ORGANIZATION DESIGN FOR BUSINESS ECOSYSTEMS

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The modern corporation has long been the central focus of the field of organization design. Such firms can be likened to nation-states: they have boundaries that circumscribe citizen-employees, and they engage in production and trade. But individual corporations are no longer adequate to serve as the primary unit of analysis. Over the years, systems of distributed innovation – so-called business ecosystems – have become increasingly prevalent in many industries (Adner & Kapoor, 2010; Iansiti & Levien, 2004; von Hippel, 1988). Ecosystems generally encompass numerous corporations, individuals, and communities that might be individually autonomous but related through their connection with an underlying, evolving technical system.

In the future, I believe the key problem for organization design will be the management of distributed innovation in such dynamic ecosystems. Specifically, how should diverse entities be integrated into a coherent network that generates goods in the present and new designs for the future? To answer that question, organization designers must think about how to distribute property rights, people, and activities across numerous self-governing enterprises in ways that are advantageous for the group (ecosystem) as well as for the designer's own firm or community.

DISTRIBUTED INNOVATION AS THE UNINTENDED CONSEQUENCE OF MODULARITY

Organization design always reflects the material culture of a given time and place and is thus fundamentally constrained by technology (Heilbroner, 1967; MacKenzie, 2009). Of particular importance are the technologies of communication and information processing. Communication technologies matter for obvious reasons: they change the degree of real-time adaptive coordination within an organization. Information-processing technologies play a subtler role: they change the degree to which an organization can experiment to discover new and better practices.

When communication and information processing are slow and costly, organizations tend to be small and locally specialized. Standardization across geographically dispersed units is feasible but expensive. When communication is faster but information is still precious and expensive, large organizations become more feasible yet they will tend to be risk-averse and not innovative once their basic configuration has been established (Bohn & Jaikumar, 2005). In the Information Age, the cost of information processing has plummeted, and this supports innovation in two distinct ways. First, it speeds up the evaluation of new designs by making it possible to compute the impact of design changes without having to build physical prototypes. Second, and less obviously, cheap information processing makes it feasible (and even desirable) to modularize designs, that is, to subdivide them into nearly independent components that can be modified separately without compromising the whole (Baldwin & Clark, 2000; Clark, 1985; Simon, 1962). In other words, when information is cheap, designers and engineers can codify the architecture of a technical system – specifying the way the parts will fit together – and begin to experiment with both the component modules and the architecture. In contrast, when information is expensive, such experimentation is not practical.

Not surprisingly, the rise of modular systems occurred hand-in-hand with the upsurge of ever-cheaper information technology in the second half of the 20th century. Such systems

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made highly distributed innovation not only possible but, in a value-seeking economy, inevitable (Heilbroner, 1994). Interestingly, distributed innovation was an unintended consequence of modularity. In fact, it was not even envisioned as a possibility by the first designers of modular systems. Consider, for example, the IBM System/360 computer. In using a modular design for that product, IBM was seeking enhanced customer satisfaction, economies of scale, and reduced complexity in manufacturing. But distributed innovation unexpectedly emerged in the form of competition from the manufacturers of plug-compatible peripheral devices like disk drives. At the time, IBM executives were surprised – and greatly dismayed – by the rise of that business ecosystem.

Even when the possibility of an ecosystem is apparent, managers cannot necessarily anticipate the pathways to profitability. For IBM, the saga of unintended consequences continued with the personal computer. After their experience with the System/360, IBM executives tried to create a PC ecosystem to reduce costs and to enhance the new product's appeal. They assumed that IBM would profit from every PC system sold and control the growth of the market to protect IBM's minicomputer franchise. This worked fine in the short run, but then the ecosystem became flooded with PC clones, which destroyed IBM's profits and cannibalized its minicomputer business. Unable to compete, IBM was forced to retreat from the ecosystem it had nurtured. But the model of distributed innovation based on modular architectures was here to stay.

ADVANTAGES OF BUSINESS ECOSYSTEMS: JOY'S LAW AND CREATIVE PROBLEM SOLVING

Innovation is fundamentally the result of creative problem solving. But creativity is a delicate creature, and nurturing it in organizations is a topic much discussed in both the academic literature and the popular press. A basic challenge is that creative problem solvers are very diverse in their habits of thought and action. As such, an organization that supports one person's excellence will frustrate others. And the best individuals to solve a particular problem could literally be scattered around the world. As Bill Joy, a co-founder of Sun Microsystems, once famously said, "Most of the bright people don't work for you – no matter who you are. [So] you need a strategy that allows for innovation occurring elsewhere" (quoted in Surowiecki, 1997).

Consequently, organization design must take into account that creative problem solvers can choose from among many different work environments. Some individuals may form startups to tackle a particular problem; others might choose to work by themselves and dedicate their efforts to answering a research question; and still others may seek a community of like-minded individuals. A key issue here is how to induce such diverse individuals to apply their skills to a given set of problems in ways that allow their efforts to be linked and aggregated into a coherent whole. Some problem solvers might prefer working on their own problems while others may choose to solve problems for others, all motivated by intellectual curiosity, financial compensation, fame, or any combination of those and other factors (Lakhani & Wolf, 2005). Whatever the case, there are two common threads that distinguish these diverse individuals from agents who work under standard employment or supply contracts: autonomy in problem selection and control over their own creations. The latter issue can be addressed by allocating property rights to problem solvers, giving them control over their creations. Such control could be used to generate profits or to ensure that a creation remains "forever free."

In summary, many creative problem solvers will not (or simply cannot) work effectively under standard employment or supply contracts. Moreover, no single setting can attract all types of creative people. And that's what makes distributed innovation in a business ecosystem such a desirable organizational form. The ecosystem provides a large tent that can encompass creators who value autonomy and want to exercise control over their ideas. Indeed, the delicacy of creativity – the fact that it withers quickly in the wrong environment – makes diverse business ecosystems not only desirable but increasingly necessary to remain competitive in many industries.

COMPETITION AND TECHNOLOGICAL EVOLUTION IN BUSINESS ECOSYSTEMS

When organization design focuses on individual firms, the discussion naturally tends toward head-to-head competition among companies making similar products. Such competition has not disappeared from business ecosystems: firms still rise and fall on the value and appeal of their products and the efficiency of their operations. But while members of an ecosystem compete, the larger system itself will inevitably evolve, opening countless opportunities for recombination: the selection of one mixture of organizational elements from myriad possibilities. Consider Facebook. The key asset of the firm is a social network website with content supplied almost entirely by users and with revenue generated from advertising. In some respects, Facebook is a classic, ad-supported business, but the company's operations have grown far beyond the boundaries of a traditional firm. To support the website and manage traffic, Facebook depends on the Internet and World Wide Web protocols (free rules); the Internet's physical infrastructure, both wired and wireless (regulated modules); personal computers and smartphones (low-cost modules); and four major open-source codebases (free modules). By recombining those and other components from the distributed innovation of a business ecosystem, Facebook was able to capitalize on lucrative opportunities in the rapidly growing field of social networking.

CONCLUSION

Business ecosystems of distributed innovation first became prominent in the high-tech and information-intensive industries, and they have since spread to other areas. But the extent to which business ecosystems will play an important role throughout different industries remains to be seen. To be sure, certain markets present inherent challenges. In heavily regulated industries, for instance, an integrated corporation that is responsible and accountable for a given product might be a more effective organizational form than a multi-agent, recombinant ecosystem. That said, the potential benefits of distributed innovation must be recognized, and the field of organization design must broaden its traditional focus on the individual firm to encompass this compelling new approach for creating value.

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