LUISS Guido Carli
LIBERA UNIVERSITÀ INTERNAZIONALE DEGLI STUDI SOCIALI

Department of Business and Management

Chair of Management of Innovation

GiPSTech and the competition over Indoor Positioning technology. Empirical evidence of the importance of a strong innovation ecosystem behind the emergence of a Dominant Design

Supervisor

Prof. Francesco Rullani

Co-Supervisor

Prof. Andrea Prencipe

Candidate

Alessandro Petrich

Matricola: 656701

Academic Year 2014/2015

Summary

Selecting processes of dominant design often depend on the efficiency of the underlying innovation ecosystem. In fact, starting from a deep observation of past technological battles, it was evident that too many times, several cutting edge technologies did not succeed in reaching the technological dominance. Given that dominant designs can be recognized only ex-post, once they have emerged, it could be too late for managers and innovators to adjust their own strategy. For this reason, we want to demonstrate the importance for them to take in consideration the innovation ecosystem since the beginning, in order to properly shape the innovation strategy and to influence the following technological selection.

Innovations become dominant just after a given period in which lots of competitive variables by interacting with each other, boost technologies towards the dominance. We found many prior analyzes related to dominant designs and technological competition, however less attention has been devoted to examine the critical influence generated by innovation ecosystems during the selection of the dominant technology.

Let us assume that a new industry is born after a technological discontinuity is verified, then we can observe a period of high turbulence and uncertainty that affects the industrial demography, and a period of intense competition based on the concept of product innovation. From a closer point of view it happens that, when a new technological need emerges, and a new possible technological paradigm is set, several new firms enter the industry and try to overcome each other offering differing alternatives on the market.

The model proposed by Abernathy and Utterback represents one of the most effective tools to understand the way the innovation process works. It is a theory that, if well studied and completely understood, could help firms in studying their industries and to assess if it is the right time to invest in developing the technology that best fits the

market demands. They developed a dynamic model where, given a life cycle of an industry, it is possible to distinguish an alternation of two main innovations in terms of predominance: product innovation and process innovation. The model breaks down the industry life cycle in three stages (fluid, transitional and specific), which differ the ones from the others because of the different attention and investments firms put on the two typologies of innovation.

When a dominant design emerges, we are in front of a creative synthesis of innovations related to technological solutions, which have a broader appeal if compared to other solutions. Anderson and Tushman defined it as "*a single configuration or a narrow range of configurations that accounted for over 50% of new product sales or new process installations and maintained a 50% market share for at least 4 years".* It is not always the best technology but for sure it is the best technological compromise in the set of different functional characteristics presented by an innovation. Several prior studies centered their focus on defining what a dominant design is and on identifying its emergence. In fact, an innovation turns out to be a dominant design after a determined timespan in which several competitive factors play a fundamental role. The according point is that a dominant design, once emerged, solves the uncertainty typical of the fluid phase, it changes the rules in the competitive arena and it continues to be present until there will not be customers anymore for that product class. The main characteristic of market standards is that it could be recognized only in retrospect when sometimes is too late for competitors to adjust their innovation strategy

Thus, starting from the main pillar of our analysis, which was characterized by a huge literature confirming that the end of technological uncertainties within rising industries is the direct consequence of the emergence of a dominant design, the analysis performed in this paper wants to demonstrate that efficient innovation ecosystems represent a crucial variable because they actively contribute in solving that technological uncertainty, and consequently in helping one technology to become the dominant one.

To perform an accurate analysis of that crucial variable, we present innovation ecosystems as a twofold variable, where on one hand we considered them as an exogenous variable by taking in consideration key factors like geographic proximity, cultural adjacency and institutional supports, while on the other hand we compared innovation ecosystems to firm-specific assets because in this case their efficiency strictly depends on the innovating firm.

To better understand the exogenous variable we can imagine it, as a highly technological hub where innovative processes constantly reinforce themselves. To make a quick comparison, it could be helpful to think about Paris at the beginning of '900. The French capital used to be the most active cultural and artistic hub in Europe, and this was due the fact that there was an underlying self-reinforcing virtuous cycle where a huge number of artists generated a highly efficient network of surrounding players, who started to orbit the artistic system. Artists, dealers and buyers were so strictly interconnected to each other that Paris received the attention of other foreign artists and buyers, whose the first started to move to Paris, while the second generated an European artistic marketplace, which consequently enhanced the quality of artistic works realized.

The exogenous perspective of ecosystems is vital when talking about innovation because unfortunately the boosting qualities of innovation ecosystems are concentrated just in few areas owing to several boundaries like geographic distance, cultural differences, and lack of trust and confidentiality. Incidentally, innovation means changes in already established technological paradigms, and these changes require a strong cooperation between players operating in efficient ecosystems. These players should align and commit to reach the same innovative results, because when a new technology is launched, to be selected as dominant design it is not sufficient that it is a potentially disruptive innovation or that the firm is located in the Silicon Valley.

Here comes the second perspective of innovation ecosystems, which presents ecosystems as strictly dependent on the firm's ability to build a strong and efficient

network of strategic and aligned players. This network, when enabled, could turn into a firm-specific asset, which allows a technology to take off towards the technological dominance. The role played by the focal firm is crucial because first of all, considering the main features of its technological solution, it has to identify the right exogenous ecosystem where it can find the right partners and the most reactive market conditions, then it has to build its network and to coordinate all the efforts of other interconnected players and innovators, which should align and commit to reach the same results.

Thus, the larger the ecosystem of actors the greater should be the coordinating strategy of the focal firm; every single dependency, partnership, alliance, joint venture should be calculated and aligned before developing the final product. This process of common understanding toward a successful cooperation and co-innovation is a feature typical of innovative ecosystem. The risk of not coordinating is to fail.

From a closer perspective the focal firm should be able to perfectly coordinate upstream and downstream innovations, which could add critical values to the innovation deployed by the focal firm. This is a crucial activity because, if the focal firm does not pay the right attention to these procedures, it will face several bottlenecks to offset. Specifically, we can assess that upstream component challenges represent a bottleneck to the value creation because they constrain the focal firm's ability to deliver the full innovation, while downstream complement challenges thwart a full value creation because they impede the customers to fully enjoy the focal firm's innovation. Now it is quite obvious that bottlenecks can arise in all levels of the innovation process and a successful firm should be able to offset them as soon as they come up. In fact other players will probably have to face and to solve their innovation challenges, and the focal firm should give them the right time without delaying the launch of the final innovation. Challenges in innovation ecosystems can be an opportunity to enhance the competitive advantage or a risk to destroy it. In particular, on one side we have the suppliers, which usually face challenges, which could increase the value of the final innovation. On the other side we can find the complementors, whose big challenges could destroy the entire competitive

advantage previously created because they are not so efficient to fully deploy the innovation to the right end-users.

These two faces of innovation ecosystems, when combined, are so potent that they can influence and shape technological environments, multi-sectorial industries and the selection of dominant designs. This ecosystem perspective is particularly relevant if connected to innovation because innovation means shake-ups in already established technological paradigms, and these shake-ups need to be orchestrated by a strong cooperation between players operating in efficient ecosystems. In fact, often disruptive technologies fail because, they undermine the foundations of a socio-technical regime without the right support, while on the contrary, the socio-technical regime is reinforced by the savage opposition of incumbents, organizations, lobbies and social networks. Thus, governments and national institutions (exogenous ecosystem) should intervene to influence these subsystems underlying a socio-technical regime, in order to accommodate a new upcoming technology. Once the socio-technical regime becomes accommodating, it comes to the firm to effectively build its own firm-specific ecosystem, which is the key to disrupt already existing technological paradigms.

It is important to analyze the ecosystem variable because it is a variable that could be actively shaped by the firm while launching a new technology. In fact firms can strategically assemble their own firm-specific ecosystems and even if they cannot influence the external ecosystem variable, at least they can search the optimal ecosystem for their technology to emerge and consequently move there. Not monitoring the ecosystem activity could be a threat for managers because they risk to understand how the market is being shaped when it is too late to adjust the competitive strategy

To demonstrate the importance of innovation ecosystems we analyzed the rising indoor positioning industry through from the perspective of a start-up, which is trying to launch a cutting-edge technology: GiPSTech. Indoor localization and navigation has been defined as one of the next big things because it will allow and facilitate the interaction

between users and the surrounding environment. The underlying needs of interacting with the environment in a closed space could be different and they depend on the user we are considering. Hospitals, malls and museums could be interested in helping the user navigation within their spaces, while retail companies could be interested in the technology to improve their marketing efforts addressing the right information, to the right person at the right time. The Federal Communications Commission of the U.S would appreciate the advent of an efficient Indoor Positioning System (IPS) in order to promptly provide emergency services.

More than 200 start-ups, after having recognized this “pool of revenue”, entered the competitive arena betting on different technological solutions. For example we can find technologies based on cameras, Wi-Fi signals, Bluetooth Beacons, inaudible sound waves, LED signals and geomagnetic fields. These technologies differ in terms of costs, capabilities, precision, longevity and need of infrastructures. Then they can be classified in two main categories: proximity solutions and positioning solutions. The first ones are those like Bluetooth Beacons. It means that the user’s mobile will engage with the system built up by the retailer, who can create value for the consumer through messages or push notifications. The second ones on the contrary, are more sophisticated technologies, which offer greater performances, accuracy and real-time localization. Positioning is quite different from proximity because the result will be a moving blue dot on a map (Blue Dot typically stands for You Are Here) and because it will enable several wayfinding applications, turn-by-turn solutions and just-in-time services.

Starting from this point, we have deeply studied the three main technologies (Wi-Fi, Beacons, Magnetic positioning), which solve the indoor positioning problem and, as it is showed in the study, it seemed pretty logic that the technological solution developed by GiPSTech is the closer to the condition of optimal solution. However, the vast majority of players are betting on the other technologies. In fact, when it comes to decide on which technology it is worth to focus innovative efforts, many players go for the less risky one. In fact, technologies like Wi-Fi and beacons are widely used on a daily basis. Today every building is equipped with a Wi-Fi connection, while many retailers have

already started to use beacons as a marketing leverage. Wi-Fi is a general technological standard for Internet connection, but it is not a standard to perform localization. It is quite imprecise and there are no margins for future improvements. Anyhow, big players still rely on this technology, forcing it to do the job of other technologies. For example, Apple has recently acquired for $20 Millions a startup (Wi-Fi Slam), which developed a Wi-Fi indoor localization system, while InvenSense has acquired, other two Wi-Fi positioning startups: Movea and Trusted Positioning. Apple exploiting its leadership made a predatory announcement to the rest of the players; it clarified which technology they considered the most valuable, and probably this move triggered a powerful herd behavior among smaller players. Apple is also betting, for marketing purposes, on the beacons technology by having endorsed iBeacons. However, even if we previously specified that beacons are good for proximity purposes and not for indoor positioning, when a big influencing corporation as Apple opts for that technology, it could happen that it becomes so popular that it is then exploited to solve different problems. Nowadays beacons are so diffused that if we have to decide which technology is the closest one to be the next dominant design, it would be obvious to choose beacons.

However, the very distinguishing feature of this industry is that just one technology has been developed from scratch: magnetic positioning. In fact, it should be highlighted that technologies like Wi-Fi and Beacons exist to address other needs. Those technologies operate in other industries, however they can, at least in part, provide an acceptable technological solution to address indoor positioning needs. Then, taking a look at the previous graph, we can say that Wi-Fi and beacons are competence-enhancing technologies, while magnetic indoor localization is a competence-destroying one. This is due to the fact that, the first two are following evolutions of already existing technologies, they have been improved since their creation and still they will. On the other side, magnetic positioning is an innovation that partly destroys those competences developed by already existing technologies.

Supported by this case study we tried to figure out what are the hidden factors that

decide over the life of a given technology that somehow is better than the one selected as dominant design.

To prove the crucial role played by an efficient ecosystem in supporting a given technology, by including the ecosystem's influence, we modified four well-known charts which have been elaborated by previous important authors and that nowadays are widely accepted. In particular we modified:

- Dosi's Technological Paradigm.
- Abernathy & Utterback industry lifecycle model.
- Schilling's U-shaped relationship between entry time and lock-out probability.
- Technology Adoption Cycle presented by Rogers.

Be that as it may, the technological paradigm theory does not provide any detail about which technology is going to be the dominant one. In fact, on Dosi's chart we can see different trajectories, which represent the problem solving activity performed by alternative firms to create a new technological solution; however it is impossible to identify the technology that is the closest one to reaching the technological dominance. The new suggested model includes a third variable (market performance) that consider the influence of the ecosystem efficiency while developing a technological solution. Given that, the revised chart is a 3D technological paradigm graph, which gives birth to different plans on which technological trajectories move and which are located at different levels. The higher the plan is, the closer it is to technological dominance. This point of view is important to constantly monitor what happens after.

According to Abernathy and Utterback, when a new industry is created, it is characterized by a fluid phase where firms tend to enter the industry until expected profits are driven to zero. At a certain point, approaching the transitional phase, the dominant design completely manifest itself and it will generate a general shake-out within the industry. Innovation ecosystems directly interact with the industry lifecycle

because, as we want to demonstrate, when an ecosystem is efficient the fluid phase lasts less than it otherwise would last. The direct consequence of it is that technologies when propelled by efficient ecosystems turn out to be dominant sooner.

Then, we considered it was notable to analyze the relationship between the entry timing and the probability of technological lock-out. The relationship is represented by a U-shaped curve, which aims at evidencing how the best moment to launch a new technology is in the middle between being to early and too late. In fact, first movers do not always gain a first-mover advantage that helps them in imposing a technological standard. As we will see, timing is a crucial variable that a firm has to understand *a priori* if it wants to force other players to switch to its technology.

The right "time to market" generally coincides with the full emergence of complementary technologies and customer needs. However, several case studies have demonstrated that even if a firm is late in launching its technology, it could succeed in reaching the status of dominant design. These case studies (e.g. Apple iPod) support the evidence that if a technology rises in an efficient ecosystem and if the solution is valuable, it could disrupt all the fortresses previously built by competitors. Thus, a late entrant if boosted by the right ecosystem, will be able to impose its technology as the dominant one.

Finally, we will introduce a modified version of the adoption cycle model proposed by Rogers because it is prominent to support our analysis over the importance of efficient innovation ecosystems. As it is going to be presented later, the adoption cycle will be accelerated or delayed considering the ecosystem efficiency. When the underlying ecosystem is efficient the elapsing time between the innovators' adoption and the early majority one lasts less than in the generic model, while if it is no efficient the necessary time for a technology to be adopted will last ages, with the direct consequence that the technology is unlikely to be the new dominant design.

The entire model is strictly connected to the concept of breakthrough innovations, discontinuities and market standards. In fact, after the recognition of a new technological paradigm and the beginning of competition among alternative technologies, the strife is all about triggering the adoption cycle model. In fact, in order to reach the technological dominance, it is necessary to efficiently activate the adoption cycle process before the competitors.

The importance of modifying widely accepted theories with the inclusion of a fundamental variable like the innovation ecosystem one, relies on the possibility for managers to influence the dominant design selection by shaping their strategies after considering the new variable we added.