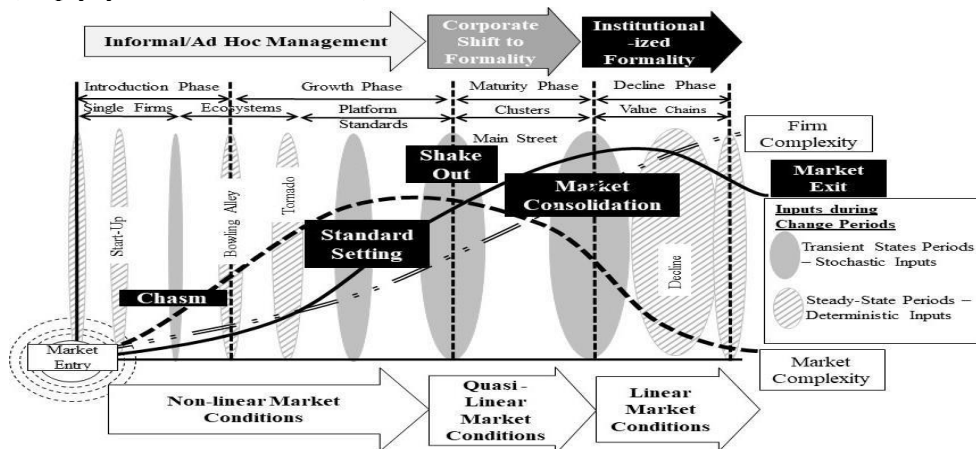


Figure 1: Complexity and the high-tech market lifecycle

Source: Kopyay, Mitchell, and Cohn, 2015

As the market continues to grow in complexity, many competitors will leverage various products, services, or technologies in order to establish a stronger position within the market and emerge as a market leader. In many ways these circumstances

set the standards for products or processes that firms are expected to follow. The market complexity will remain high until the shakeout occurs in the market, which will determine which firms will survive or fail (Koplyay and Mitchell, 2014b). Once the shakeout has occurred, the complexity in the market will decrease as the formalized market becomes standardized and commoditized. Beyond the shakeout, market pressures will drive a cycle of price reductions, eroding margins for firms. Likewise, many firms as they progress through the market lifecycle may seek to improve their internal efficiency by using software like Enterprise Resource Planning (ERP) to help the firm save time and money (Kot et al., 2020). Generally, product quality, reliability, and user-friendly products or services will be critical for long-term market success. As market maturity nears, strategic options will decrease until only cost leadership remains, achieved by reducing costs. Market share is built in early market phases and can be leveraged by large customer bases in the late market phases. A firm's lack of adequate market share can initiate a cycle where mergers and acquisitions are used to establish greater market traction (Koplyay, Paquin, and Bulger, 2006).

Notably, larger firms with relative market dominance like Apple will likely have an advantage in late market phases compared to their smaller counterparts (Balogh, Svec, and Wright, 2021). Larger and older firms tend to do better in later phases of the market lifecycle as they have greater capacity to create more jobs, pay higher wages, have higher productivity, and lead innovation development (Atkinson and Lind, 2018). However, firms regardless of their size cannot grow indefinitely in the market. At a certain point, economies of scale will show decreasing returns and internal transaction costs increase. When these two trends meet, a firm's growth will stall and internal decision-making will slow down, hindering a firm's ability to respond to emerging issues timely. Firms can help mitigate this slow down risk by preparing and implementing decision-making strategies. For instance, firms can reflect, explore, and ultimately determine areas for improvement like excessive transactional costs that could occur from significant delays emerging from withheld internal resources or setbacks executing tasks. A firm's market scanning mechanisms should be capable of identifying elements that support long-term market success. These elements can include financial excesses that can be reduced, market related maneuvers that can minimize market decline, the possible consequences of holding large assets when markets crash, the mapping of relevant competitors' market-related activities, and forecasting possible strategies that can amplify further market growth.

Once firms reach market maturity, the market will largely dictate how long this phase will last, with the firm's product, services, or structures exerting some level of influence on potential outcomes. In addition to preceding market circumstances, mature firms can have a two-way internal flow of decisions occurring simultaneously, which can result in a top-down flow alongside bottom-up osmosis of strategic options. The former captures senior executives' views of intended

strategies and the latter mingles strategic options with intended strategies to create an emergent overarching strategy (Mintzberg, 1980).

Evolution Of The Decision-Making Process

Overall, opportunities in the market can manifest or dissipate instantaneously with unpredictable frequency and firms must be attuned to profit when they are present. The speed and caliber of a firm's responses will determine whether their implemented strategies are successful or not (Kyzenko et. al., 2017). However, a firm's tendency to foster isolated closed internal information systems can result in degraded communication channels that ultimately can undermine their success in the market. Particularly, if the firm does not impart sufficient information, systems like negentropy can draw from relevant environments. In the short-term, firms can obtain superior information from a more open system like a relatively independent system. Likewise, it is beneficial for firms in the long-term to remain as open as possible to the flow of market information coming from a relatively independent system. Generally, the boundaries firms establish need to be selectively permeable to the flow of information to meet the informational needs of the firm's various departments.

However, firms should be aware about the risks and benefits involved in engaging with a relatively independent system; especially high-tech firms, which could be derailed by poor lead generation if adequate customer relationship management systems and data interpretation are not implemented (Tognoli, 2019). Essentially, firms must determine how open they should be with the relatively independent system in order to maximize benefits and minimize risks, such as establishing information filters to prevent the loss of a firm's organizational identity during the flow of market information. Fundamentally, the laws of market entropy compel firms to establish boundaries with the flow of market information and helps frame the decision-making process regardless of market volatility.

Additionally, some changes involved with market phases have a seismic impact on firms, such as start-up firms crossing the chasm towards greater market growth. Normally, before these start-up firms achieve larger market growth, they will focus on short-term market survival rather than strategically aligning themselves towards market dominance. This singular focus will typically shift as market dynamics rapidly change. However, this gradual progress of greater market dominance can be fraught with market-related challenges for firms. For instance, this intense period of market instability can push firms to exit the market due to factors such as market saturation, which is known as the shake-out. The shake-out normally occurs when firms experience market stagnation in the early maturity market phase and relatively low demand for the firm's products or services. Relevant firms gain a competitive advantage in the market by obtaining the most innovative, unique, and meaningful products or services to customers, compared to rival market competitors (Yi, Amenuvor, and Boateng, 2021). Table 1 below shows further information on how decision-making styles change throughout the lifecycle.

Table 1. Decision types, styles, and subjects through the lifecycle

PHASE	Start-Up	Growth	Maturity	Decline
Leadership Styles with Examples	Inspirational (Mindbridge)	Supportive (Shopify)	Logical (Hewlett-Packard)	Directive (Facebook)
The Organizational Culture	Creative	Supportive	Quality Focused	Control / Production
The Factors Involved with Decision Styles	<ul style="list-style-type: none"> ●Based upon entrepreneur’s Intuition. ●Emerging scenarios. 	<ul style="list-style-type: none"> ●Databases. ●Predictions and forecasting. 	<ul style="list-style-type: none"> ●Information Bases. ●Cause and effect analyses. 	<ul style="list-style-type: none"> ●Analytical bases. ●Specific targeting of results.
The Factors That Shape Decisions	<ul style="list-style-type: none"> ●Market opportunity. ●Market positioning. ●Competitor’s moves. ●Attracting V.C.s ●Positioning for growth. ●Revenue growth. ●Innovation. 	<ul style="list-style-type: none"> ●Work/Supply ecosystems and chains ●Debt/equity management. ●Market share growth. ●Middle line margins growth. ●Product quality, reliability, and cost. 	<ul style="list-style-type: none"> ●Asset base utilization. ●Bottomline profitability. ●Market share stability. ●Mergers and acquisitions. ●Cost leadership. ●Competitor benchmarking. ●Production. ●Logistics. 	<ul style="list-style-type: none"> ●Re-investment. ●Avoiding sunk costs. ●Competitors abandoning market. ●Legacy systems servicing. ●Financial external market opportunity.

Source: based upon Rowe et. al., 1999; adapted from Goldsmith and Koplyay, 1998

Strategic Controls In Decision-Making

Strategic controls are key drivers for implementing corporate plans, whether on a project or operational basis (Lorange, Morton, and Ghoshal, 1986). Managing the evolution of a simplifying market and increasing internal firm complexity does not exactly occur on a strict timeline; firms may be required to make market-related decisions when multiple situations are incongruous. When a firm becomes more complex, such as “multi-faceted and multi-dimensional”, it becomes vital for them to have a monitoring and performance measurement system in place to report on the various critical factors influencing the firm’s success in the market (Lorange, Morton, and Ghoshal, 1986). For instance, the performance of Meta’s costly implementation of the recent and unproven *metaverse* remains to be evaluated based on the company’s investment to yield are turn on profits. Firms do not need to undertake such risks as there are alternatives that can be pursued. Firms can actively monitor market progression and make adjustments to strategically align themselves with ever-developing changes. For example, firms can design a system with

feedback safeguards that can automatically implement adjustments in cases of plan deviation.

Firms will require to have in place accurate measurement metrics and timely interventions to effectively manage a system that actively monitors and enables strategic adjustments. In this way, firms undertake a proactive role rather than reactively responding to market changes. Normally, a passive management control style is perceived as being more responsive but less costly for firms compared to their active counterparts. However, strategic controls in place can result in beneficial outcomes for firms over time, which can justify their use. Namely, the implementation of business plans through strategic controls can assist firms by avoiding costing unforeseen market failures. Overall, active controls are linked to the amount firms invest into various endeavours as well as the capacity to manage unintended outcomes.

Exercising Control

Firms will likely contend with more rigid market conditions and comprehensive frameworks that will limit how they can perceive, define, and implement decisions. For instance, an entrepreneurial firm in the early lifecycle will likely proceed intuitively in its strategic market choices and will focus on its efforts on maximizing speed and effectiveness. Generally, the relatively low levels of formality and complexity within firms enable them to quickly make and implement decisions at a high frequency rate. This is possible as firms with informal structures contend with fewer bureaucratic channels decision-makers and thus can act faster. However, less diverse sources of information come with particular risks as decisions firms may make could be incompatible for the current market circumstances. However, a firm with high market growth can recover from an occasional stumble in the market.

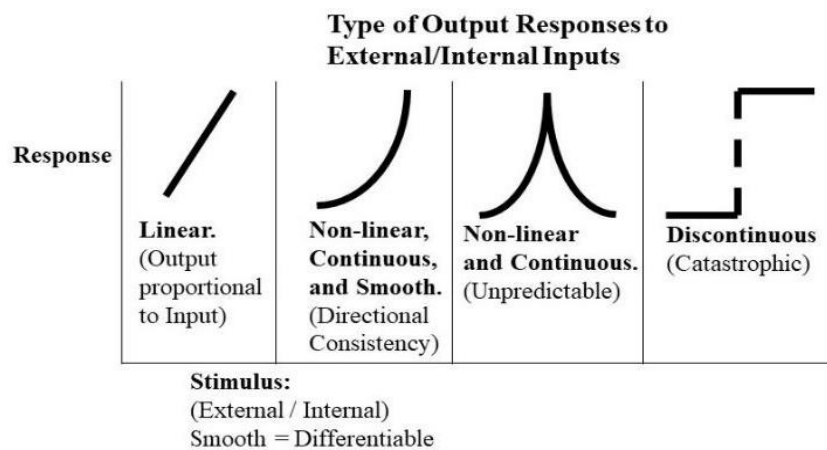


Figure 2: Output responses
 Source: Kopyay own work, 2023

Generally, there are four strategic scenarios where firms can exercise controls within the different management style, illustrated in Figure 2 above. A linear response occurs when the firm reacts in a rather simple and proportional manner compared to its inputs, whether its internal or external. A non-linear response is continuous and disproportional compared to the firm's output; normally, it must be larger in scale. In both scenarios, the linear and non-linear responses are typically predictable with minor differences present. In general, progression of emerging events in the market are predictable for firms. As long as firms plan accordingly, they can overcome various market challenges.

Decision Factors

As firms progress in the market, they will encounter the chasm (Moore and McKenna, 1995), which arises as early adopters to newly emerging market segments revel in the disruptive nature of innovative products, services, or technologies. These early adopters can benefit from the lack of market competitors in these newly emerging market segments and expedite their market dominance. Once the market matures, firms in this phase will actively seek out well-priced products or services with high reliability and quality for customers. Once the early majority arrives, the complexity of the market starts to decrease and the internal complexity of the firm continues to increase. Essentially, firms and associated parties need to be able to implement strategies that can adapt to emerging changes in the market.

However, many start-up firms fail to consider the suitability of various business strategies that could be applied for different market conditions. Likewise, the ability for firms to timely adapt to market change can become increasingly impaired as the firm's internal complexity rises alongside market progression. For instance, firms will likely choose and begin to target their services or products towards particular market population segments as they progress through the market. Table 1 shows further information.

The tailoring of services or products to satisfy particular population groups is known as concurrent engineering, which can impose unique challenges for firms. As new products or services are being invented by firms, the newly proposed features can be superimposed upon pre-existing ones, thereby creating particular boundaries for firms with the product design process. While these boundaries can delay product or service market introduction, there is no penalty for firms with high market growth as the customer profile remains stable and predictable. Likewise, it may be advisable for firms to diversify their customer base as existing customers may not be repeat clients, which can in the long-term erode sales margins. To help mitigate this risk of sales erosion, firms can utilize various economic models as these models can provide firms with some power to predict and control various market variables. The predictive nature of these models is partly based on the generation of forecast data, such as the volume of sales.

Additionally, these economic models will normally evolve into theories of market dynamics, such as consumer behavior. Overall, a firm's early market decisions have to be effective as to enable them to quickly implement strategies that can strategically position the firm within the market; and if necessary, reposition them in accordance with emerging market changes. Figure 3 shows the evolution of decision-making through the high-tech lifecycle.

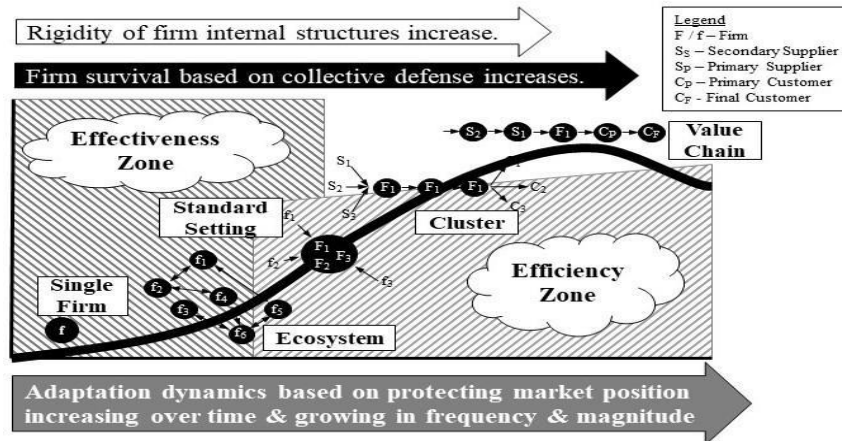


Figure 3. The decision zones of a market
 Source: Adapted from Kopylay, Mitchell, and Cohn, 2015

Factors and Influences on Discipline-Specific Decisions

Another means for firms to analyze the decision-making process is to segment the various market variables into the internal and external functional structures of the firm. Also, various market conditions can foster different management styles from firms. For example, dynamic market periods promote an entrepreneurial management style whereas less active market periods will foster a conservative management style (Matejun and Mikolas, 2017). Likewise, the increase of a firm's internal complexity and the eventual market decline challenges all decisions within the decision-making process as there is a high probability for the firm and the market to be misaligned.

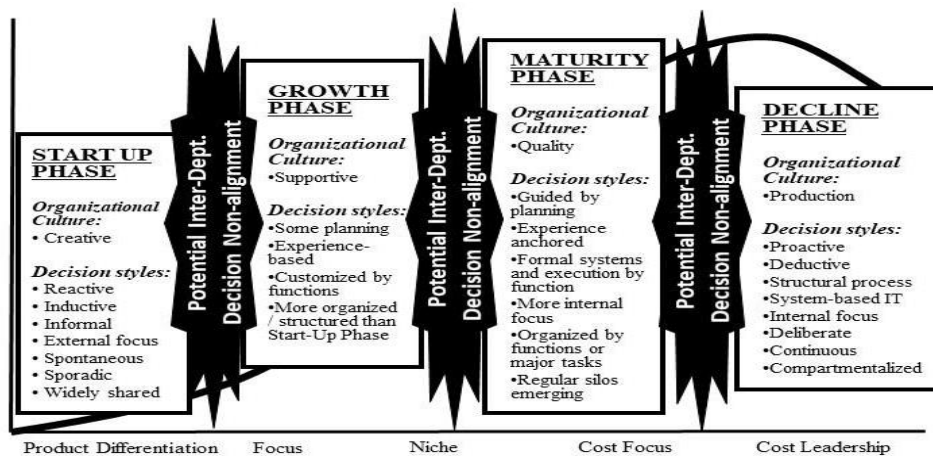


Figure 4: Profile of decision making across the lifecycle

Source: Adapted from Rowe et. al., 1999; Goldsmith and Koplyay, 1998

Firms can use the fuzzy edges to analyze the potential leads and lags between the different functional components within the firm during periods of relative market inactivity. These leads and lags may not be entirely driven by the firm’s internal and external conditions. For example, delayed decision-making and unresponsive management could foster leads and lags within the decision-making process. While start-up firms may be more immune to leads and lags, firms in late market maturity and market decline are more vulnerable due to their highly bureaucratic internal structures, which can increase the likelihood of chronic delays to implement strategies. Essentially, start-ups can be less prone to leads or lags in the decision-making process., but can be more vulnerable to poor decision execution in the market compared to their more established counterparts (Shpak et. al., 2022). Figure 4 shows the fuzzy edges in the decision-making process throughout the lifecycle.

Product development decisions

Start-up firms are normally dominated by its product designers as they are the critical links for the firm to connect with the relatively small innovator and early majority customer bases, which tend to be insistent on acquiring the most innovative technology available. However, product design will eventually lose its pre-eminence within the firm during periods of market decline and compel leadership to focus on marketing efforts instead. At the very early start-up stage, firms tend to not utilize marketing as much as in later stages as customers will independently seek out the firms’ products or services. Normally, product developers associated with firms in the growth market phase will hone their skills by simplifying designs, improving reliability and performance, and reducing costs.

This type of shift in strategy is known as the “cross-over decision points” within the firm, of which the decisions are based on signals off the changing foundation. Product design never fully recovers from this loss of influence within firms unless the firm emerges into an innovation driven niche market after the market shakeout

phase. For instance, Apple's co-founder Steve Jobs' drive to produce the most innovative products was and still is driving the company's success to date (Segall, 2012).

Marketing decisions

Firms will typically pursue promising sub-markets and build channels to associated customers once they move past the chasm market. Once firms establish these channels, marketing strategies will aim to pursue two objectives; the first is to emphasise the gathering of market intelligence, and the second is to distribute their products or services. Market intelligence can benefit firms by illustrating how the early majority of customers are using their products or services as well as identifying what alternative uses such products or services could have for these customers. This is a classic application of the "Job-to-Be-Done" theory, which views a customer's engagement with products or services as a means to accomplish particular tasks (Christensen et al., 2016). This relation emphasises how important it is for firms to understand how their customers engage, use, and expect from their products and/or services, as to most efficiently align with market demands and maximize profitability.

Also, once firms enter market maturity and have significant production capacities in place, their marketing capabilities typically focus on maximizing production volume with customer orders. Firms in this situation will usually aim to strike a balance between having enough customer orders to remain productive while ensuring products /or services do not suffer from meeting quality standards in the process. Some firms will aim to diversify their production line, which undermines the quality of products or services in an effort to maximize sales without consideration for the means of production.

Finance decisions

Entrepreneurs of start-up firms will usually assume finance responsibilities due to the relatively low complexity occurring within the firm and its corresponding market space. Also, a firm's largest early step in relation to the market is to increase their internal complexity by hiring financial staff. Likewise, this specialized hiring process is typically initiated when the firm attracts venture capital funding, which often begins right before market growth when the firm gains market traction through the bowling alley and tornado, and product research and development. When their growth ramps up, the capital allocation process becomes more structured and disciplined. As a result, the firm's specialized finance group starts to impose bureaucratic and more rigid structures on the firm's personnel like the product developers and marketers. These rigid structures are established by the finance group, setting a return-on-investment expectation on their firm.

Once the firms enter market maturity, financial efforts will generally concentrate on gaining further market share, innovative capacity, or entry into new markets through mergers and acquisitions. For instance, mobile payment company Block Inc.'s, market growth strategy to expand into the restaurant industry was a good method for diversification and increased market dominance. Overall, larger market shares

should translate into more efficient economies of scale for firms and a superior execution of cost leadership strategy within the mature market. However, the process involved in gaining larger market shares requires firms to have defined structures and a relatively large staff to administer daily operations. Within the late mature market or market decline, a firm's financial efforts will normally shift towards boosting their cash flows to maximize profit margins.

Logistics decisions

The mature and declining market is all about maximizing profit margins for firms. The mature market solidifies after standard setting is established. For example, the concepts in Porter's Five Forces Model (1980), uses logistics to amplify leverage over suppliers as a means to extract excess economic rents by creating hard value chains. Likewise, the top three priorities for small and medium-sized firms will normally relate to the quality of their products or services, meeting delivery schedules, and the price and cost of their products or services (Ferreira and Silva, 2022). In this process, the role of suppliers within the supply chain is minimized, so suppliers and firms become increasingly dependent on their customer base. Within particular circumstances, customers and particularly stakeholders can exert sufficient pressure on firms and suppliers to such a degree that corporate behaviour may be altered to meet their demands. Given this dynamic, larger firms tend to focus on relationship cultivation and achieving beneficial relationship-based outcomes, but suppliers tend to be smaller in scale and less powerful and are more inclined to protect their investments by building information networks and growing joint relationship endeavours (Nyaga et.al., 2010; Kozma, 2017). Figure 5 showcases the evolution of relationship cultivation from the start-up to the mature market.

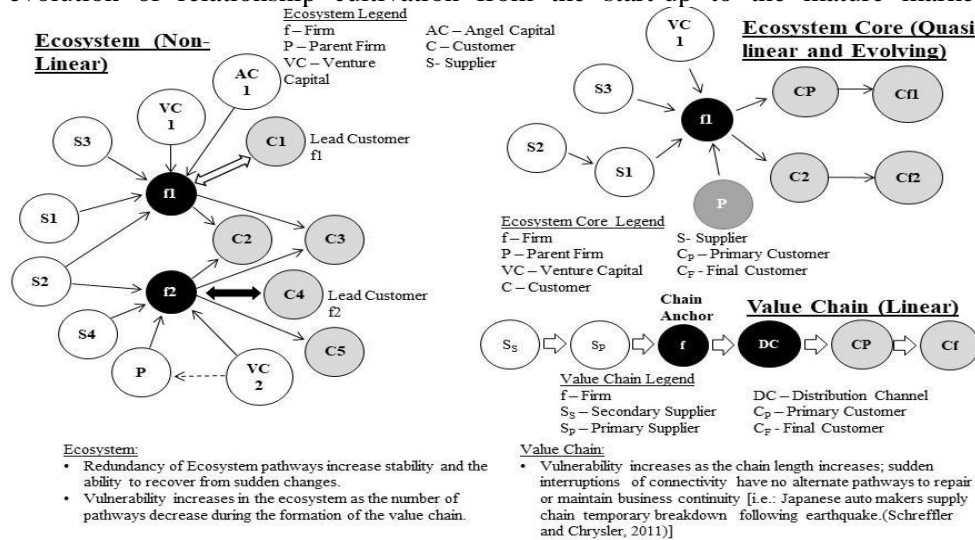


Figure 5: Evolution of market and value chain structure and participants

Source: Koplyay and Mitchell, 2014b

Human resources decisions

Early in the lifecycle, a firm's human resources (HR) personnel will contend with a relatively small number of employees and will usually aim to recruit the most innovative candidates, who are more likely to thrive with minimal supervision and guidance. To retain employees, firms will often utilize lock-in contracts that obligate employees to work for them for a set period of time. Once employees are locked-in, the firm's HR personnel can proceed with their employee training. Training does not normally begin before employees are locked-in as they could leave before the firm can recoup their investments.

However, despite lock-ins, it can be difficult for firms to retain talented individuals. Firms can provide additional benefits to attract promising candidates like giving employees stock options, supporting them with educational opportunities, retirement benefits, and bonuses based on their level of seniority. These incentives can assist firms in attracting desirable candidates and being able to retain them long enough for the firm to generate sufficient profits based on employee labour. Although not all firms will be in a position to provide these benefits, those with high market growth are the most likely to implement these types of employee retention tactics as there is structural and financial capacity to do so. Overall, the focus of a firm's HR department will be focused on external recruitment to concentrate on managing internal affairs.

Production decisions

Production is an important element for firms to consider. Within the early lifecycle start-up phase, firms will have to proceed with their production efforts on a relatively small scale, where their entire personnel or staff will often be required to assume multiple functions. In the early market growth phase, the outsourcing of a firm's production needs often enables them to operate with a variable cost model by delaying significant investments into fixed assets. Furthermore, a firm's production strategies normally proceed through market progression incrementally and often uses market techniques like Total Quality Management (TQM), which encourages non-disruptive small asset changes that resists disruptive market behaviour from firms. Normally, firms have limited interest at this stage to expand their production operations beyond cultivating their supplier network. As the firm's revenue grows and their dependencies on suppliers increase with market progression, a change to the firm's internal production operations may occur to gain greater control over their manufacturing processes like product quality. Usually, a firm's efforts to shift towards greater production insourcing occurs as a result of the firm being pressured to meet higher quality demands by the early majority. Further demands are less likely to be placed on firms as the perception of customers regarding products or services is mainly based on efficient production lines that can meet their material needs.

Key Points In Decision-Making

An interesting consideration for firms regarding their decision-making process is the various variables dealing with differing benefits and risks that can influence the

firm's market progression. Generally, a firm's production operations, HR strategies, and product development possess reliable flows of data for the firm and are low risk when it comes to the decision-making process. Essentially, these variables will not often result in a firm implementing poor market-related decisions. However, a firm's marketing strategies, finance planning, and logistical operations are high risk; and as such, require firms to pay particular attention to them as to avoid costly mistakes. Normally, the risks associated with marketing, finance, and logistics, are related to the leads or lags present within the firm's decision-making process. Additionally, a firm's marketing strategies could be particularly vulnerable as there is increased exposure to the full dynamics of the changing market compared to logistics and finance, which could result in marketing strategies losing their traction with their targeted audiences.

As firms enter into the mature market, their size and influence tend to increase. For instance, at the beginning of the lifecycle, the ecosystems among market firms generally fosters the establishment of product standards, which are aimed at preventing competition from entering their market space. Likewise, these firms tend to cooperate on product development and lobby efforts with the government for research support, investments, and market protection. Gradually, the cooperation amongst firms becomes more competitive, until full value chains emerge with their competitive logic. For example, in the early 2000s, JDS Uniphase leveraged their value chain to obtain market dominance over competitors. This particular example illustrates the dilemma of a long value chain with several centers of gravity. At the downstream end, the firm's focus is on their marketing strategies, employees, products/service, profit margins, and the refinement of their products or services. While the upstream end is focused on the firm's assets, production operations, logistics, and volume of sales. Overall, firms must remain vigilant and mindful of the various variables within the decision-making process as many of these elements can affect market progression.

Conclusion

Whether formally acknowledged or not, the high-tech lifecycle has been present and operating within the market for a long time. Essentially, the high-tech lifecycle follows market phases, progressing from the emergence of start-ups to firms experiencing market growth, firms achieving market maturity, and firms eventually experiencing market decline. This paper expands upon the understanding surrounding internal and external factors impacting the mode, quality and consequences of the decision-making process throughout the high-tech lifecycle, the complexities related to firms and within the market, the evolution of the supply chain, and the need for firms to align their decisions with the respective market phase. While complexity is not necessarily the prime focus of this paper, complexity cannot be separated from the decision-making process within high-tech markets and should be included to enable a comprehensive understanding of the high-tech lifecycle.

There is no one approach that firms can use to rectify specific challenges they can face within the market. To this effect, there are common remaining critical internal and external factors that will likely impact the mode, quality, and consequences of the decision-making process. Given the relatively predictable nature for certain market elements to occur, firms can predict, plan, and implement the most appropriate means to reduce market-related risks and maximize beneficial outcomes. These findings contribute to improving the understanding of critical internal and external factors that impact the mode, quality and consequences of the decision-making process according to the high-tech market lifecycle, helping firms identify, anticipate, and adapt to change.

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CYKL ŻYCIA I EWOLUCJA PROCESU DECYZYJNEGO FIRM ZAAWANSOWANYCH TECHNOLOGICZNIE

Streszczenie: Ewolucja procesu decyzyjnego w dziedzinie zaawansowanych technologii zostanie zbadana poprzez cykl życia rynku zaawansowanych technologii. Wprowadzono nowatorską koncepcję "rozmytych krawędzi", aby zdefiniować fazy podejmowania decyzji w cyklu życia rynku zaawansowanych technologii. Ponadto na sposób podejmowania decyzji przez firmy mogą wpływać różne czynniki, począwszy od wewnętrznych grup dyscyplinarnych, konkurentów rynkowych, a skończywszy na przywództwie kosztowym i stale rozwijających się warunkach rynkowych. Celem niniejszego artykułu jest zbadanie czynników związanych z wewnętrznymi grupami dyscyplinarnymi, ponieważ mają one największy wpływ na zmiany w procesie podejmowania decyzji w całym cyklu życia. Teoria ugruntowana została wykorzystana do konceptualizacji wpływu wewnętrznych grup dyscyplin na proces decyzyjny w całym cyklu życia i do przedstawienia wyników sugerujących, że wiele krytycznych czynników wewnętrznych i zewnętrznych firm wpływa na tryb, jakość i konsekwencje procesu decyzyjnego.

Słowa kluczowe: cykl życia zaawansowanych technologii, proces decyzyjny, granice informacyjne przedsiębiorstwa, kontrole strategiczne, ewolucja przedsiębiorstwa

生命周期与高科技企业决策过程的演变

摘要：将通过高科技市场的生命周期探索高科技决策过程的演变。一个新颖的概念·模糊边缘·被引入来定义高科技市场生命周期中的决策阶段。此外，公司决策的方式可能受到各种因素的影响，从内部纪律小组、市场竞争者到成本领先和不断发展的市场条件。本文的目的是探索与内部学科组相关的因素，因为这些因素往往对整个生命周期中决策过程的变化影响最大。扎根理论用于概念化内部学科组对整个生命周期决策过程的影响，并报告发现表明公司的许多关键内部和外部因素影响决策过程的模式、质量和结果。

关键词：高科技生命周期·决策过程·企业信息边界·战略控制·企业演化