



MIT Sloan School of Management

MIT Sloan School Working Paper 6957-23

Competitive Dynamics — Winning in Technology Markets

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COMPETITIVE DYNAMICS – Winning in Technology Markets

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ABSTRACT

A series of models and examples demonstrate the “why-what-how-when” discipline for strategic management. This approach emphasizes the importance of context – the business landscape in which strategies succeed or fail. The causes and implications of three interconnected sets of dynamics are explained: competition within a generation of technology or business model; competition between generations of technology or business model; and competition over multiple cycles of innovation, investment, demand growth, and profitability. Think of them as waves nested within waves. Winners understand, anticipate, and influence these market dynamics. They stay ahead of the dynamics, building trust-based relationships and exploiting the learn more/serve better model. Examples are drawn from energy, financial services, telecommunications, and aviation markets. They show how the framework can be used to develop and execute winning strategies, how it can guide the successful reinvention of a market participant, and how it can illuminate the objectives of competition and the definition of winning. The causes of commoditization and strategic options for contending with a commoditized market are analyzed. Technology is an enabler. It increasingly is in the background, making things easy and seamless for customers, providing a superb customer experience, personalizing relationships, and customizing products and services. A business reinvention specialist explains why it is difficult for large organizations to innovate in an ongoing manner and how they can innovate without having to change core processes or culture.

Key words: competitive strategy, market dynamics, innovation, technology adoption, commoditization, System Dynamics

Preface¹

The advent of Covid-19 in 2020 marked an inflection point in human history which is likely to be regarded in retrospect as significant as an event as the transformational pandemics of history such as the Justinian Plague and the Black Death. While the mortality rate of Covid-19 as a percentage of the global population is relatively low compared with historical pandemics (the Black Death is estimated to have killed 40% of the then world's population), one major defining characteristic of Covid-19 is that it is the first global pandemic of the Fourth Industrial Revolution – the so-called digital age.

One of the most significant and immediate consequences of Covid-19 was that social distancing transformed working practices for cognitive activity in the developed world pretty much overnight from being office-bound to remote working. The centralised office model that took some 150 years to evolve to its current form was not just challenged but in the majority of cases this model was comprehensively demolished, with remote working from home becoming widespread in the UK and in many other developed economies. While remote working from home started out as a temporary expedient, with the abatement of the Covid-19 pandemic, remote working from home for at least two days a week has become the norm for many office workers in the UK. This is just one example of how Covid-19 has become a powerful accelerant for change, particularly so far as the digital economy is concerned.

The 30 years preceding Covid-19, starting with the first web browser created by Sir Tim Berners-Lee in 1990, saw the relentless rise of digitally-based enterprises that in most cases simply did not exist in 1990. Built on the foundations of the Third Industrial Revolution which brought the proliferation of electronics, computers and telecommunications, the digital age that started at the turn of the millennium has seen almost every aspect of economic endeavour challenged and transformed. This was more often than not done by entirely new companies. By the autumn of 2020, the five largest publicly traded companies in America were Apple, Amazon, Alphabet, Microsoft and Facebook. These five companies at that time represented more than 20% of the US stock markets' total worth.

The impact of these and other new tech companies and their underlying technologies have disrupted and in many cases destroyed the operational and economic models of businesses across the globe that saw neither the threat nor the opportunities that the wave of new technologies presented.

Over the last two decades, we have seen the rise and rise of social media as the facilitator of both social and political change, the migration of computing power from deskbound PCs and laptops to mobile devices and data migrating from physical hard disks to the Cloud. Social media, hand-held devices and Cloud have now become the new technological norm and while all three will continue to flourish and develop, I believe the next 10 years will see technological innovation dominated by three new additions to the line-up of defining digital technologies. They are Distributed Ledger Technology (DLT) of which Blockchain is a sub-set, Artificial Intelligence (AI) and the Internet of Things (IoT).

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It is worth noting that each of these technologies have been around for quite a while, at least in terms of the relatively short timeline of digital computing. AI, based on the primitive computing of the day, emerged as a defined academic discipline in 1956. The first example of IoT was an internet-connected Coke machine in 1982. The structure of DLT was first conceived in 1991. Why have these rather ancient technologies now come into prominence around the same time? The answer is the combination of a huge increase in available computing power of individual devices (and even more vast power with these devices forming peer-to-peer networks) and the equally vast proliferation of data and its availability. These two elements are the catalyst of the digital age.

While AI, DLT and IoT each deliver standalone functionality, each also has the potential to interact with either or both of the other two. Paradoxically, this complementarity arises from the fundamentally different characteristics of each of the three technologies. Each over the next ten years individually and in combination will have a huge impact on both the global economy and the way we live. As with their predecessor enabling technologies, these new digital age technologies will bring significant positives along with new challenges, for businesses and governments and also in social and political arenas.

There are already a significant number of real-world examples of combinations of the three technologies of DLT, AI and IoT. For example, in the case of AI and IoT, Rolls-Royce launched in 2018 its IntelligentEngine vision with an aircraft engine that is "connected, contextually aware and comprehending." This is based on advanced data analytics of the real-time output of thousands of aircraft engines and AI using machine learning.

Another example is ScanDiags. This is a service that automates MRI interpretation and documentation. ScanDiags builds machine learning algorithms that save time and money and help improving clinical quality by automatically interpreting medical images and other healthcare information. ScanDiags says "these algorithms are integrated into clinical and business processes at health providers of any size, at manufacturers of artificial body-parts, at manufacturers of radiology equipment, at government agencies overseeing national and regional healthcare systems, at insurances and at educational organizations that train clinicians and radiologists. In day-to-day clinical work, our algorithms unburden medical professionals from repetitive and thus quality-challenged work and analyse and leverage more clinical information than ever to lower health providers' costs."

For businesses, from an operational and economic point of view, the digital age technologies will deliver huge productivity gains with emerging economies getting disproportionate benefit as there will be less legacy infrastructure to hamper early adoption and technical intellectual capital is now disseminated literally at the speed of light.

As in the case of ScanDiags, all three of the new digital age technologies will bring about major changes in the way work and how processes are carried out, with the elimination of whole swathes of activity previously carried out by humans or the activity being carried out by smart machines, bots or smart processes, most of which will be based on AI applications. It is now recognised and accepted this will mean significant change in the nature of work and with

that, social and political change. In many respects, the major challenges for the future will be how this social and political change is managed rather than the harnessing of the new renaissance technologies.

So what of the future? Will the disruptors be disrupted themselves? Over the last 20 years, the dynamics of competition within global markets have changed beyond recognition and this paper provides some fascinating insights as to how this change came about and lessons learned. Whether the disruptors will fall into the same traps as their predecessors remains to be seen but what is certain is the world in 2035 will be very different from what it is today and we will see even more change in the next 10 years than we have seen in the last three decades.

Introduction

Winners understand, anticipate, and influence the dynamics of competition. These dynamics are complex. They operate over multiple time frames ranging from days to decades. They involve the interactions of products and services, generations of technology, companies, and markets. And they determine the evolution of value chains, dominant business models, and market leaders. The market dynamics create the landscape in which strategies succeed or fail.

The structure of technology markets determines their behavior.² The most influential elements of structure include circular relationships, where chains of cause and effect close on themselves over time. For example, satisfying customer experiences build trust, which leads to a more open relationship between a supplier and its customers, which enables the supplier to serve its customers even better. Think of how we let Amazon, Google, and Facebook collect and use vast amounts of personal information. Engineers call these circular chains feedbacks.

Inherent in the feedbacks are delays that separate cause and effect. It takes time for customers to build trust in a supplier, for a supplier to learn more about customer needs and refine its products or services, and for customers to perceive and appreciate the improved experience. Delays are the second important element of market structure. And the relationships between cause and effect often are non-linear. Examples are thresholds (you need a critical mass of customers for word of mouth recommendations to become significant) and diminishing returns (the productivity of R&D frequently declines when a generation of technology matures). Non-linear relationships are the third key element of market structure.

Together feedbacks, delays, and non-linearities shape the complex behavior of technology markets. Some of the resulting dynamics are primarily within a generation of technology, for example, the learn more/serve better development of extraordinary customer experiences in financial services. Other dynamics characterize the interactions between two or more generations of technology, for example, the adoption of new technologies, emergence of dominant standards and business models, and commoditization one sees in media markets. And still others occur over multiple generations of technology, for example, evolution of the value chain and the transformation of organizations and entire industries in the area of personal mobility.

² Forrester (1961).

These competitive dynamics define the relationship between innovation and market leadership. They determine the windows of opportunity to introduce innovations into the market, the incentives and capabilities for established incumbents to innovate, and thus their vulnerability to disruption by new market entrants. And they determine the commercial success of an innovation and economic and social value it creates. As the dynamics unfold, the winners transform their value propositions and sources of advantage.

A series of models and examples will demonstrate the “why-what-how-when” discipline for strategic management. This approach emphasizes the importance of context – the dynamics that are shaping the business landscape. The market context should determine the rationale for the strategy, i.e., the assumptions on which it is based and its objectives. Strategy development should be top/down and outside/in.

Why → What → How → When

- Why – context; *technology, social change, regulation*
- What – strategy; *customers, needs, value propositions*
- How – execution; *business model, capabilities, partners*
- When – timing; *market conditions, prerequisites, adjustments*

Figure 1: A Framework for Strategic Management

The strategy must be dynamic, anticipating the evolution of customers, their needs, the value chain, and sources of competitive advantage. Using information to serve customers better is central to successful competitive strategies. Flawless strategy execution builds the trust required to have access to sensitive customer information and license to use it. And it is essential to get the timing right. Getting too far ahead of your customers is as dangerous as lagging behind.

Waves Within Waves

The market dynamics create the landscape in which strategies succeed or fail. There are three interconnected levels of competitive dynamics, each defined by its time parameters and periodicity. Think of them as waves nested within waves.

Competition within a generation of technology or business model – competition focused on price and service quality; results in changes in market shares, leadership, and stability; new entrants challenge incumbents, e.g., internal combustion car, fixed line phone, mainframe computer; key dynamics: learn more, serve better

Competition between generations of technology or business model – competition focused on technology performance and cost; results in the emergence of dominant standards, designs, and business models; platform plays with powerful

network effects, e.g., electric vehicle, mobile phone, personal computer; key dynamics:

- adoption of new technologies
- emergence of dominant standards, designs, and business models

Competition over multiple cycles in innovation, investment, and profitability – competition focused on new customer behaviors and needs; results in changing sources of advantage; redefinition of the value chain; transformation of products into solutions, e.g., mobility, artificial intelligence, cloud computing; key dynamics:

- commoditization
- unbundling the value chain
- restructuring of companies and industries

The long-term industry dynamics are characterized by recurring cycles in investment, capacity utilization, price competition, and profitability. Often, there are multiple cycles over 20-50 years. Competition becomes increasingly intense leading to commoditization of the principal products or services and their enabling infrastructure. The dynamics are amplified up the supply chain, causing violent cycles of feast or famine for suppliers. They typically result in industry consolidation. The dominant incumbents are vulnerable to new market entrants with innovative business models. They are victims of active inertia.³ These long-term dynamics can be seen in many capital intensive industries, for example, telecommunications, airlines, energy, automotive, and pharmaceuticals.

The mid-term dynamics define the life-cycle of a generation of technology. The entry of firms into a market and the subsequent exit of many or most competitors are central to the dynamics. The large number of firms generates a high rate of experimentation and innovation which drives improvements in cost and performance and accelerates adoption of the new technology. As the market becomes more crowded, the intensity of competition increases. A dominant design and standards emerge and a wave of companies leave the market. The focus of innovation shifts to the process for producing the product or service. The survivors pursue economies of scale. These dynamics typically occur over 10-20 years. There are many examples including digital cameras, media players, wind energy, and biofuels.

	<u>Short-term</u>	<u>Mid-term</u>	<u>Long-term</u>
Focus:	products and services	business models	behaviors and needs
Advantage from:	price and service	cost/performance	relationships
The prize:	market stability	dominant design	value chain
Examples:	internal combustion car fixed line phone main frame	electric vehicle mobile phone personal computer	personal mobility artificial intelligence cloud computing

Figure 2: Examples of the Three Waves

³ Sull (1999).

Competition Within a Generation

The short-term dynamics of competition occur within a generation of technology, for example, fixed line telecom services, ethanol-based biofuels, VHS video cassettes, and internal combustion powered cars. Competitors offer similar products or services whose performance improves incrementally over time. Competitive position is primarily determined by price and service quality. And the prize is market stability defined in terms of prices and margins.

The market often becomes crowded, with several waves of later entrants attacking the established incumbents. Price competition can be intense, making it very difficult to compete based on service quality. Price competition is amplified in markets that develop a wholesale level which enables asset-lite reseller to compete with vertically integrated suppliers. The challenge for a competitive strategy is how to build and defend market share based on service leadership. Consider the example of fixed line telecom services.

The first priority is to stabilize cycles of retail price competition. These cycles reverberate through the market. They drive cycles of profitability and investment in network infrastructure, and cause excess capacity to build up over time. Competitors must avoid becoming trapped in a “race to the bottom” where wholesale and retail prices converge on marginal cost – essentially zero. It is necessary to moderate price competition first. Then service can emerge as a major competitive factor.

The dominant incumbent has the leverage to improve discipline in the retail telecom market. A significantly more stable and profitable market results from the combination of:

- Moderating the effects of capacity utilization and competitor prices on retail price decisions;
- Basing retail price decisions primarily on unit cost, target profit margin, and the value-added capabilities of the core and access networks;
- Becoming significantly more conservative in forecasting demand growth and adding capacity to meet estimated future requirements; and
- Adopting higher profit targets, to incentivize value-added pricing and retain more of the benefit from increased efficiency.

This strategy represents a decision to give higher priority to defense of profitability than defense of retail market share. Over several years it would stabilize the cyclical market dynamics, slow commoditization, and create value for all participants. However the market leader cannot ignore its competitors. In order to affect the market dynamics its retail prices must be close enough to competitors to be relevant.

Investments in service differentiation should focus on wholesale platform capabilities. For telecom service providers, this layer is in-between the basic network layer, i.e., connectivity,

processing, and storage, and the customer-centric application layer, e.g., search, DRM, content management, and payments.

Platform capabilities are customer-centric, not product-specific. They provide components that enable customers to build the solutions they require. They support customers over the lifecycle of their relationship with a service provider, and thus have more predictable and enduring value than individual products and services. Platform capabilities enable configuration and pricing of services for customers who use the network infrastructure in quite different modes, for example, streaming video, downloading large media files, publishing, P2P content sharing, social networks, VoIP, and e-commerce. Their requirements for bandwidth, symmetry, immediacy, and security are significantly different.

The principal impact of platform capabilities is on reseller service quality. There are significant delays before these investments affect the competitive dynamics of the market. First, infrastructure operators must develop and roll-out the enhanced platform capabilities. Then, resellers must exploit the capabilities to improve basic service quality and develop new propositions. And finally, retail customers must recognize and respond to higher service quality. In the meanwhile resellers will fall behind their market share objectives and, unless the market is effectively disciplined, will resort to more aggressive pricing. Intense price competition would distract customers and “mask” service differences. That is why disciplining the market is the essential first step.

Successful competitors employ innovative business models that use customer information to create value. Trust plays a central role in the implementation of these business models. It determines what you can do with information, i.e., observe, capture, analyze, and use to create value. Customer information has become the most valuable asset, especially in commoditized markets. Trust is the essential prerequisite for the customer to reveal sensitive information, authorize use of this information, and welcome the results. In the absence of sufficient trust likely customer behaviors are deliberate deception, holding back, and fending off.



Figure 3: The Learn More/Serve Better Model

Trust is built through serving customers better, e.g., segmenting the market, personalizing relationships, and customizing solutions. Customer information management drives a dynamic model of relationship value. The model involves extremely powerful self-reinforcing mechanisms which can be either virtuous or vicious.⁴ Growing satisfaction and trust leads the customer to be more open regarding values and needs, and more willing to empower the

⁴ Weil and Weil (2001).

provider. As an empowered agent the provider can search, evaluate, advise, and implement on behalf of the customer. This “learn more, sever better” model is central to value creation in many markets. Trust is built over time through a series of great customer experiences.

Proactively demonstrating trustworthiness and accelerating development of trust-based relationships are top priority. In an article on customer relationship management Weil and Weil argue quite emphatically that trust is the prerequisite to empowerment. Customers must empower a service provider in order for the provider to serve them better and build more value in the relationship for both parties. Being proactive accelerates the creation and realization of this value. The specifics of the journey will be different across the customer segments. But the principal issues pertain to privacy and security of sensitive information.

Competition Between Generations

The mid-term dynamics define the life-cycle of a generation of technology. The literature highlights dynamics which are fundamental to the sources of innovations and their impacts on firms, markets, and industries.⁵ These dynamics include:

- Entry and exit of firms;
- Experimentation and innovation;
- Technology evolution;
- Improvements in cost and performance;
- Emergence of standards and dominant designs;
- Adoption of new technology;
- Network effects;
- Development of a mass market;
- Market growth;
- Market saturation;
- Intensity of competition; and
- Commoditization.

⁵ Utterback (1994).

The entry of firms into a market and the subsequent exit of many or most competitors are central to the dynamics of innovation. In the early stage of a new market or generation of technology the perceived opportunity is large. No firm is dominant. The product or service is not highly refined and there are many competing variations. As the number of companies in the market grows so does the rate of experimentation and innovation. The market is in a very fluid state where both suppliers and customers must contend with substantial uncertainties.

In the early stage of market development standards usually are rudimentary or unclear. Competing standards create risks for both suppliers and customers. At some point the dominant standards, design, and form factors emerge. These often are not the “best” from a technical performance or user perspective. But the tipping dynamics are powerful once they get going.

At this point the game changes dramatically. The focus shifts from experimentation and product or service innovation to refinement of the dominant design and the pursuit of efficiency and quality. Product innovation becomes incremental. Process innovation leads to large-scale, highly specialized facilities. In most markets only a small number of firms survive the transition. The others exit the market or are absorbed in one or more rounds of industry consolidation.

Costs decline and performance improves rapidly following the emergence of the dominant standards and design. The few surviving firms offer very similar products or services. Competition grows increasingly intense. Certainty about standards, greater availability of information, growing network effects, declining prices, and improved performance accelerate the development of a mass market.

As the market matures the product or service starts to “commoditize.” This term denotes a competitive environment in which product differentiation is difficult, customer loyalty and brand values are low, and competition is based primarily on price. Commoditization is driven by excess capacity. There are recurring cycles in investment, capacity utilization, prices, and profitability. In commoditized markets competition de-couples prices from costs, margins are highly sensitive to capacity utilization, innovation slows or stops, and the sources of sustainable advantage are less tangible, e.g., customer insights, use of information, and trust.

Competition between generations of technology is affected by both objective and emotional factors. Relative price and performance have a significant impact, particularly if the new generation of products or services better meets new needs or values of customers. Network effects can be quite powerful, where the value increases non-linearly as a function of the number of users. But fear and fashion also are important. Risk averse customers are hesitant to adopt a new and “unproven” technology. Will the performance be as promised? Will this become the dominant standard? Will my boss approve? Will my friends think it’s cool?

The dynamics of innovation are interrelated. Figure 4 centers on the number of firms in the market. The entry rate is determined by the expected growth and profitability of the market and availability of finance. In the early fluid stage of a new generation of technology the size of the prize is quite uncertain. Thus a “lemming effect” often occurs, where the inflow of entrants reinforces the impression that this must be the “new big thing,” attracts a large amount of investment, and thus encourages additional firms to enter the market. In a relatively short time

there can be a surprisingly large number of companies in the market. These self-reinforcing dynamics were conspicuous during the dotcom boom.

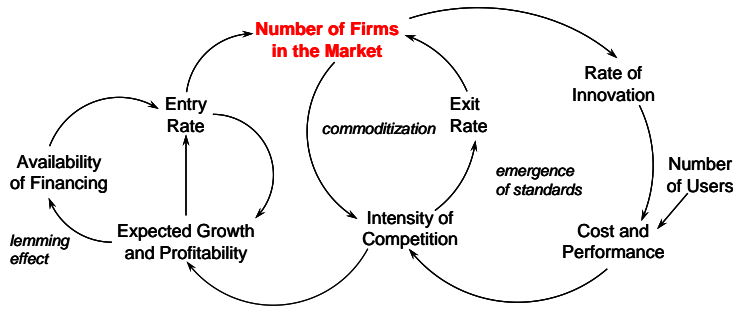


Figure 4: The Dynamics of Technology Adoption

The large number of firms generates a high rate of experimentation and innovation. This is the hallmark of the fluid phase. Continual innovation and the increasing number of users of a new technology drive improvements in cost and performance. But the diversity of designs and standards creates significant uncertainty. The need for standardization grows. Then the dominant standards, design, and form factors emerge.

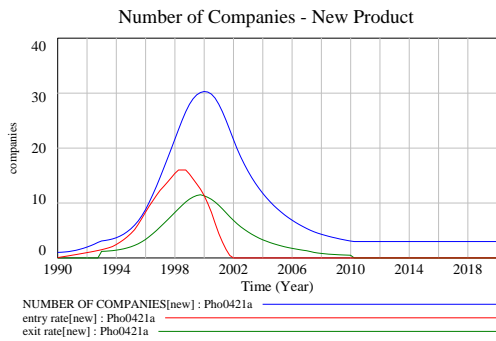


Figure 5: Number of Companies in the Market

The dynamics of technology adoption are captured in Figure 6. The adoption rate of products or services based on a new technology depends on both the number of potential users and their willingness to adopt. As discussed above customers' willingness to adopt a new technology depends on both objective and emotional factors, i.e., price/performance, network effects, and perceived risks.

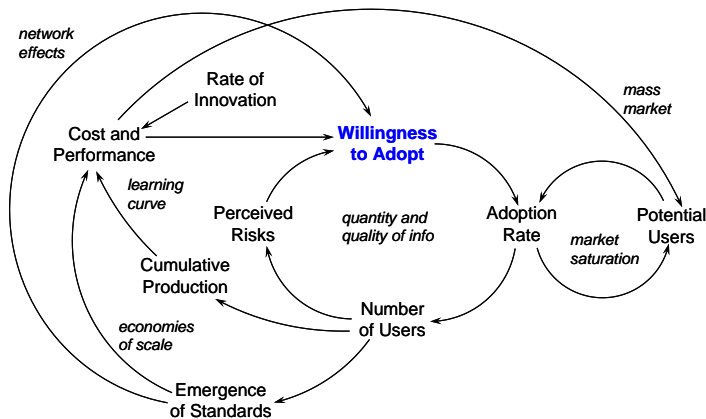


Figure 6: Willingness to Adopt

Unit cost generally declines and quality improves as a function of cumulative production. This is the so-called “learning curve” effect. Emergence of the dominant standards and design triggers industry consolidation, leading to a few large suppliers. They can realize substantial economies of scale, contingent of high levels of capacity utilization. During this transition phase incremental innovations continue to improve performance while process innovations improve productivity and quality. The emergence of standards also enables network effects.

The perceived risks of a new technology can be high in the early stage. It is unproven, and potential users have reason to be skeptical and cautious. Things start to change as the number of users increases. The quantity and quality of information about the new technology improves, allowing more confident assessments and decisions. Respected reference users legitimize a new technology and make its selection easier to defend. And products or services based on the new technology can become a fashionable “must have.” This happens in business markets as well as consumer markets, e.g., the rush by companies in the late 1990s to get on-line. Then the risk is of not adopting, of being seen as “behind the times” or “not getting it.”

Competition Over Multiple Cycles

The experience of many technology-based industries shows the existence of powerful long-term dynamics that lead to “commoditization” of products and services. These industries exhibit recurring cycles in investment, capacity utilization, prices, margins, and return on capital. Research at MIT more clearly defined the dynamics of commoditization and identified leverage points whereby a company could influence the effects of those dynamics on its business performance. A generic market dynamics model was developed using the System Dynamics methodology. It was used to analyze the behavior of a cross-section of markets at different stages of maturity and liberalization. Figure 7 is an example of output from this model.

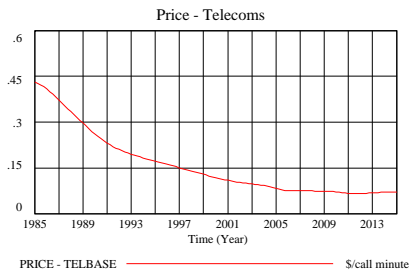


Figure 7: Telecom Price

A series of simulation experiments explored the impacts of technological trends and innovations on the dynamics of commoditization.⁶ How does commoditization change the incentives for investments in new capacity and technologies? How does commoditization alter the character of markets and their cycles? And how should a company adjust its technology and business strategies to various stages of commoditization? The simulations focused on three markets: air transportation, long distance telecommunications, and refined petroleum products. The development of these markets was analyzed over a thirty-year period. The dynamics of growth, cyclicity, and commoditization in each case were explained. By comparing and contrasting across the three cases significant differences in the drivers of the dynamics and, hence, the long-term performance of the markets were illuminated.

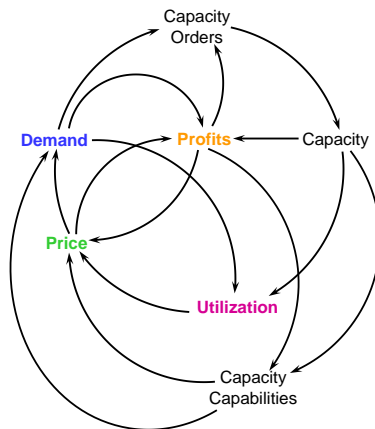


Figure 8: The Generic Market Model

⁶ Weil (1996); Weil and Stoughton (1998).

These results support the overarching conclusion that commoditization is driven by excess capacity. And they show that complex interactions over time among industry structure (e.g., the fragmentation and internationalization of markets), management policies (e.g., the response of pricing and investment decisions to capacity utilization and profitability), and technology strategy (e.g., the impacts of technology on costs and capabilities) underlie persistent excess capacity and, hence, commoditization.

The results also raise significant questions about cause and effect. Does commoditization erode and eventually destroy the incentives and capabilities to innovate? Or is it the consequence of inadequate investment in technology and innovation? The research shows that many factors are *both* causes and effects of commoditization. Significant technological progress is very important in mitigating commoditization, by stimulating greater demand, facilitating differentiation, and rewarding aggressive investors. The results raise a provocative conclusion. "Commoditization" easily can be a state of mind. In that case it inevitably becomes a self-fulfilling prophesy!

Demand growth in commoditized markets tends to follow an irregular "stair step" pattern, driven by the combination of recurring cycles of over capacity and price cutting and macro-economic cycles. This pattern can be seen in Figure 9. Demand growth typically slows as an industry matures. It is both a cause and result of commoditization. A point is reached where eroding margins produce pressures which counter-balance the downward effects of poor capacity utilization on price. Ambitious new entrants seeking to build share, established companies defending their positions, and even governments backing national champions all have their limits. The result is to moderate price cutting and thereby slow subsequent demand growth

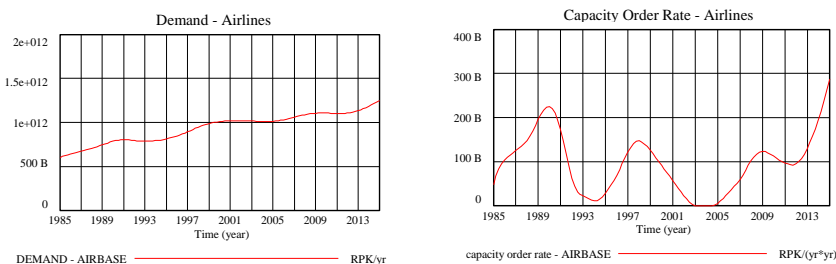


Figure 9: Airline Demand and Capacity Orders.

The effects of technology on the industry's cost structure also are significant. If, as in the case of the airlines, the investment required per unit of capacity is rising the industry becomes dominated by fixed costs. This makes margins extremely sensitive to capacity utilization, and hence increasingly volatile. Conversely, as with telecoms during most of the simulated period, if technology is driving fixed costs down steadily, margins become less sensitive to utilization and in general more stable.

As shown in Figure 9 capacity orders tend to become increasingly cyclical over time, with the down-cycles becoming lower and more extended. This has profound implications for both the industries in question and their suppliers. Highly commoditized industries will have periodic opportunities to introduce new technologies, but these will be quite limited both in duration and relative to the installed base of capacity.

Suppliers will face an increasingly severe "feast or famine" marketplace. They will find it extremely difficult to maintain their production and technological capabilities during the periods of famine and to accurately anticipate the next feeding frenzy of orders. Thus suppliers are likely to become risk averse and reactive, waiting until the next cycle is clearly underway before expanding capacity and launching new development programs. In that case lengthy delivery delays, serious quality problems, and slowly evolving technology are the probable results. This is the situation currently facing major parts of the commercial aircraft industry.

The combination of slowing demand growth, eroding profitability, and inherently long asset lifetimes (generally 20-30 years in the industries studied) leads to stagnation of the industry's portfolio of capacity. There are powerful incentives in a commoditized industry to stretch asset lives and invest as little as possible. Significant "barriers to exit" which make it more difficult and/or costly to eliminate capacity (e.g., governmental support of national champions, protection by bankruptcy courts, or environmental regulations which impose large clean-up obligations) exacerbate those dynamics.

While the model does not explicitly track technology, the implication is quite clear: any new technologies are adopted very slowly. The outcome is a perverse technological lock-in. Technologies which offer the possibility of moderating or escaping from the commodity game have a small impact. The research indicates that this is a crucial part of the advanced stages of commoditization. Industries, at least in their traditional forms, become trapped in a commodity business from which escape is increasingly unlikely.

The research shows that these factors are *both* causes and effects of commoditization. The same is true for the tendency in commoditized industries to add capacity in ever larger blocks, and for there to be inadequate supplier capacity and hence exaggerated lead times during each up-cycle in capital investment. It is quite likely that financial markets, not fully understanding the dynamics of commoditization and their consequences, are overly optimistic about the "quality" (i.e., the growth and volatility) of these companies' future profits. Adequate profitability tends to be limited to periods of substantial, but not sustainable, cost reduction.

Rapid market growth mitigates commoditization. It does so by quickly absorbing any excess capacity which might develop from over-optimistic forecasts, industry fragmentation, or subordination of profitability to building and defending market share. Thus it reduces the importance of the barriers to exit which typify commoditized markets and otherwise cause excess capacity, once it develops, to persist.

With rapid market growth planning errors are forgiven. And a rapidly growing market is less of a zero-sum game for new entrants. They have greater possibilities to build volume without directly confronting the incumbents. There is more opportunity space for new entrants

and incumbents to co-exist. This moderates the conflict among their objectives and the resulting price competition. Rapid market growth substantially reduces the likelihood that excess capacity will compound from one industry cycle to the next.

Technological progress also is very important in mitigating commoditization. New technologies offer possibilities for differentiation, for example, supersonic travel, wireless Internet access, less-polluting fuels, fully integrated financial services. Technology-driven enhancements in product and service capabilities can stimulate faster demand growth. Consider the impact of the Internet on demand for telecommunication services. Less-polluting fuels may prevent regulatory constraints on energy consumption. And as noted above, more rapid demand growth absorbs excess capacity more quickly.

In addition significant new technology can reward aggressive investors with a combination of lower costs, lower capital intensity, higher value added, and greater operating flexibility than their less aggressive competitors. This is particularly apparent in the telecommunications industry. By comparison the petroleum refiners are very cautious exploiters of new technology.

Contending With Commoditization

There are three basic strategic options for contending with a commoditized market:"

- Play the commodity game successfully – achieve cost leadership. often through economies of scale;
- Compete on service – invest in capacity capabilities (security, reliability, resilience), provide a superior customer experience, build trust; or
- Reinvent the game – develop an innovative business model, create a new value chain, introduce new dynamics (learn more/serve better, platforms).

The last option is the most interesting because, if successful, it changes the fundamental character of the market. Think of how Uber, Lyft, and others have redefined mobility. But it also is the most challenging because it requires a different organizational culture. And as management guru Peter Drucker famously observed, "Culture eats innovation for breakfast."

The energy sector provides an instructive example. Energy as a product is a commodity. Differentiation is very difficult, customer loyalty and brand values are low, competition is based primarily on price, and sustainable advantage comes from cost leadership. Energy as a product is subject to the typical commodity dynamics – recurring cycles in investment, capacity utilization, price competition, and profitability. Competition has become increasingly intense leading to commoditization of basic energy products and their enabling infrastructure. The dynamics are amplified up the supply chain, causing violent cycles of feast or famine for suppliers.

Energy markets are increasingly transparent with respect to products, prices, service, and customer information. New entrants can segment the markets and cherry-pick the best customers. Energy suppliers must contend with greater complexity, e.g., autonomous vehicles, smart buildings, the internet of things, the gig economy, and micro-enterprises. The successful companies will move from products to solutions that solve problems for customers.

Energy as a Service (EaaS) creates value by solving important problems for a segment of customers. The experience is key. Tim Brown, CEO of design and innovation consultancy IDEO, observed “You can own a product, but you can only experience a service.” Energy as a service is customer centric. The target customers thus far are primarily energy users. Examples of EaaS include energy management for data centers, charging infrastructure for electric vehicles, fuel cost optimization for airlines, and energy risk management. The emphasis on energy consumption and cost constitutes first generation EaaS. The next generation of EaaS is redefining the relationship between energy consumers and suppliers in a more fundamental way,⁷

An example is a project undertaken by a team of graduate students at the Massachusetts Institute of Technology.⁸ This project identified an opportunity to provide EaaS to operators of electric vehicles. Most forecasts of EV adoption in the US are wildly optimistic. It will take a long time for EVs to reach 10% of the active vehicle fleet. It is unlikely that anyone will invest in ubiquitous infrastructure when EVs are a small fraction of the fleet.

Thus for an extended period the charging infrastructure may have to find the EVs and go to them. Even when the fraction of EVs is higher only a minority of US households have a dedicated parking space. The rest park wherever they can. Charging your EV in your garage overnight doesn't apply to them. There also is the emergency rescue opportunity: assisting drivers who have very low batteries.

A clear customer focus, for example, EV owners who live in the suburbs of major cities and don't have a dedicated parking place, and a simple value proposition for those customers, for example, confidence that their EV will be charged and ready to go when they need it, are critical success factors. Often the value proposition is based on intangible, subjective factors such as trust and convenience. Think of Amazon.

The sources of value and growth in the energy sector are shifting significantly. The next stage is development of second generation energy services. These services are “second generation” because they are more dependent on technology and formal intellectual property such as databases, software, analytics, and models than the first generation services. They could include hosted platforms and applications, managing sustainability, and advice, e.g., regarding best practices in infrastructure resilience and integrity.

The second generation services are more intelligent. They often involve innovative business models that use customer information to create value. Most business model innovations are platform plays. Platforms are business models and enabling infrastructure that create value for multiple, complementary constituencies through powerful network effects. Weil and Lee

⁷ Weil (2019).

⁸ Yamaguchi et al (2017).

analyzed the dynamics of platform development.⁹ Examples of the reinforcing dynamics are the attractiveness of the platform to content and app developers, the generation and use of customer information, and the value of the platform for its users. The more “sides” (categories of users) a platform has, the stronger the network effects. Potential platform users include consumers, suppliers, developers, advertisers, and providers of financial services.

Intelligent energy applications already span a wide range of domains including building management, manufacturing, energy infrastructure, oil and gas production, and mobility. Google’s Nest started as a smart thermostat that learned a customer’s behavior and preferences and personalized the customer’s home environment while showing how it could be more energy efficient. Nest evolved over time. Utilities formed another side of the platform, subsidizing the adoption of Nest in return for the right to remotely reduce the customer’s energy consumption at times of peak demand.

Google added new functional features to Nest, for example, home security, positioning Nest as the platform for the intelligent home. These new features generate a mountain of information for Google: the customer’s comings and goings, the time spent in each room, patterns of energy consumption, the customer’s energy efficiency, etc. Advertisers will become an additional side of the Nest platform. One can imagine what will come next: consumer credit for acquiring more energy efficient appliances and lighting; smartphone apps that enable customers to monitor and control their homes remotely; and a feature that aggregates energy demand, puts blocs of demand out for tender, and takes away price uncertainty and volatility.

An increasing number of people are rethinking the relationship they want to have with a car. Traditionally, a car was a prized possession. It was a statement about the owner’s personality and aspirations, and how he or she wanted to be perceived by others. But now many consumers, especially young “millennials,” think of a car as a service that provides mobility on demand. The new logic is compelling. Most personal cars are lightly used. They sit idle much of the time. Why incur the expense and hassle of owning a car when mobility is available whenever, wherever, however you want? There are two principal mobility on demand models: taxi hailing (think of Uber) and vehicle sharing (pioneered by Zipcar). In the US and many other major markets Uber is the dominant taxi hailing service.

Three streams of vehicle technology are converging to affect the design, operation, and energy consumption of passenger cars and light trucks:

- The connected vehicle;
- The autonomous vehicle; and
- The sustainable vehicle.

The connected car already is a reality. Through both proprietary platforms (for example, GM’s OnStar) and the Internet (for example, Google’s Waze) vehicles are becoming connected to one another, a wide range of information providers, the emergency services, and insurers.

⁹ Weil and Lee (2018).

Development of autonomous vehicles has become a major initiative within the automotive industry and also among some of the leading technology groups. Most analysts believe autonomy is likely to progress in a series of measured steps. Google has rejected the incremental approach and are going for a fully autonomous vehicle in one step.

A range of “sustainable” vehicle technologies are being explored, i.e., alternatives to the traditional internal combustion engine powered by gasoline or diesel fuel. They include hybrids like the Toyota Prius, pure plug-in electric vehicles (for example, Tesla and Nissan Leaf), and cars powered by hydrogen fuel cells and compressed natural gas.

There will be major opportunities for intelligent energy solutions. The nature and timing of these opportunities will change as the three streams of vehicle technology evolve and converge. A potential technology scenario is shown in Figure 10. The lower left quadrant describes the current situation in the United States, Europe, and Japan. Plug-in hybrids and fully electric vehicles are a very small fraction of the total vehicle fleet. While driverless autonomous vehicles are being tested, no fully autonomous vehicle is being produced in large quantities and offered for sale to the driving public. Even China, where the government is aggressively pushing advanced vehicle technologies, currently is in this quadrant.

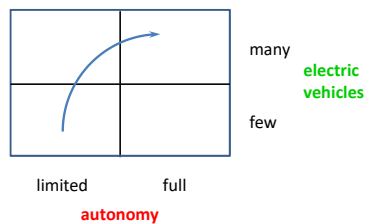


Figure 10: A Technology Scenario

The blue arrow in Figure 10 denotes the technology trajectory assumed in this scenario. Most analysts expect the adoption of electric vehicles to progress faster than the availability and acceptance of fully autonomous technology. Thus, the upper left quadrant is the second phase of the scenario: a significant number of EVs with limited autonomy features, e.g., parking, stop and go traffic, and position keeping on highways. At some point fully autonomous, driverless vehicles will become a reality. There still is likely to be a lengthy period of transition in most markets during which vehicles with various degrees of autonomy will share the road. The upper right quadrant is the third phase of the scenario.

Some influential visionaries focus on the third phase. They skip over the opportunities for intelligent energy solutions during the first and second phases. Each phase of this scenario offers significant opportunities, but they differ as the scenario unfolds. During the first phase, EV’s are a small fraction of the total vehicle fleet in most markets. The early adopters may be concentrated in certain geographic areas, e.g., the West Coast and Northeast of the United States and Northern Europe, but at a more granular level the locations and movements of EVs will be difficult to predict. The business case for investing in fixed EV infrastructure will be weak.

During the second phase of the scenario the principal opportunities will be fixed charging infrastructure for EVs. The charging stations will need to be in convenient locations for the EV operators, near where individuals live and work and at the bases of EV fleets. Governments, major energy businesses, and start-ups are already anticipating these opportunities.

Significant adoption of fully autonomous vehicles will be a game changer. Their charging infrastructure doesn't need to be in residential and commercial areas. When they need to be charged, autonomous EVs can go to electricity substations on the perimeter of a city or in a nearby rural area, where large quantities of higher voltage, lower cost energy are available. Electric utilities are obvious suppliers at this stage though resellers could intermediate. Intelligent systems will be required to predict and influence demand, e.g., through dynamic pricing, and to manage the distributed supply represented by millions of EV batteries.

To summarize, the most interesting opportunities for intelligent energy solutions in the mobility sector will evolve with the maturing and adoption of new vehicle technologies.

- Phase 1 – mobile charging systems;
- Phase 2 – fixed charging infrastructure in residential and commercial areas; and
- Phase 3 – charging infrastructure co-located with electricity substations.

Please remember that this mobility scenario is a potential future, not a forecast. It does however highlight several characteristics of opportunities to escape the commodity game. First, many are transient. Thus, it is essential to understand the dynamics that create the opportunity and get the timing right. The risks of being too early or too late are significant. Second, innovative business models often are required to capture the value. These business models will use a combination of information, artificial intelligence, and machine learning to solve a problem for a segment of customers. Third, trust plays a central role in the implementation of these business models. The level of trust determines who has access to the information and their license to use it.

Innovating in the Customer Experience

The most powerful drivers of change are not trends internal to a particular market sector or industry. Rather, they are the confluence of far more significant demographic, social, and technology trends. The most significant driver of change is ubiquitous, low cost broadband connectivity. Ubiquitous, low cost broadband is disrupting and reshaping how products, service, and contents are packaged, marketed, delivered, and used. It changes the social dynamics of markets, creates new economics of information, enables deconstruction of integrated value chains, stimulates innovation, and accelerates commoditization. It offers exciting opportunities while posing major threats to established strategies, business models, and cultures.¹⁰

¹⁰ Pine et al (1998).

This market environment must be thought of as more than a technology phenomenon. It also is a major social phenomenon characterized by an explosion of self-expression and peer-to-peer (P2P) sharing of content. The emergence of personal and participatory media is especially significant. The implications are profound and not well understood. Markets are segmenting in new and unfamiliar ways. Customer segments have significantly different behaviors and needs. Flexible, customer-centric platforms focused on these market segments, not individual products, have become the principal sources of value.

Technology is an enabler. It increasingly is in the background, making things easy and seamless for customers, providing a superb customer experience, personalizing relationships, and customizing products and services. Social segmentation of markets is far more important than traditional economic, geographic, and technological segmentation. Social segmentation focuses on who you are and how you interact with other people.

Customers, not product and service providers, are defining who is trusted and what is relevant, welcome, valuable, and acted on. Consumers have a greater sense of identity and are taking control of their affairs. Marketing 1.0 was about selling the company to customers. Marketing 2.0 is about advocating customers to the company. It recognizes major shifts in market power. The new power brokers are consumer-friendly brands, social networks, and IP entrepreneurs.

Trust is central in a 2.0 world. As discussed above, it determines what you can do with information. Customer information has become the most valuable asset, especially in commoditized markets. Customer information management drives the dynamics of relationship value. This “learn more, sever better” relationship is central to value creation in commoditized markets. Trust is built over time through a series of customer experiences. Proactively demonstrating trustworthiness and accelerating the development of trust-based relationships are top priority.

Increasing market openness and the new economics of information are creating a very different ecology. It is far more transparent, competitive, and unforgiving. An ever greater fraction of customers will discover who has the best prices, service, products, and technology, who treats customers well and who does not. All basic products and services will be completely commoditized. Innovative product, service, and content integration, use of information, and relationship models will become the principal sources of differentiation and value added.

The implications are daunting. Major businesses will be increasingly vulnerable to commoditization, with eroding revenues and margins. In many markets the next generation business models are unclear. Active experimentation is required, based on an unfamiliar set of principles: deep customer insights; rapid, low-cost prototyping; early engagement with customers and suppliers; test marketing outside the formal system of IT governance; and acceptance of failures.

A social perspective on innovation explains why it is necessary for organizations to change the way they interact with customers. Successful product innovations build on customer

needs and create positive behavioral change among large groups. What is “quality” from a customer perspective? Why are the innovations that create real value mostly not about technology? And why are the winners companies who manage the social side of technology – the complete experience of customers?

The iPod is an excellent example of the key attributes of a successful innovation:

Solve a problem for customers

Redefine quality

Keep it simple

Build in flexibility, allow experimentation

Create powerful network effects

Forget about your “industry”

Markets where the major incumbent companies are not doing these things are vulnerable to disruption, e.g., photography, music, wireless communications, and payments. Still there is an element of luck. That is why rapid, low cost prototyping and experimentation are so important. Experimentation is the essential prerequisite for innovation.

The concept of “industry” becomes highly constraining during a period of disruptive innovation. It is an oversimplification which distorts critical perceptions and decisions and often leaves large, established companies surprised by changes in the competitive environment. They fail to understand who their key competitors are and how customer needs, expectations, and values have changed.

Commoditization is accelerating. *e-commerce* completely destroys traditional barriers to market entry. The start-up investment can be quite small. This led to a proliferation of new *e-merchants*. Plus *e-commerce* is an appealing mechanism for established players to extend themselves into new markets. The Internet is ubiquitous, and the extra investment is small compared to building or acquiring physical presence. Hence many try, few succeed (particularly on a large scale), but markets have become more crowded and fragmented.

e-commerce provides a rich array of new opportunities and a fertile environment for innovation. *e-commerce* enables totally new business models to emerge, for example, demand aggregators (next-generation media and malls which deliver large audiences to product providers), intelligent agents (next generation servants who search, advise, and buy on behalf of consumers), and platform operators (next generation utilities who provide products, markets, logistics, and back-office services at a wholesale level).

e-merchants have an advantage in de-commoditizing products. The *e-commerce* environment provides powerful opportunities for differentiation through customer service, product integration, and new relationship paradigms. Success comes from changing the paradigms. A breakthrough in *e-commerce* requires building powerful brand experiences, enhancing customer relationships, exploiting *e-commerce* economics, orchestrating effective channel mix, and rethinking organizational structure. It is essential to align propositions with key customer needs, not with a company’s internal structure.

Some companies and their leaders do not understand what is happening. They are repeating the mistakes of the past, viewing *e-commerce* as a new way to conduct business as usual. As with previous generations of computing, the technology is considered a means for refining the current paradigm, i.e., doing things “better, faster, cheaper.” They don’t see the prospect for radical change in how their business is conducted and the opportunity for anticipating, or indeed shaping, the new paradigm.

The critical consideration may well be time. In this rapidly evolving environment there is a limited window of opportunity to be ahead of the pack. But many incumbents still do not seem to “get it.” They are convinced that evolutionary change will be sufficient. They are bogged down with polishing their current business models, pursuing economies of scale, controlling cannibalization, and defending the indefensible. They will fail to change at the required rate because of excessive caution or over-confidence. Many incumbents have performed impressively and feel altogether too comfortable. The risk of hubris is very great.

The most enlightened companies talk earnestly about “empowering the customer” and becoming his or her “trusted helper.” Yet their thinking about relationships seems remarkably static and simplistic. They do not understand how and why a relationship develops over time, what empowerment really is, or the route to their desired objective. In important ways they have it all backwards. It is the customers who does the empowering, not the provider! And to think otherwise is to perpetuate the obsolete business model.

The primary source of competitive advantage, value added, and profits has become effective customer information management. Customer information management drives the dynamic model of relationship value described above. The starting point is the customer experience, i.e., how is the customer treated, and how does he or she feel as a result? A positive customer experience is based on individualization:

- “We know and deal with customers as individuals;” and
- “We treat them with respect, honesty, and fairness.”

As described above, this model involves extremely powerful self-reinforcing mechanisms which can be either virtuous or vicious. Think of the virtuous version as “learn more, serve better.” In this mode knowledge about the customer is used to personalize the interface, create bespoke service, and add greater value. Growing satisfaction and trust leads the customer to be more open regarding values and needs, and more willing to *empower the service provider*. The empowerment is critical. It gives the service provider license and credibility. As an empowered agent it can search, evaluate, advise, and implement on behalf of the customer. It can engage in acceptable, indeed appreciated, “push,” e.g., cross-selling and up-selling.

Thus the relationship becomes more valuable to the service provider who can, in turn, deliver greater value to the customer. A true “win/win” situation. The value of the relationship derives from its long-term profitability which, of course, depends in part on its persistency. As customer information management drives these dynamics, it becomes increasingly difficult for

competitors to win the customer away. And it becomes less and less necessary to buy the customer's loyalty through rock-bottom pricing.

There are some fundamental lessons here. First engaging the customer depends on delivering value. The "value" can come in a wide variety of forms, e.g., a better deal, greater convenience, a sense of accomplishment, recognition as an individual, a feeling of confidence and control. Second engagement over a period of time is required to build the customer's trust. The easiest way to ruin a relationship is to frustrate, disappoint, irritate, or abuse the customer, e.g., by over-stepping the bounds of what he or she at any point considers "acceptable behavior."

By far the most important lesson is that the service provider must cede control of the relationship to the customer before the customer can empower the provider. This is another biblical truism in the spirit of "Noah built the ark before it started to rain." Here the point is, "You must give in order to receive." The service provider must trust the customer to show the way in the relationship, to indicate how he or she wants to be treated and what constitutes real value, and to remain loyal and committed. The provider really has no other choice. Empowerment is a gift. An old Chinese cookie fortune says it very well, "You must possess something before you can give it away."

Winning

The preceding discussion explained the causes and implications of three inter-connected sets of dynamics: competition within a generation of technology or business model; competition between generations of technology or business model; and competition over multiple cycles of innovation, investment, demand growth, and profitability. How can this framework be used to develop and execute winning strategies? How can it guide the reinvention of a market participant? And how can it illuminate the objectives of competition and definition of winning?

Development of a successful strategy starts with a clear understanding of the dynamics, current status, and likely future of the market. The objectives and basis of competition are different in each of the three waves. And it is possible for more than one of these dynamics to be working simultaneously. In particular, a product or service offering a new customer experience can disrupt a mature commoditized market. Digital cameras and social media are examples. Thus it is essential to determine which dynamics will be most important. Winners will be quick to identify new customer needs, new competitors, new business models, and the new capabilities required to address them.

Within a generation of product or service the principal objective should be to moderate destructive price competition. This can be achieved by adding refinements, often complementary services, to a product-centric business model. Services are "productized." You frequently hear airline executives talk about their "products" which really are service variations, e.g., first class, business class, and economy. Other examples can be found in the automotive market: more extensive warranties; leasing; and cross-selling other financial products. These refinements increase switching costs and hence customer retention.

Competition between generations is a different story. The principal objective should be definition and control of the dominant design. The basis of competition primarily is alternative technologies. For example: internal combustion and electric vehicles; mainframes and personal computers; fossil fuels and nuclear power.

Some times two generations of technology co-exist, but often the new technology is a potential substitute. When there is substantial substitution a new dominant design emerges. The market leaders could include incumbents and/or new entrants, e.g., GM and Tesla. However, many incumbents could be left behind. They don't see the need to change or fail in execution. Think of Kodak which dominated photography for a century but is a minor player in the current, almost completely digital market and Apple, which transformed the mobile phone into a high resolution camera.

The long wave dynamics are always working. The strategic objective should be to identify and respond to new customer needs and behaviors. A segment of customers may be rethinking its relationship with a product, for example, wanting it available as a service. Consider how a significant number of people, especially young urban dwellers, think about mobility. For them a car is not a prized possession that expresses their success, personality, and aspirations. Mobility is a straight-forward service requirement.

The primary basis of competition to meet this need is alternative business models. For example: vehicle sharing (ZipCar, BMW) and ride hailing (Uber, Didi). These business models offer greater flexibility and efficiency. The average urban-based personal car sits idle most of the time. The mobility as a service models make much more intensive use of vehicles and relieve the user of responsibility. Moving? Get a van. Hot date? Get a sports car. Converting products into services can be a key element of a strategy to compete in a mature market.

A series of models and examples demonstrated the “why, what, how, when” discipline for strategic management. This approach emphasizes the importance of context – the dynamics that are shaping the business landscape. The market context should determine the rationale for the strategy, i.e., the assumptions on which it is based and its objectives. Strategy development should be top/down and outside/in. Please recall the elements.

Why – understanding the market (defining the game)

- Is there a dominant design
- Who are the market leaders
- Are new entrants disrupting the market
- Does the market have a wholesale level
- Are there vertically integrated competitors and resellers
- What is the basis of competition
- What is the value chain
- What are the principal dynamics
- How is the market likely to develop
- How can you maximize learning
- How can you encourage and benefit from experimentation
- How should the strategy anticipate changes in the market

The concept of “winning” is inherently contextual. What is the game? Who are our competitors? What is the prize? The game is defined by the market dynamics. For example:

- Competition for the dominant design within a generation of technology;
- Competition between established incumbents and new entrants;
- Competition between vertically integrated and asset-lite business models;
- Competition between generations of technology;
- Competition to build a dominant platform; or
- Competition in a mature, commoditized market.

The dynamics are not mutually exclusive. Competition for the dominant design often is between established incumbents who defend the status quo and new entrants who have a different idea, for example, full service and low cost, no frills airlines. Mature, commoditized markets often stratify with a wholesale level and an end-user level. That enables competitors with asset-lite business models, i.e., resellers, to challenge vertically integrated incumbents. These dynamics are occurring in telecommunications and consumer banking.

Developing and applying the models presented in this paper yielded conclusions that apply to a wide range of markets and provide the context for winning strategies. First, rapid market growth mitigates commoditization. It quickly absorbs excess capacity, reducing the importance of barriers to exit. Excess capacity is unlikely to cumulate from one cycle to the next. Planning errors are forgiven. And the market is less of a zero-sum game for new entrants.

Intense competition de-couples price from costs. When costs are declining competition drives prices down faster and farther. Competitive pressures cause less than 100% of any cost increase to be reflected in prices. Eroding margins counter-balance the effects of low capacity utilization on prices.

In most commoditized markets margins are extremely sensitive to capacity utilization. The impacts of technology on cost structure can accelerate commoditization, for example, the effect of e-commerce on the retail sector. If the investment per unit of capacity is rising, an industry becomes dominated by fixed costs. This makes margins increasingly volatile. Consider the airlines. And if variable costs are low they have a huge impact on pricing decisions. The marginal cost of carrying an additional data packet on a telecom network is essentially zero.

As a market matures capacity orders become increasingly cyclical, with the down-cycles lower and more extended. This has major implications for both the industries in question and their suppliers. Commoditized industries will have periodic opportunities to introduce new technologies. But these will be limited both in duration and relative to the installed base of capacity. Suppliers face a “feast or famine” market. The energy sector is an excellent example.

Slowing demand growth, eroding profitability, and long asset lifetimes lead to stagnation of an industry's portfolio of capacity. There are powerful incentives to stretch asset lives and invest as little as possible in new capacity. Any new technologies are adopted very slowly. The result is a perverse technological lock-in. Think of the electric utilities, shipping, and automotive sectors.

And most important, as a market matures and commoditizes the sources of competitive advantage become increasingly intangible. Customer insights, special skills and capabilities, powerful brands, a company's reputation, the character of relationships with customers and suppliers, and the level of trust are key. Sophisticated use of customer information, for example, by Amazon and Google, can set a competitor apart from the rest.

Please recall the three sets of market dynamics – the waves within waves. The short-term dynamics of competition occur within a generation of technology, for example, fixed line telecom services, ethanol-based biofuels, VHS video cassettes, and internal combustion powered cars. Competitors offer similar products or services whose performance improves incrementally over time. Competitive position is primarily determined by price and service quality. And the prize is a more stable market with fewer and less destructive price wars. The market leader, defined in terms of market share, is often best positioned to impose discipline.

In the mid-term, many markets experience waves of innovation. Two or even three generations of technology coexist for a significant period. Interactions among the generations are complex. They have major impacts on the longer-term dynamics of the industry, for example, market leadership and the value chain.

Competition among generations of technology is affected by many factors. For example:

- Improvements in price/performance;
- Changes in user requirements;
- Perceptions of benefits, costs, and risks.
- Characteristics of early adopters;
- Attitudes toward things which are new; and
- Network and bandwagon effects.

The entry of firms into a market and the subsequent exit of many or most competitors are central to the dynamics of innovation. As discussed above, a large number of firms generates a high rate of experimentation and innovation. It drives improvements in cost and performance, increases the willingness to switch, and accelerates adoption of the new technology.

As the market becomes more crowded, the intensity of competition increases. A dominant design and standards emerge. A wave of companies leave the market. The survivors shift to process innovation and pursue economies of scale. In the mid-term competitive advantage comes from product/service cost and performance. The prize is control of the dominant design.

The long-term industry dynamics are characterized by recurring cycles in investment, capacity utilization, price competition, and profitability. Often, there are multiple cycles over 20-50 years. Competition becomes increasingly intense leading to commoditization of the principal products or services and their enabling infrastructure. In a mature market competitive advantage comes from reinventing the game, i.e., escaping from the dynamics of commoditization. The prize is to dominate the sweet spot in the value chain.

What – *designing the value proposition (defining winning)*

- What are your strategic objectives
- What problem will you solve for customers
- How will you capture part of the value
- What are the sources of your advantage
- How can you moderate price competition
- How can you create network effects
- What is your business model

Winners understand, anticipate, and influence these market dynamics. They stay ahead of the dynamics, building trust-based relationships and exploiting the learn more/serve better model. The typical progression of a winning strategy involves four steps:

- Turn a product into a service (e.g., a personal car into mobility on demand);
- Make the service intelligent (e.g., use customer information to personalize);
- Invest in infrastructure capabilities (e.g., security, sustainability, resilience); and
- Develop a multi-sided platform (e.g., users, suppliers, payments, investors).

As described above, the energy sector provides an example. Energy as a product is a commodity. Differentiation is very difficult, customer loyalty and brand values are low, competition is based primarily on price, and sustainable advantage comes from cost leadership. Energy as a product is subject to the typical commodity dynamics. Energy as a service (EaaS) offers opportunities to escape from the commodity game. It creates value by solving important problems for a segment of customers. The experience is key. Trust plays a central role in the implementation of EaaS. It determines what you can do with information, i.e., observe, capture, analyze, and use to create value. Customer information has become the most valuable asset, especially in commoditized markets.

Relationships must become “integral” partnerships as described by Fine and Pipenbrock. They differentiate between modular and integral supply chains. “Modular supply chains consist

of relatively flexible and interchangeable relationships among suppliers, customers, and partners. By contrast, integral architectures typically link subsystems with tightly coordinated relationships and distinctive or unique features that cannot be easily connected to other systems.” This typology is illustrated in Figure 11.¹¹

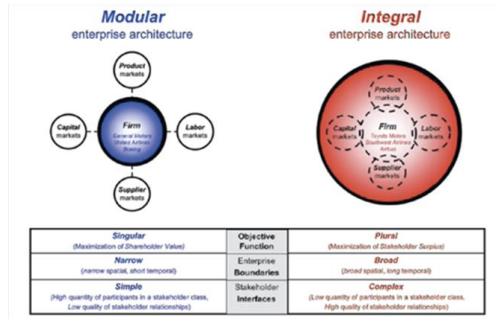


Figure 11: A Typology of Enterprise Architectures

The future is services and customer experiences based on innovative use of information and sophisticated analytics. This will require investments in platforms, intellectual property, and people with new skills and capabilities. Companies must decide when to develop these assets internally and when to buy them through acquisitions and venture investments. Roberts and Liu conclude that a company should use, in a timely and appropriate way, a broad range of business development strategies, e.g., alliances, joint ventures, licensing, equity investments, and mergers and acquisitions, in order to perform optimally over its underlying technology life cycle.¹²

How – resourcing the strategy (building the ecosystem)

- What skills and capabilities are required
- Is endogenous development a realistic possibility
- What relationships do you want with your suppliers
- How can you create a successful innovation program
- What are the roles for alliances and partnerships
- Could venture investments provide the required capabilities
- Are merger or acquisitions parts of the answer

Commented [HBW1]:

The implementation issues must be understood and effectively managed. How should an EaaS provider experiment with and deploy innovative technologies with customers for whom energy is mission critical and fault intolerant? The best approach depends on the structure and culture of a particular customer segment, e.g., operators of data centers, vehicle fleets, and medical centers. Each of these segments is quite sensitive to the performance of energy solutions but is different in terms of the consequences of a problem and their willingness to take risks with new, unproven technology.

¹¹ Fine (2005), Pipenbrock (2009).
¹² Roberts and Liu (2001).

Winners will manage relationships to build trust and intimacy, and use customer information to provide solutions which are relevant, welcome, valued, and acted on. Sustainable competitive advantage will come from intangible factors, e.g., customer insights, special skills and capabilities, brands, reputation, relationships with suppliers and customers, trust, and the customer experience. Achieving a unified approach to and relationship with customers is essential.

Intelligent services often are enabled by the capabilities inherent in infrastructure. Potential capacity capabilities include security, reliability, resilience, and sustainability. Please recall that the value of capacity capabilities derives from the additional demand they can generate and from differentiating commoditized products, thereby enhancing the pricing power of suppliers and the potential for increased profits.

Their value also derives from the optionality they create. As Baldwin and Clark explain, capabilities embody real options, i.e., the ability, but not the obligation, to take specified actions in the future.¹³ Thus they can avoid the dysfunctional consequences of “now or never” but irreversible decisions. Examples of real options include the ability to enter a new market, to adopt an unproven technology, to offer more aggressive service level agreements, and to invest in innovative start-ups.

Integrity, adaptability, resilience, and sustainability are examples of capacity capabilities. Infrastructure integrity has emerged as a key capability. It is far more than security. For example, the technical coherence and reliability of the energy grid are critical, especially as it becomes much more software intensive and many different parties can introduce changes. Blockchain technology could be used to authenticate the identity and authorities of people with access to the grid infrastructure. Can they modify the software, add a new application, alter a data file? The mid-term objective could be an open platform where a utility hosts apps developed by customers. At that stage the platform integrity issues become even more complex and critically important.

Another important capability is the flexibility to anticipate changing market conditions and customer needs. The most interesting opportunities for intelligent energy solutions in the mobility sector will evolve with the maturing and adoption of new vehicle technologies.

- Phase 1 – mobile charging systems;
- Phase 2 – fixed charging infrastructure in residential and commercial areas; and
- Phase 3 – charging infrastructure co-located with electricity substations.

This mobility scenario is a potential future, not a forecast. It does however highlight the characteristics of intelligent service opportunities. Many are transient. The risks of being too early or too late are significant. Thus, it is essential to understand the dynamics that create the

¹³ Baldwin and Clark (1992).

opportunity and get the timing right. These dynamics will determine when it's time for the infrastructure to evolve and the appropriate direction.

Commented [HW2]:

The ability to capture, analyze, and exploit the information generated by infrastructure is still another very valuable capability. Of course, trust is essential for this capability to work successfully. As discussed above it determines what you can do with information, i.e., observe, capture, analyze, and use to create value. Trust is built through serving customers better, e.g., segmenting the market, personalizing relationships, and customizing solutions.

Growing satisfaction and trust leads customers to be more open regarding their values and needs, and more willing to empower the provider. As an empowered agent the provider can search, evaluate, advise, and implement on behalf of the customer. This “learn more, sever better” model is central to value creation in most markets.

Referring to Figure 8, capabilities can be inherent in new capacity or the result of retrofitting features into existing capacity. Either way, they require expenditures which may not be approved and funded if profits were unsatisfactory. This effect is represented by the arrow from Profits to Capacity Capabilities. But these capabilities should be considered assets and the costs of creating them should be considered investments, not expenses.

When – *getting the timing right (being one step ahead of customers)*

What are the immediate priorities

Are some steps prerequisites for others

How can you avoid getting too far ahead

Where are options possible

How can you maximize learning

How can you encourage and benefit from experimentation

How should the strategy anticipate changes in the market

Commented [HW3]:

Converting products into services and investing in infrastructure capabilities require attitudes and behaviors that often do not exist in traditional suppliers, consumers, and risk managers, for example, insurance companies. In a presentation at MIT Daryl Dunbar, a highly experienced business reinvention specialist, explained why it is difficult for large organizations to innovate in an ongoing manner.¹⁴ “This is because they have become successful by being consistent and resistant to disruption. But large organizations can innovate without having to change core processes or culture.” He offered five tips for successful innovation in big businesses:

- Get a sponsor (don't start a project without a committed sponsor);
- Keep it relatively cheap (think big but start small);
- Think about the customer (their reaction to the end-product is all that counts);
- Embrace the landmines (engage with gatekeepers from the outset); and

¹⁴ Dunbar (2016).

- Make it look familiar (make the request look like any other investment).

Dunbar observed “Delivering innovation will change things. Culture change becomes an outcome of innovation not a prerequisite.” This is shown in Figure 12.

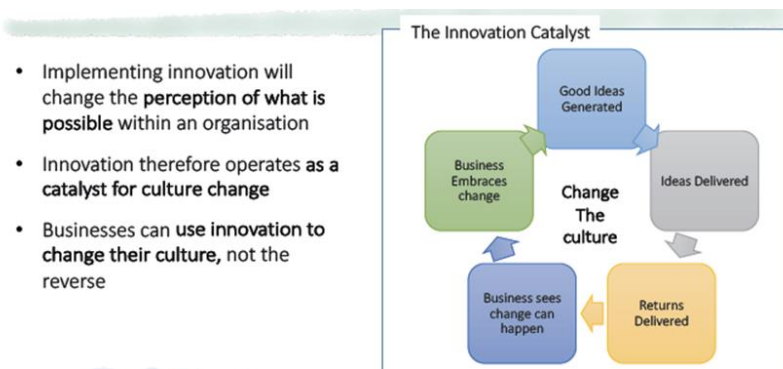


Figure 12: Innovation Drives Culture Change

The tension between culture and innovation identified by Dunbar determines whether an organization conceives and executes a winning strategy. The winners monitor the market ecology, i.e., how the most powerful drivers of change are likely to affect current business models and what business models are emerging from new entrants and adjacent sectors,

The advantages of being the first mover with an innovation often are over-stated. In many instances the first mover is a pathfinder which shows the way for followers who do a better job of meeting customer needs. In other cases the first mover fails to effectively exploit its advantage. The fast follower can learn from the first mover and has many options to do “better,” e.g., a lower price, increased performance, higher quality, or a superior customer experience.

As with all generalities, there are exceptions. The first mover has a significant advantage where the development cycle is quite long relative to the lifecycle of the product in the market, e.g., Intel vs. AMD in micro-processors, or where being the first to scale creates powerful network effects and establishes a dominant platform, e.g., eBay in auctions and Google in search and web advertising.

Winners continually seek ways to build trust and intimacy in customer relationships, and use customer information to segment markets, personalize relationships, and customize solutions. They are not presumptive about a customer’s desires, but instead develop ways for the customer to show them what is relevant, welcome, and valued. For example, customers trust Amazon to hold their payment details for one click checkout, track their browsing and purchases in order to make useful recommendations, and intermediate payments to 3rd party sellers.

Most large established businesses fail to reinvent themselves when faced with discontinuities in their markets. Some do not see the need to change. Others fail to execute effective change programs. There are however reassuring success stories, e.g., IBM's transformation from a mainframe computer business to a world leader in IT services. The leap of faith is not as great as it may appear. The critical success factors include: a disciplined step-by-step approach; not taking your eye off the ball regarding major legacy businesses; engaging customers in the transformation process; achieving quick wins; and realistically managing expectations.

Winners also are continually generating and prototyping experimental ideas. They have platforms for rapid, low cost prototyping and test marketing. Failures are acknowledged as an inevitable consequence of this approach and indeed as the only way to determine what will ultimately work. For example, continual experimentation by Google has produced killer applications such as Gmail and Google Maps.

Winners recognize that innovation and corporate entrepreneurship are tightly linked. Innovation is about ideas while entrepreneurship is about delivery. Winners are excellent at both. Entrepreneurship is more than product development. It is business development, e.g., entry into a new market or addressing new customer needs. For example, the iPod made Apple a leader in consumer electronics, Egg extended Prudential into banking, and the PlayStation established Sony in gaming.

The winners run a balanced portfolio of evolutionary and breakthrough innovations, of quick wins and foundation building projects. Quick wins can be developed rapidly and inexpensively with a high degree of certainty of meaningful impacts on revenues and profits. They build and sustain commitment to innovation. For example, 3M achieves quick wins by building on existing core technologies.

A key enabler is the Chief Executive's support of the innovation program. The level of support fundamentally is the results of the CEO's values and personality. Does he or she believe passionately in innovation? It is reinforced or eroded by the performance of the innovation program. Is it achieving its milestones and having a visible impact on the company's revenues and profits? That is why quick wins are essential.

Strong CEO support is required to ensure adequate resourcing of the innovation program. Innovation competes for resources with existing operations. If overall company profitability is poor pressures build to cut the funding of innovation. These pressures are difficult to resist when the innovation program does not appear to be making a difference. This may be because of the delays before innovation projects have a significant impact, or it may be a legitimate response to an ineffective program. CEO support protects the innovation program and gives it a chance to demonstrate ROI.

The winners anticipate more frequent cycles of intermediation and disintermediation and value chain disintegration and reintegration. Two important, and probably irreversible trends stand out. First, customers are becoming increasingly well informed, eager to take control of

their lives, and willing to exert their power. Second, markets are becoming increasingly transparent and differences in prices, products, service quality, and how customers are treated will be noticed and acted on.

The essence of the new business environment is the shift of power to customers. Markets will democratize. The authority and preeminence of large established institutions will be challenged. The barriers to entry will be much lower and scale will be far less important. Competition will come from anywhere and everywhere, not just the other major providers of products or services.

The challenge is to aim where customers will be in five years. They are a moving target and the lead-times for change, and developing next-generation platforms, are substantial. It is important not to lag behind customers nor let competitors get far ahead. The most difficult aspect of this transition will be to overcome the organizational and cultural barriers: complacency; fear of failure; fear of cannibalizing large legacy businesses; and focusing on incremental innovations vs. big new opportunities. The highest priority is to visualize and prototype next-generation customer-centric platforms.

Successful innovation programs develop and utilize capabilities which do not usually exist in large, established companies. The combination of market and technical knowledge comes from both learning by doing and on-going investment. Deep customer insights must be acquired. Platforms must be developed for rapid, low cost experimentation, prototyping, and test marketing. The composition of the innovation team is critical. It must have the skills and experience to push ideas aggressively while engaging effectively with Board level executives and leaders of the major legacy businesses. An innovation team must earn the respect of these senior managers through their behavior and results.

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