

RISK PROFILES ALONG THE LIFECYCLE IN DYNAMIC MARKETS

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ABSTRACT

That supply chain management and logistics are a determining factor for the long term success of a company was well documented by Forrester over a half century ago [1], with the importance of the statement only growing through the intervening years. Whether consciously factored into the operating mode or not, logistics and distribution channel management plays a critical role in the life, and death, of a firm. From the rudimentary beginnings of the start-up company to the hectic world of the growth company and onto the relatively secure existence in mature markets, the value chain consisting of logistics and distribution channel linkages follows the firm, until it solidifies into immutable form of the mature value chain and begins to exert an inexorable pressure on the survival of the entire chain, and conversely the chain imposes its will on the members. The emergence of mature industry value chains is often driven by the need to monopolistically control logistics and distribution channels which provides a competitive advantage but also introduces a serious exposure to pending shock loadings of the chain.

KEYWORDS

life cycle, complexity, risk, organizational factors, business process.

Introduction

In the early stages of development, firms tend to be supple and pliable along with their coupled ecosystems that resist perturbations generated within the market, but by the time maturity is achieved, real brittle structures confront the market forces and these structures often break down under extreme loadings. Once in a mature value chain though, the suppliers feel a long term pressure to grow beyond their chain as they tend to be more of a volume business than the partners downstream in the chain. This struggle between chain discipline and lost business opportunities leads to many compensating strategies for the suppliers and sometimes to dissonance that can internally endanger the value chain. Risks arise both from external and internal threats to the

chain. External shock loading such as earthquakes, tsunamis, secure data breaches, or disastrous interruptions can stress the system to a breaking point. There is an important and compelling logic to maintain sub-optimal inventories in anticipation of JIT becoming JIC [just in case]. It is an eternal struggle between optimal performance and a more viable but suboptimal one. This paper will examine the causes and consequences of value chain perturbations and shock loadings, due to emerging risks in the market and within the chain, during the market development. The value chains we refer to can range for loose ecosystems in early markets to rigid linear structures in late markets, we call the collective external alliances. (In Sec. 4, Fig. 6 shows the progression of these external structures for the firm during the market lifecycle).

Types of risks and their consequences

We will be dealing mostly with the relatively predictable occurrences of perturbations due to risks residing in the market along the lifecycle and within value chains [2, 3] and occasionally in the cloud, due to cybersecurity issues. Much of the supposed uncertainty associated with risks can be substantially understood by examining the lifecycle of a market and the natural developments that occur as the firm travels along this lifecycle. Risks assume different character and intensity depending whether the firm is in relatively turbulent and complex context of early stages or the more placid and simple dynamics of mature markets [4, 5]. We categorize risks in two major groupings:

- uncertain and unpredictable, which by its nature cannot be countered through reasonable precautions [an act of nature such as an earthquake in Vienna],
- predictable with a margin of error, but surprising in its potential impact [a hundred year flood in Vienna].

Although it is worth remarking that what was unpredictable yesterday may well be foreseen today; for example a large earthquake in California is now almost a certainty, but the date is unknown. It is reasonably predictable risks that we will be examining in this paper and mapping them along the market lifecycle along with the attendant prescriptions for mitigating the effects of an occurrence. Within the predictable category of risks it is worthwhile to isolate and describe three risk types that dominate the market landscape:

- **Internal risks;** the malfunction of internal systems, relationships, and market intelligence. Among these we find breakdown in logistics and distribution channels due to shutdown of connectivity of the transportation network, bankruptcy of a key supplier, distributor or a principal customer. An ongoing court case between Apple and its designated sapphire supplier for lenses, GT Advanced Technologies, highlights the dangers. The court documents filed by GT supposedly contain information that harms the reputation of Apple and discloses competitive practices. A supplier is only reliable while it is functioning properly, at the black hole stage of bankruptcy a third party decides on disclosure; the courts. It is worthwhile noting that there's a migration of some risks from external status to an internal one during the lifecycle. For example external suppliers during early markets become internal value chain partners during the mature stage.

The opposite can also happen as in the case of Delphi becoming a firm independent of the GM chain, although still subsidized by GM in maintaining the viability of its pension plans.

And of course strongly dependent on sufficient flow of orders from GM for immediate survival:

- **External risks;** these occur when the market delivers a jolt to the firms in the form of an unexpected perturbation that ranges in magnitude from a small oscillation of market conditions, such as the entry of a small competitor, to a shock loading of the system targeting the firm or the whole market, such as the loss of critical suppliers and supplies [loss of potential access to rare earth elements from China for the high-tech industry]. A further example of the first is the defection or demise of a supplier, but only one among many. The second type is typified by a situation such as Apple introducing an innovative product that causes massive market share reductions for a competitor.
- **Cyber risks;** risks due to infiltration of malware into the business systems, such as internet based theft of credit cards and raiding of bank accounts. With the advent of the cloud this can only grow in frequency and magnitude as the huge and repeated cascades of data can mask malware intrusions, and with sleepers, cause the maximum damage by the time the problem is discovered. Big data can lead to big headaches, as Home Depot recently admitted to a further loss of customer data in the order of 50 million compromised cases, originating from a supplier's system linked closely with Home Depot's internal operations; seamless ties can lead to major cyber headaches.

Within these categories of internal, external and cyber risks we find elements of both physical and information aspects, and both elements matter. Asset based companies such as manufacturing are more exposed to physical risks by the nature of their business and consulting or banking firms, as a contrast, are lot more exposed to information risks. Three noteworthy observations:

- risks can migrate from external to internal status and conversely
- when risks are internal they can cause bigger damage than when they are external, because propagation of damage is harder to contain in tightly linked systems,
- the loss of one outsourced or external supplier may be mitigated but the loss the only supplier inside the value chain may bring the whole chain down.

Why market lifecycle matters for understanding risk

The market lifecycle and its significant milestones can be divided into three major phases, the initial start-up and growth phase, the leveling off and maturity phase, and the decline and collapse phase as illustrated in Fig. 1.

The first and last are generally phases of turbulence whereas the maturity is a period of stability where market behavior is quite reliable. Figure 1 captures the dynamics of market phase succession. Within these major phases, subsections are either steady state or transient, and their behavior is masked by the larger phenomenon of the three dominant phases [5]. Although there are two big turbulence periods and one major stable one, within each of these are small disturbances of varying intensity that act as strong manifestation of transient behavior or benign and controllable stability zones, called steady states.

They are worth a closer look for the special conditions they create that give rise to both risks and for the limitations they impose on the means to respond. The six transients of the market are potential points of no return.

- **Market entry** represents the opportunity to evolve from incubation to a start-up role in a nascent market. Failure to properly time entry may result in a permanent absence from the market. The early market is fault tolerant and accepts incomplete products, and can act as an early beta test.
- **Chasm** occurs as early firms make a transition from pure product innovation to satisfying the early majority client base which demands more reliability, quality, and better price, also a substantially complete product. The inability to adjust in real time may leave the firm in the chasm and force an eventual exit from the market.
- **Standard setting** unleashes a process of coalition forming around principal firms which introduce often competing standards platforms. The choice of platform partner may dictate which coalition emerges as the market leader, forcing the other groups into a follower role, as in Apple versus Samsung or Motorola. [Blackberry recently partnered with Samsung to provide secure communications for the Samsung android products, enhancing this platform’s survival chances]. The standard setting also has the critical role of building a barrier to disruptive technology suddenly invading the market, as beyond this market point, all competitors need to be compatible with a platform. Standard setting occurs in all industries; such as the beverage industry where container size and materials are standardized; and in aerospace where the capacity and range of airplanes are similar in each airplane class.
- **Shakeout** is the first mass burial ground for firms. The market is in extreme turmoil; too many competitors and not enough clients as demand starts to level off. And usually it’s firms with adequate financial resources which survive not necessarily those with better technologies. As the market storm rages, firms have to weather the storm, but this takes spending of reserves. For the second time since start-up days, questions are asked about the firm’s burn rate and financial staying power under turbulent market conditions. And since most young firms live day to day, many disappear in the shakeout.

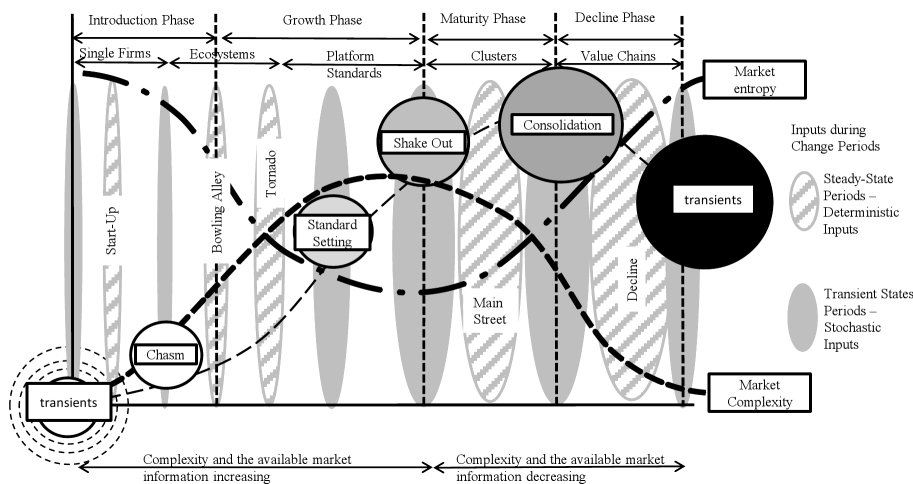


Fig. 1. Stability along the life-cycle.

- **Consolidation** represents the period when firms merge are acquired or seek long term partnerships, and this is done to respond to the prevailing strategic imperative of the market, cost leadership, which is imposed on the market by the fact that late stage client base seeks the best price at a given quality. To deliver the best price firms must have better economies of scale which in turn depends on better market share, hence the efforts of combining firms to achieve this market share advantage.
- **Market exit** happens after a market starts to decline but in spite of this delicate situation, a decent living can be made by firms that wait for exit of others and begin to service the legacy component of the market, namely the client base that has too much invested in existing technology or is reluctant to switch to promising but untested new ones. Lucent made a very lucrative living within this market reality.

The risk here is the timing of the eventual exit and the danger of leaving too much of the asset base stranded as sunk costs. It is worth noting that as the market develops a gravity type force increasingly asserts its presence and causes market contraction, in the sense of pulling the firms closer together. The most important manifestation of this gravity type force is M&A.

From standard setting on, the gravity force becomes more of a factor at each stage. Platforms already display this grouping effect as firms coalesce around various standard platforms, in maturity the M&A activity is a further reflection of this increasing gravity pull as firms merge to produce bigger entities. And then emergence of value chains orders the loose stellar gatherings into tight solar systems orbiting around firms that anchor the chain.

Finally in market decline and onto market collapse the entire market is swallowed by a final black hole, the market exit. The market pulses and experiences expansion in early stages due to forces such as product and market differentiation that create a “distance” between competing firms to contraction in late growth, maturity and collapse where economies of scale arising from cost leadership strategies induce contraction [6]. These expansions and contractions are due to both the prevailing strategy and the underlying customer base that dictate a range of options from product differentiation to cost reductions to maintain margins in face of a price taker situation. There are many ways to react to expansion type periods but progressively these choices are reduced to a unique one by the market in the final stages of maturity and decline due to the fact

that there is really only one way to deliver against a unique prevailing price for commoditized products and that is better strategy execution. The strategy is given, cost leadership, and hence its implementation results in competitive advantage Cost leadership essentially dictates an economy of scale reaction and this can be achieved only through better market share. This market share is attained either by organic growth [but in a no growth market that would be prohibitively expensive as every competitor defends share for the same reason] or a strategy of acquisitions.

Hence the dominant response mode becomes M&A; if you can't beat them, buy them. And this firm enlargement activity is induced by market contraction due to a gravity type shaping force called economies of scale [7]. The market has a life of its own.

The nature, frequency, and magnitude of risks change dramatically with each transient phase. In the chasm the risk management approach shifts focus to the early majority customer needs and away from the singular focus on the disruptive product design approach intended for innovator and early adopter type customers; the challenge is now to make a marketing mind set adjustment which is relatively easy, given the proper leadership. In fact product designers yield internal leadership to marketers. [The transient holes that swallow the unsuspecting or ill-prepared firm tend to grow in size and duration and re-emerging becomes progressively more difficult. The holes get bigger and darker and have a stronger pull akin to gravity]. The chasm swallows some firms, while others cross to the platform phase. At the platform phase opportunity costs abound, which one to chose or where to place the bets. This takes deliberate consideration and careful long term decision horizons, the risks are greater and more unforgiving. The risks are also sequential, which platform to follow and when to abandon if it was the incorrect choice. But in both of the above phases the response to these external risks are internal, the quality of decision taken by the firm and its timing determines the outcome.

At shakeout, the firm is totally at the mercy of the market as the perturbations are larger, more frequent and last until the number of market competitors is reduced to match the market demand. There is a huge drain on resources of the firms while the market decides survival. Risks are entirely external, there is a significant loss of control of market positioning by management until the market levels off. The quality of internal decisions are merely coincidental to survival, and may not matter as the market

buffets the firms with such force that reaction and adaptation may not be possible in real time. This is a phase of strategic drift, where you hope to outlast the hurricane [8].

Consolidation becomes a safari of big game hunting to find the partners who offer the size and market presence to cope with cost leadership strategy that is now given to the firm by the market. The risks grow to firms without proper partners as each M&A is consummated. There is a danger of being left out or finding less than adequate partners as was the case with the HP and Compaq merger [9]. Risks now impose a sequential discipline of choice of a partner and choices not taken to find a partner, and the next round of decisions may have to cope with more long term vulnerability of missed opportunities. By the time market exit looms on the horizon the risk taking may become gambling in the sense that the penalties imposed [leaving the whole asset base as sunk costs] may outweigh the profits taken in the dying market. The compensating factor is the size of the installed base to be serviced in the market for a given technology may be quite large and lucrative. And this may be true even under a disruptive market renewal. Such was the case for Lucent which made a decent profit off this installed base in the early internet, even though Nortel intruded with a disruptive technology that swept the market forward. The risk taking was reduced to a choice between low early sales in a growth but high risk business or continuing the legacy business until it shut down.

Usually management decision frameworks favor survival with low risk options; these are our market transients that go from the pristine white hole of market entry to the irresistible black hole at market exit that swallows all. By and large the transient market drivers are stochastic, because both the choice of strategy and the customer base are in doubt, and hence quasi-unpredictable, but the unfolding of over-all events and their consequences is quite predictable, although not necessarily controllable.

In between market transients are the steady states of start up, bowling alley, tornado, main-street and decline and represent the calm waters of the market where well defined strategies lead to success and risks can be confined and dealt with through the choice and sequencing of the right strategies. The bowling alley requires the firm to build from the ground up its business by selecting vertical market components say the banking industry and its ecosystem as was done in cybersecurity by Entrust, nurture and develop these so called vertical components until in the tornado phase they merge into

a horizontal mass market. Even the hyper-growth phase of the tornado is manageable as long as the focus is on top line growth and maintenance of market share against closest competitors [10]. It is firms, with relative market share strength in the tornado, which will eventually set up the standards platforms and dictate further market development. Although “grow big or go home” strategy during the tornado has its execution pitfalls, it is doable. Main-street or the mature market is the Promised Land for shake-out survivors; the market becomes calm and quite predictable with the only surprise element left being the sudden move by a competitor. Customer base holds no more surprises and hence competitive anticipation, carried out through business intelligence functions, is the key. As Grove, the ex-CEO of Intel once remarked in the mature market phase of Intel: “we better start paying more attention to our competitors” [11]. Knowing what and when a competitor is likely to do has strategic value and hence, on the darker side of business competition, cyber-spying begins to take shape; and this risk is now in the cloud.

A further aspect of market dynamics are the types of stability that are prevailing in the market depending where the firm is in the life-cycle. In the earliest phase of the incubated company that just emerged into the market or the start up that is finding its traction, zone stability prevails, this means that the firm yields space to a perturbation and re-locates under the force somewhere within its zone of competency. It has portable skill sets that can be deployed some distance from its original position and hence can restart the process [12]. Also it has minimal investments of knowledge, assets or experience in the dislocated previous position and can land on its feet. In a sense it has relatively better capacity to absorb shocks unleashed by a risk scenario that can prevail during the whole growth phase, though with more difficulty as the growth accelerates and sweeps the firms along. Commitments are now being made to both logistics systems and distribution channels, and once built, these channels represent a bridge to a particular client cluster and the tendency is to fill these channels with product variants that the customers may need. Filling the channels is an imperative dictated by the finance function in the firm, and the process of marketing being dominated by finance begins. The channel represents the investment and the more products it carries to the customer the higher the return on the investment, so marketing is now supervised by finance. There is both a physical commitment, the channel, and an informational one, knowledge of the customer, and these commitments can anchor the firm as depicted in Fig. 2.

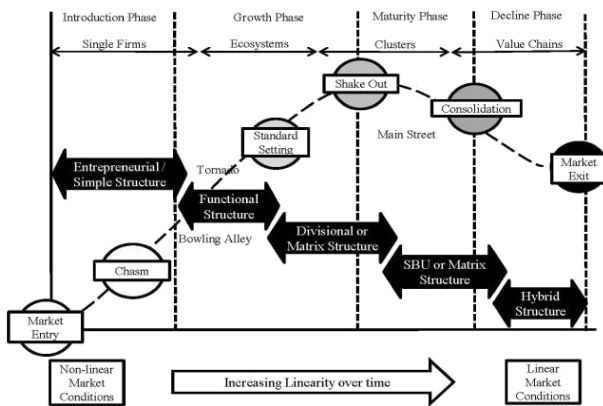


Fig. 2. Internal structural forms of companies through the life cycle.

By the time perturbations occur around leveling off and early maturity the firm can still yield space but tends to return to a market position that is quite close to the original one. This positioning happens for many reasons as the firm has routines now; a culture, a way of doing things and policies or guidelines that focus on a specific market segment and leaving this segment constitutes a risk by itself and therefore the tendency is to spiral back to a known position. Or even better, all of the perturbation energy is absorbed by the firm's structure in the form of restructuring, downsizing or severing as was done by IBM. In this case no movement from established market position was necessary. Many smaller IBM's remained around the same market position delivering different products and services

Finally when late maturity materializes the firm now is quite rigid in its structure, it is likely located in a value chain, whether this is explicitly evident or defined by strong partnership relationships, and can no longer find a new home in the market without immense new investments of resources and change of culture. The progression of structural forms for the firm during market development is shown in Fig. 2.

It must resist the perturbation and even the shock loading, and it does the best it can, by building reinforced ties that resist shocks in situ. Some of these ties are illustrated by the Japanese practice of continually bolstering supplier relations by the exchange of staff and technology and limiting the number of suppliers in order to exert more influence on the small number remaining in the fold. This has its own risk consequences because when a supplier experiences trouble the chain suffers immediate disruptions. The trade-off between many suppliers, small influence on the conduct of one, and a few suppliers with extensive influence on each, is the risk of disruption. With many suppliers, one missing is of no consequence but with a few, even one troubled supplier can cause ma-

ajor upheaval. So there is the dilemma of risks building up because of consideration of efficiency. Another example illustrates this even better; asset intensive manufacturing operations tend to run with lean production and minimize inventories or maximize inventory turns by practicing JIT, which has direct impact on cost reductions. However when flow of goods in the value chain is interrupted JIT can become JIC, or just in case [13]. Excess inventories are often a decent hedge against interruptions of flow and should be assessed against the likelihood of interruption and the total costs of downtime. In the case of Toyota, victim of an earthquake in Japan, lack of inventory reserves [JIT] that could have compensated for the breakdown of flow of inputs, cost the firm global leadership and was a huge blow to its reputation within the dealership network [18].

As markets evolve so do the firms, they acquire more structure, cultural rigidity, prescribed routines and locking in to specific positional strategies. Furthermore their resource base, especially the core competencies get fine tuned to the chosen client base and the emphasis shifts from effectiveness, being in the right place, to efficiency, doing things right. And the firm becomes more internally focused on its own operations, as it must to deliver on the cost leadership strategy, and does so at the detriment of losing some perspective on market developments. This is the primary reason why intrusive and disruptive technologies introduced into the market at this stage escape the attention of the big players who are the most threatened by this technology. There is a willful blindness due to the internal focus and the many discipline instilling reinforces such as policies, guidelines and operating procedures that wash the market vigilance out of the firm [14]. Yet this discipline causing market myopia is both necessary and unavoidable as efficiency requires it. So the risk trap here is the loss of market perspective and inability to adjust to new disruptive market invasions in real time. We can look at one aspect of firm function, innovation, to illustrate the problem. Figure 3 traces the risk attitudes in the firm during the lifecycle.

We can see the risk attitude shift from promoting risk taking at start up to defeating risk taking and avoiding it altogether by maturity [15, 16]. And again the reasons are clear; a young firm is trying to catch the market attention and it interacts with the innovator client base that seeks out the cutting edge and most challenging products. But the mature firm has many investments and resources committed, including its fine tuned internal core competencies and core capabilities related to its function in the value chain, targeting its now substantial stable client

base, and will not let risks intrude to compromise this position. It will resist any effort, internal or external, to move it from the lucrative locked in position. Furthermore it lacks the necessary strategic choices to move even if it wanted to, cost leadership rules and no other strategy is available for the mass market. Sometimes a niche retreat is possible where innovation can be deployed and blue sky innovation again dominates but the risks with niche markets is that mass market players can follow you if there are no strong boundaries to defend the niche. Just because Apple succeeded and returned to the mass market after perfecting its advanced i-product offerings does not mean others can. There are many strategic choices in early markets due to the wide range of feasible product offerings. The chasm closes some options by focusing on specific client groups, further down the road the standard platform cuts down on options by locking in firm to standards and in mature market the product now being commoditized, cost leadership becomes the only choice. Hence if the strategy is given to you by the market then the competitive advantage can only come through the execution of the strategy and this is why mature firms do so much navel gazing.

risks which loomed in the market migrate within the firms and the real struggle is now within firm boundaries. Strategic choice availability through the life-cycle summarized in Fig. 4.

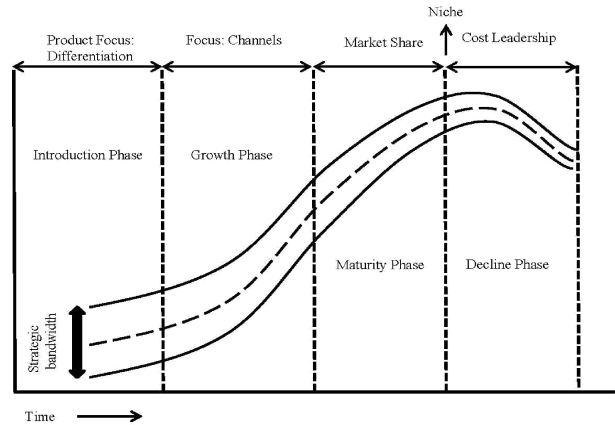


Fig. 4. Strategic choice availability through the life-cycle.

Complexity, nonlinearity and masking of risks

If we look at Fig. 1 again we see that early markets tend to be nonlinear in behavior due to the fact that ecosystems accompanying the firms, as they form, create a network effect that grows geometrically with the addition of each new member. This leads to complexity in the sense that the whole is more than the constituent parts and with emerging properties not necessarily predictable from the behavior of the components. The nonlinearity starts to fade along with complexity towards the end of shakeout and slowly linear behavior emerges but still mixed with nonlinearity [quasi linear] until in maturity the market behaves in a linear manner; output being proportional to input in the value chain, thereby regaining predictability. However there is a trade off as complexity migrates into the firms forming the value chain which happens through information absorption through IT interfaces with the market that gather, filter and analyze appropriate information from the environment depending on the setting and sensitivity of the filters. For example if business intelligence is looking for pending M&A by competitors then only information relevant to this assessment is allowed through. If pending moves by competitors need to be anticipated then the internal hiring campaigns of this competitor may reveal intentions. The value chain itself will behave in a linear fashion but the individual members of the chain become internally complex [4, 5]. GM is an extremely complex organization internally but its response modes to dealership moves or supplier pressures are easily analyzed.

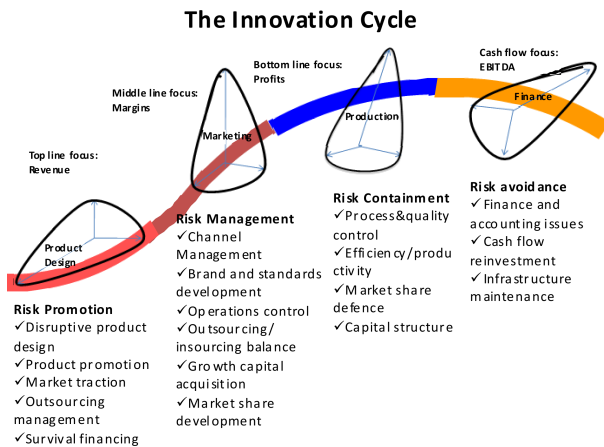


Fig. 3. Risk and the innovation cycle.

We can see here a logic of risk progression, as the strategic choice funnels down to one, the external risks in the market migrate inside the firm. In parallel with the decrease of strategic choices the firm's decision making style also tracks this convergence to risk avoidance, as impulsive and intuitive early stage decisions are replaced by elaborate, data intensive and deliberate ones [17].

Late stage markets are relatively stable and calm, except for perturbations or shocks, which would come from outside the market, any ongoing turmoil takes place inside the firms as M&A occurs or restructuring or downsizing is implemented. Hence the

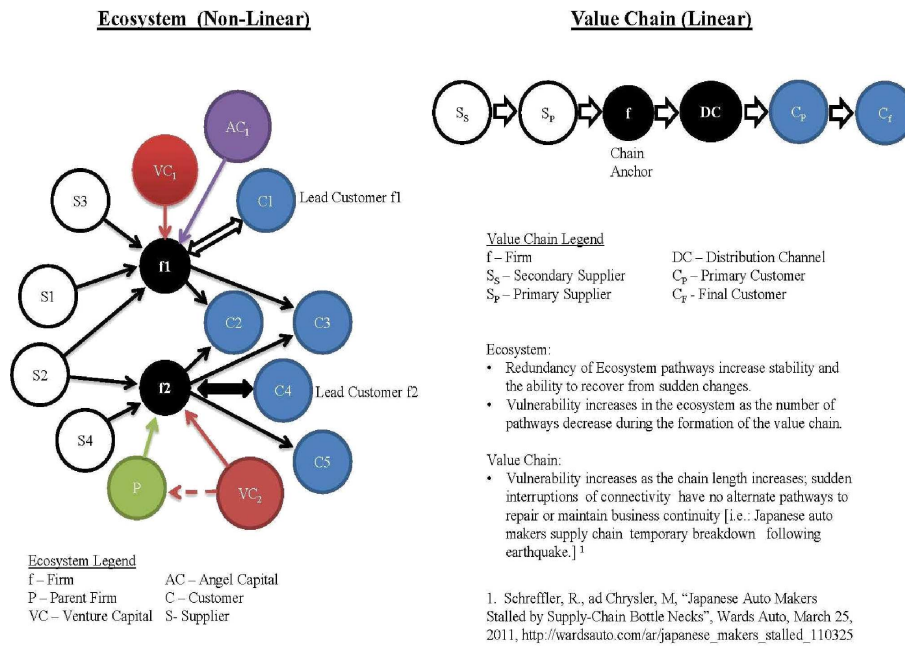


Fig. 5. Ecosystems and Value Chains.

Late stage firms acquire substantial structure and much formal and informal connectivity within and among functions, making predictability difficult, but we can enclose the firms in a “black box” within the value chain and deal with the response cascade among boxes to find linearity. If we increase by X% supply through-put at the beginning of the chain we’ll find normally X% increase in output at the downstream end in the long run [partly this happens because firms in value chain are into lean production and JIT inventory mode, thereby eliminating internal transient responses due to internal absorption of input effects, in other words delays in output responses]. Figure 5 shows the formation of early stage ecosystems which are highly nonlinear and late stage value chains that are substantially linear, and in our context ecosystems are just proto value chains with one significant difference.

Complexity hides in their structure in response to expected risks generated by external perturbations. And firms find the solution to external perturbations in this very complexity. If a portion of the ecosystem is severed there are alternate paths that can be taken for the ecosystem to affect self-repair. A previous example in this paper commented upon Blackberry providing secure communications abilities to Samsung products; this is an example of a firm being able to refocus its products and re-enter the ecosystem, albeit in an upstream location in the value chain compared to its previous position of being close to the final customer. By the time we get to

platforms this self-repair type recovery is much harder to achieve. The structure of the platform, which is a more advanced form of ecosystem, is simpler and more rigid and once a tie is cut between an application provider and the platform it is much harder for the app provider to link with new platform as it has now specialized and an opening at other platforms may not be compatible. Finally at the true value chain stage of maturity, the collaborative structure is strictly linear and extremely rigid and brittle. Any rupture along the chain can prove fatal for the whole chain not just the firm at the point of impact. At the early M&A phase, which is based mostly on technology acquisition we find a hybrid structure that has both linear and nonlinear components, the cluster. The merged firms go through a period of rationalization to eliminate redundancies and while this is happening internally, there will also be more suppliers, distributors present then required. Elimination of these suppliers and channels results in further linearization of the whole chain. This flattening of the chain rolls out towards both upstream [suppliers] and downstream [distribution channels] components. Eventually the whole chain is ironed into a flat shape but during transition this hybrid manifests both the vulnerability of the linear chain and the redundancy of the ecosystem. Where a perturbation occurs makes a difference. Along the linear components the perturbation can cause major damage but ecosystem ends of the chain can absorb even major hits without collapsing. From the risks

perspective we have the following story unfolding; in early alliance environment the point of impact of a perturbation, caused by a risk materializing, does not matter as any portion of this system can absorb the shock and affect self-repair. Figure 6 shows the evolution of value chain structure and the flow of resources among members.

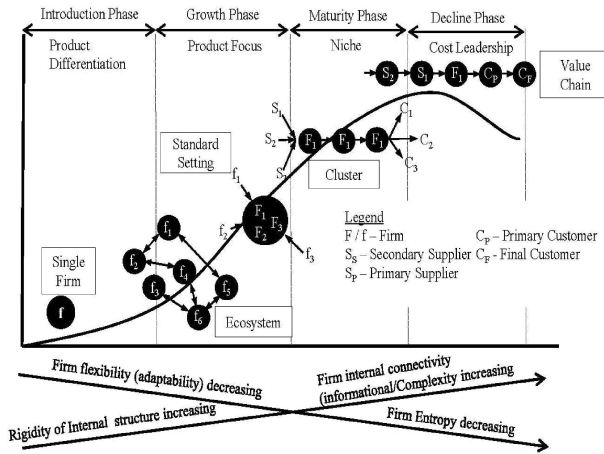


Fig. 6. Ecosystem to Value Chain Evolution through the life-cycle.

Clearly higher connectivity offers paths of recovery under perturbations that damage the structure, but also creates complexity and with it the loss of predictability, so the trade-off is between controllability and stability. Ecosystems are more stable [zone stability] but much less predictable or controllable. By the time we get to platforms, a hit on the platform can either be absorbed or sink the whole system depending on its magnitude, but on the periphery where suppliers and distributors dock most perturbations can be absorbed. In clusters the center is vulnerable and the ends are not, and finally in formal value chains every point of connectivity is a major exposure for the chain. A perturbation need not target the individual firm but cause damage as long as it disrupts its connections. The connection between Walmart and its major suppliers is the trucking system and if this component experiences a major downtime Walmart is in serious trouble even though neither it nor its suppliers suffered damage. So we can think of the connectivity of these networks as having processing units, the firms, and connections that handle the flow of goods or information among them. Risks to flows can be handled early but become more exposed as the structures evolve. A few flows in ecosystems, some in platforms, many in clusters and all in value chains are critical. This is a very important element of risk analysis as you can deliberately damage competitors and activate a risk sce-

nario by interfering with the exchange of resources in the structure.

Mature market value chains are what we recognize as having distinct logistics and distribution channel components. As the chains form some internal risks arise and are magnified by the fact that some firms are upstream and other downstream. Upstream firms are what we call suppliers and downstream the sellers. Upstream firms tend to produce more commoditized higher volume and less value added products. Through efficiency and economies of scale the suppliers tend to outgrow the downstream customers of the chain and begin to chafe under the constraints of the chain that limits them to sell only to chain members. This can lead to internal conflicts that can endanger the chain. In Canada, a mini Walmart operation Giant Tiger solved this stress risk issue by allowing its trucking operations, an upstream component, to carry goods of non direct competitors on the backhaul, thereby reducing excess capacity of the trucking operation. JDS Uniphase, an original supplier to Nortel, actually outgrew the chain and thrived for a while supplying competing chains. The very structure of the value chain builds this internal stress factor that can trigger the risk. Furthermore we have shocks in value chains that may be benign for downstream and harmful to upstream firms. Good news for downstream and bad news for upstream. When volume of sales spike suddenly those without heavy asset base, usually downstream firms such as dealerships in automotive industry, profit handsomely but parts suppliers, after reaching optimum plant capacity, are forced to expand which does not come in incremental amounts but big investments increments and take time to ramp up; as is happening right now with Canadian auto parts suppliers Magna and Linamar. So, usually upstream parts of the chain are more exposed. And in highly cyclical industries such as chip manufacturing the firms have to anticipate future demand and ramp up during down-cycle to catch the peak by the time that happens. And often the upcycle may not happen when predicted and hence the asset heavy firm in the chain suffers losses due to idle capacity and maybe write offs. Figure 7 traces the essential profile differences among upstream, midstream and downstream components of the chain. For manufacturing the lessons are obvious; any means that alleviates actual flows of physical goods diminishes the risks posed by being in a chain. But the diminished flow of real goods is always accompanied by an increased flow of information which carries its own cyber risks due to the uncertain security status of the cloud. Vulnerability of linear value chains can be decreased by introduc-

ing structural redundancy into the system, but this is accompanied by higher costs.

Value Chain Members – Operational Profiles

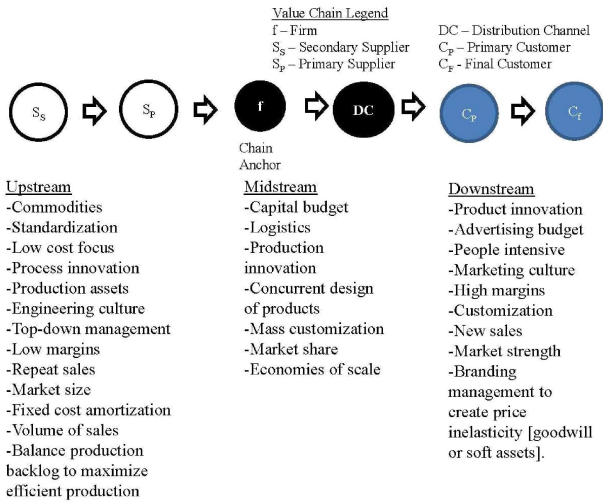


Fig. 7. Characteristics of mature Value Chain members.

So the trade off is between effectiveness, defense against risks and efficiency. Inexorably firms move along the lifecycle working with simpler overall common structures of collaboration but internally these firms become more complex, hence the simplicity you see in value chains masks some real complexity underneath. You can observe and predict the behavior of the chain but not the members of the chain. Hence the diagnostic risks move from external level [the alliance and the market] to within the partner firms in the alliance, the value chain being the final expression of an alliance .

Coping with complexity, risks, and vulnerability

Everything is relative; a wave that would gently rock a ship could swamp a boat. Energy carried by a perturbation is resisted by the internal structure of the firm and its immediate connectivity environment. A better anchored firm can offer superior resistance to perturbations as long as it can drift slightly under the blow, but both the magnitude and the frequency of occurrence of the perturbations matter. One moderate hit can be absorbed even as it causes damage but several in close proximity can sink the target, therefore both the absorption of energy and the ability to affect repair are crucial to survival. Anticipation is only useful if adequate repair reserves and routines exist to right the vessel. The early stage market firm exists loosely coupled to its ecosystem, but both the loose coupling and amor-

phous structure of the firm help in responding to perturbations. The loose couplings yield under impact and even if breakage occurs the system itself adjusts to provide alternate paths of connectivity [or in our context complexity as we associate connectivity with a measure of structural complexity]. The firm is malleable as it is totally non-structured, damage is minimal internally and the external environment. Its ecosystem generates the coping mechanism through its connectivity. The system does not resist, it drifts with the currents, and overcomes force by structural deformation which is a form of resistance though yielding space.

In the platform stage complexity is reduced and confined to the periphery of the platform itself where supplier and distribution channels dock at the mother ship. Resistance at the periphery is analogous to the ecosystem mechanism and the defense resides in the remaining complexity at the edges of the platform. A firm may leave the market or cease to exist, but is easily replaced by others. The mother ship now is more critical and is structured and inflexible and hence must absorb the perturbation. The defense mechanism is the evolving standards, such as going from proprietary to open standards, again yielding space collectively. But this system does not have a central component that ecosystems based choice of alternate path cannot compensate. Should the firm be mortally wounded the whole chain is dragged down as the vulnerability lies in the solid structure of the platform itself; it can respond slowly under impact but only at a stately pace, no instant adjustments. The rate of change dictated by the series of perturbations becomes the survival criterion; the higher the rate of impact, the less the success of survival. In clusters, complexity is banished to the extremities of the proto value chain and there connectivity based defense is still feasible, but the linearly linked central component now has two major exposure points; the constituent firms [value adding units] and their connectivity [flows of products and information]. Severing the flows or irreversibly damaging the chain member has equally devastating effects. Flow interference can happen under lot less drastic conditions than putting out of commission a member of the linear component of the cluster. Where the perturbation happens is now determinant and both magnitude/frequency and location of the perturbation define the risk.

The value chain is the final linear expression of the ecosystem where every member and flow linkage are equally exposed. Everything is vulnerable, yet this is the price to pay for efficiency because now the interplay is between vulnerability, efficiency, fit

to the environment, and survival. Chances of survival decrease progressively as the firm fine tunes its interaction with the strategy dictated by the market. Cost leadership demands linear, simple and efficient structures tightly linked to deliver the lowest cost and maintain margins. This very optimal adaptation response to the cost leadership requirement, expressed through the linear value chain, causes the maximal exposure to perturbations, some of which carry extinction-level blows. As markets mature, market complexity decreases and firm ecosystems simplify and become more efficient, but this harmonization with the market environment creates a spectrum of vulnerabilities and exposure points to future market risks.

The better adapted the firm is to its environment the more likely a major perturbation will cause damage as the firm lacks the real time reaction capacity and redundancy, it is too well anchored to its environmental position.

An example; risk profile in venture capital

As the firm emerges from incubation and pure start-up where angel capital fuels the market traction, it starts to look to venture capital for the next phase of market development that culminates in the short burst of hyper-growth known as the tornado. Funding with venture capital (vencap) is a risky cat and mouse game, with the entrepreneur's ambition being both survival and long term market success, whereas the venture capitalist is focusing on shorter term return on investment in the form of IPO or M&A and in the case of promising young firms transfer of control from the owner to the investor. There is always danger that venture capital become adventure capital [the investment goes sour] or vulture capital, where the firm is taken over by the provider of funds.

The risk scenario balances on a knife's edge; with the entrepreneur jealously guarding and nurturing his dream and guiding his ship along the competitive ocean and his vencap associate or co-captain wishing to steer the vessel to the nearest safe harbor where the merchandise aboard can be monetized either by having the public bid for the cargo [IPO] or selling to bigger player [M&A]. The risk resides in competing ambitions and conflicting goals of the entrepreneur and the venture capitalist. Vencap usually spreads its bets through a portfolio of growth firms and one or two payoffs are enough to provide a decent return on capital, but the patience levels are low and expectation horizons near. Maximum of four years are allowed to bring the crop to market and this depends

on the nature and time constants of the market itself. Where the entrepreneur sees opportunity, the vencap sees danger and visa versa. The vencap will invest only enough money to keep the young firm going for a while; in return it acquires an ownership stake. When the firm is running low on funds, and worries about its burn rate, the vencap offers a new round of investment and claims more ownership. Progressively the firm is taken over through this "starve them into submission" tactic and often the founder is shown the door before the bonanza payoff is realized. Conversely the entrepreneur may dangle golden prospects before the vencap and attract good money after bad and run the ship onto the reef, as entrepreneurs most of the time are poor managers. Risk here has duality and symmetry; both the owner and the investor are playing a game that has zero sum results; my gain is your loss.

Furthermore the pressure builds typically through a series of decisions that involve several rounds of investments, shifts in ownership and control as the firm churns towards the end of the tornado funnel. Ownership alone is not enough of a defense, as board of directors can be significantly influenced to cause a seismic shift in key stakeholder interests and isolate either the owner or the vencap in the struggle for supremacy. Often in a vencap situation the risks are purely internal and the competitive moves by the two principal antagonists determine the outcome. Both the IPO and M&A result in transfer of ownership, control and payout to the vencap along with the original owner, but the latter often remains so disenchanted by the results that if it returns to repeat the experience with a new start up often the second try is self funded with owner providing both angel and vencap thereby eliminating the vencap phase until the firm can go public.

Conclusions and future research

We have outlined how risks evolve along the market lifecycle linked to complexity and structure of the alliances that define a firm's market neighborhood. These structures: ecosystems, platforms, clusters and value chains have inherently different exposures and levels of tolerance to risks and carry different capacities to react. And often effectiveness and efficiency are in conflict. It would be interesting to see how exactly the tipping points are reached at each phase of the market that induces a shift from one collective structure to the other and furthermore how the individual firms within these groupings continue their development of structural complexity. Is there a migration of risks from the market to the chains and

from the chains to the firms? And is the overall risk level in any given market, the beta evolve along the lifecycle in correlation with the alliances. The grouping of external perturbations, in frequency and intensity, and the capacity to induce resonance in the form of a real shock is an open question, the resolution of which would be of real benefit for mounting singular and collective defense against these occurrences.

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