Encyclopedia of Networked and Virtual Organizations

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Volume I
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INTRODUCTION

As a consequence of the importance of technology platforms, it is almost impossible for firms to engage the competitive battle on their own. We therefore see patterns of competition emerge that do not match the economic models of perfect competition or even of oligopolistic or monopolistic competition. Rather, competition takes place between a few large coalitions, or networks, of firms around a common technological platform. Such networks, consisting of multiple firms performing different roles, are not unlike biological ecosystems. For such networks, therefore, the term business ecosystem is increasingly used (Den Hartigh 2004b; Moore, 1993, 1996; Witte, 2004).

The term business ecosystem was coined by James Moore in his 1993 Harvard Business Review article Predators and Prey. Moore (1996, p. 15) defines a business ecosystem as “The term circumscribes the microeconomics of intense coevolution coalescing around innovative ideas. Business ecosystems span a variety of industries. The companies within them coevolve capabilities around the innovation and cooperatively and competitively to support new products, satisfy customer needs, and incorporate the next round of innovation.” There is a strong analogy between business ecosystems and biological ecosystems, as implied by the “ecosystems” terminology.

BACKGROUND

We define a business ecosystem as a network of suppliers and customers around a core technology, who depend on each other for their success and survival. In our view, the essential characteristic of a business ecosystem is the mutual dependence of its members: when customers leave the network, the value of the network for other customers and for suppliers declines. When a new supplier of a complementary product enters the network, the value of the network for all agents rises. Or, as Iansiti et al. (2004a, p.69) put it: “Like an individual species in a biological ecosystem, each member of a business ecosystem ultimately shares the fate of the network as a whole, regardless of that member’s apparent strength.”

What are the boundaries of such a business ecosystem? As with biological ecosystems, this is difficult to establish. We think the best way to judge which agent is and which is not part of the business ecosystem is the degree of compatibility and complementarity of the products or technologies the agent offers or adopts. For example, Apple will not be considered to be part of the business ecosystem around Microsoft Windows technology because the Apple operating system is a substitute rather than a complement for Microsoft’s operating system. In this case, the Apple has its own business ecosystem around its OS technology. When we consider the business ecosystem around Microsoft’s Office technology, we find that Apple will be part of it because Apple’s operating system is complementary to this technology. Note that one and the same firm can be part of multiple competing business ecosystems at the same time. A printer manufacturer, for example, will be part of the business ecosystems around both Microsoft’s Windows technology and Apple’s OS X technology. The same is true for consumers, when they adopt products from different competing business ecosystems at the same time. For example, a customer can own two computers, one with Microsoft’s Windows technology, the other with Apple’s OS X technology.

Note also that a business ecosystem is determined by an anchor point (i.e., that which the researcher defines as the core technology). For example, when we define the anchor point as Microsoft’s Windows technology, Microsoft is likely to be in the core and firms like Intel or AMD or the large computer firms are important members of the business ecosystem. Yet we may also define the anchor point as the Intel Pentium processor.
technology. In this case, Intel will be in the core and Microsoft will be an important business ecosystem member. Consequentially, what we define as the business ecosystem is dependent on our research position. Firms and consumers can therefore be considered to be part of multiple business ecosystems at the same time. A consumer owning a computer may be part of the business ecosystems around Microsoft Windows operating system technology, Intel’s Pentium processor technology, Philips flat screen technology, Adobe’s Acrobat software technology and many more.

How is a business ecosystem different from an industry? First, a business ecosystem does not necessarily—and not even likely—contain all the agents that populate the industry. Second, the network relations between the agents in a business ecosystem are not limited to industry boundaries (Iansiti et al., 2004a, 2004b; Moore, 1993, 1996). We fail to see, however, why this boundary crossing per se would be a prerequisite for calling a technology network a business ecosystem.

How is a business ecosystem different from a conventional supply chain? First, its relations are many-to-many (i.e., network) instead of one-to-one (i.e., chain). Second, a business ecosystem is not necessarily ordered according to a logical production sequence. Modern concepts of “networked supply chains” however, may come quite close to the concept of a business ecosystem.

MAIN FOCUS OF THE ARTICLE

Species in a Business Ecosystem

Like a biological ecosystem, a business ecosystem will be populated by a diversity of “species,” each performing their own unique functions, having their own unique needs and wants, and each delivering a unique contribution to the survival and growth of the business ecosystem as a whole. Some examples provided by Iansiti et al. (2004a, p. 71) regarding Microsoft’s business ecosystem are system integrators, development service companies, independent software vendors, trainers, small specialty firms, Internet service providers business consultants, media stores, applications integrators, and many others. In other words, all firms that provide products (goods or services) or technologies that are complementary and compatible to Microsoft’s core software technology. Their number may run into the tens of thousands. For our research, we also explicitly include customers in the business ecosystem.

Health of a Business Ecosystem

Similar to a natural ecosystem, a business ecosystem and its partners are more or less “healthy.” Business ecosystem health represents the longevity and propensity for growth. Business ecosystem health represents partners’ financial well-being and partners’ impact in the network.

The health of a business ecosystem has two main components: partner health and network health.

Partner health is a (financially-based) representation of a partner’s strength of management and of its capabilities to exploit opportunities that arise within the ecosystem (productivity). Healthy business ecosystems are composed of productive companies. Unproductive companies will have difficulty to survive and will therefore ultimately lower the health of the ecosystem. Partner health is a boundary condition for partner survival (robustness) and for partners’ abilities to make innovative investments (niche creation).

Network health is a representation of how well a partner is embedded in the ecosystem as well as the impact the partner has in its local network. Healthy business ecosystems show many relations between the partners, a tight knit that is not easily destroyed or broken in upon (robustness). Partners with low connectivity to the system have less commitment to the technology platform, increasing the risk that the partner switches to another ecosystem. This would reduce the health of an ecosystem vs. that of a competitive one.

Further, healthy ecosystems show clusters of different types of partners that are intensely related. Such clusters act as niches in which innovations emerge (niche creation). This will only work when in such a niche there is a sufficient variety of partners. A cluster of three comparable partners does not contribute to partner or ecosystem health; because these partners will mainly compete instead of cooperate. With little variety in types of partners, the business ecosystem will become less innovative and slowly stagnate.

Finally, healthy ecosystems have many partners with high visibility in the market. Those partners have a high impact and therefore a positive influence towards customers and towards other partners. An ecosystem composed of low-visibility partners is less healthy.
Evolution of a Business Ecosystem

Business ecosystems evolve over time because of innovations and environmental changes. These changes have effect on the size and composition of the business ecosystem. The cumulated effects of these changes may cause the business ecosystem to shift into a new stage. Ultimately, they determine the survival time of the business ecosystem.

Innovations are the driving force behind the technology lifecycle: bleeding edge, leading edge, state of the art, dated, and obsolete. Innovations refer to new products, services, and technologies that are accepted by the market. Within a healthy ecosystem, there is a continuous stream of incremental innovations. These do not drastically alter the composition of the ecosystem, but they ensure that it will continue to grow and prosper. Incremental innovations from outside the ecosystem may be ignored or easily incorporated.

In the longer run, cumulative effects of incremental innovations may have a more serious impact on the ecosystem. Over time, they may cause the ecosystem to change gradually, yet profoundly in composition and lifecycle stage. For example, based on the Microsoft Windows technology platform many incremental innovations have emerged over the years, causing the current ecosystem to be quite different from that of ten years ago. Incremental innovations outside the ecosystem that are being ignored may cumulate into serious threats to its existence. Radical innovations, which happen only rarely, may cause similar disruptive changes, albeit in a much shorter period of time.

Environmental changes drive the market maturity (i.e., market size and growth rates). Environmental changes refer to economic growth, consumer preferences, government policy and legislation. Here, too, we can distinguish between incremental and disruptive changes. Any healthy ecosystem will be able to smoothly adapt to incremental changes in its environment.

Together, innovation and environmental changes drive the natural lifecycle of an ecosystem. The sequence and nature of the stages in the development of a business ecosystem are to some extent predictable. Each stage presents particular developmental challenges for the business ecosystem. It is to some extent possible to anticipate these challenges, and better focus executive actions:

- **Birth**: A new technology is invented through radical innovation or cumulative incremental innovations. The ecosystem is small and populated by small pioneering companies. Network relations are volatile and manifold.
- **Expansion**: The installed base of the technology grows, more and more customers adopt it. The ecosystem is growing, more and more partners come into it, partners increase their scale and scope. Network relations become more stable, focusing on a core set of synergistic relationships.
- **Leadership**: The technology becomes a standard, an accepted platform. The ecosystem is large, involving many partners. Partners concentrate on their own specific contributions within the system. The keystone (or dominator) becomes an authority in the established system.
- **Self renewal or death**: The technology is becoming obsolete. Partners in the ecosystem concentrate on milking the remaining market value, which will ultimately cause the ecosystem to die as more and more partners will invest in new opportunities outside the ecosystem. Alternatively, partners can keep the ecosystem alive by incorporating continuous streams of incremental innovations, or radical innovations, from outside the system. This will however considerably impact the size of the ecosystem and the composition of partners in the ecosystem.

Strategies in a Business Ecosystem

Firms may pursue three different strategies with respect to business ecosystems. The first two, “shaper strategy” and “follower strategy” are mentioned by Hagel (1996), the third, “reserving the right to play” is mentioned by Coyne and Subramaniam (1996). Iansiti et al. (2002, 2004a, 2004b) propose another classification (i.e., “keystone strategy,” “dominator strategy,” and “niche leveraging.” We will address them next.

First, firms can choose to follow a “shaper strategy” by sponsoring their own proprietary technology that will generate high returns when it becomes dominant in the market (Besen & Farrell, 1994; Shapiro & Varian, 1999). Such a firm in fact tries to develop or maintain its own business ecosystem, with itself and its technology in the core. However, such a strategy is both costly and risky, which means that only a few firms in
the market can afford to develop and implement such a strategy. Iansiti et al. (2002, 2004a, 2004b) point out that such a firm can pursue this shaper strategy in different ways. It can try to become a physical or value “dominator” or a “keystone.” A “dominator” is a firm that tries to manage a large proportion of the business ecosystem relations directly and/or tries to internalize the larger part of the added value created in the business ecosystem. The dominator, they state, will eventually become its own business ecosystem, absorbing the network, extracting maximum value in the short term, but destroying the business ecosystem in the long term (Iansiti et al., 2004a, p. 74). Another way for a firm to pursue a sharper strategy is to become a “keystone” (i.e., by providing a common technology platform) by being an important hub in the network, performing the task of connecting network participants, and by continually trying to improve the business ecosystem as a whole. Needless to say, according to Iansiti et al. (2002, 2004a, 2004b), this keystone approach is the strategy that will enable the business ecosystem and the keystone itself to grow and prosper.

Second, firms can choose to follow a “follower strategy” (Besen et al., 1994; Hagel, 1996). Such a strategy involves joining the dominant technology by acquiring a license for developing products based on this technology. In a situation where the firm is not a sponsor of the dominant technology, it may nevertheless profit from the potential for scale and learning effects created by the dominant technology. Not by competing with the dominant product or technology (i.e., not focusing on substitution) but instead by either:

- Offering products or technologies that are complementary to (i.e., are used together with) the dominant product or technology (Katz & Shapiro, 1986). In this way, these firms may capitalize on indirect network effects.
- Offering a product or technology that is compatible with the dominant product or technology allows the firm to make a connection to the dominant technology network (Brynjolfsson & Kemerer, 1996; Gandal, 1995). In this way, these firms can capitalize on direct network effects and in this way exploit the potential for scale and learning effects created by the dominant technology.

Iansiti et al. (2004a, p.77) refer to this kind of strategy as “niche leveraging,” in which firms develop specialized capabilities that differentiate them from other firms in the network. They also mention the leveraging of complementary resources. While we agree to these aspects, we do not think that adapter firms are necessarily niche players. Indeed, they may be focusing their attention not on specific niches, but on the market as a whole. For example, a firm like Hewlett Packard can be considered to follow an adapter strategy with respect to Microsoft’s Windows technology, but we would hardly classify it as a niche player.

Third, firms can choose to wait committing themselves to either technology network in the market. This so-called “reserving the right to play” means doing all that is necessary to create or keep open opportunities in order to acquire a strong position at a later stage (Coyne et al., 1996). There is no equivalent of this strategy mentioned by Iansiti et al. (2002, 2004a, 2004b).

FUTURE TRENDS

Research into business ecosystems is currently in its infancy. However, many researchers around the world are busy operationalizing the concept in different directions. A first direction taken by researchers is the study and further developments of the basic concept (e.g., Den Hartigh et al. 2004; Göthlich & Wenzek, 2004; Vuori, 2005; Witte, 2004). Others are developing the connections of the business ecosystems concept with other theories (e.g., with complex adaptive systems theory like Peltoniemi (2005) does. Then there are researchers who focus on charting and studying real-world ecosystems (e.g., Dittrich, Duysters, & De Man, 2004; Gueguen, Pellegrin-Boucher, & Torres, 2005; Quadragas, 2005). Another promising approach is to study characteristics of business ecosystems by simulating their behavior through agent-based simulations (e.g., Den Hartigh, et al., 2005). Still others are focusing on development of tools, e.g. tools for health measurement of business ecosystems like Den Hartigh, Tol, and Visscher (2006), or tools for innovation management in business ecosystems like Adner (2006).

CONCLUSION

For describing and analyzing technology networks, consisting of multiple firms performing different roles, the term “business ecosystems” is increasingly used.
Originating only a few years ago, research into business ecosystems is gradually becoming more and more intense. As was demonstrated in this article, some of the basic concepts of business ecosystems are currently in the process of being made operational by different groups of researchers around the world. As such, it is rapidly developing into an accepted research field with a rapidly growing body of knowledge.

REFERENCES


Business Ecosystem

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KEY TERMS

Business Ecosystem: A network of suppliers and customers around a core technology, who depend on each other for their success and survival.

Dominator: A firm that tries to manage a large proportion of the business ecosystem relations directly and/or tries to internalize the larger part of the added value created in the business ecosystem.

Follower (or Adapter or Niche Player) Strategy: Joining the dominant technology by acquiring a license for developing products based on this technology.

Health of a Business Ecosystem: Represents the ecosystem’s longevity and propensity for growth.

Health of a Partner in the Business Ecosystem: Represents partners’ financial well-being and partners’ impact in the network.

Keystone: A firm that provides a common technology platform, is an important hub in the network, performs the task of connecting network participants and continually tries to improve the business ecosystem as a whole.

Species (in a Business Ecosystem): Types of companies, each performing their own unique functions, having their own unique needs and wants and each delivering a unique contribution to the survival and growth of the business ecosystem as a whole.

Shaper Strategy: Sponsoring an own proprietary technology that will generate high returns when it becomes dominant in the market (and yields high cost upon failure).