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When technological discontinuities and disruptive business models challenge dominant industry logics: Insights from the drugs industry

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ABSTRACT

An industry's dominant logic is the general scheme of value creation and capture shared by its actors. In high technology fields, technological discontinuities are not enough to disrupt an industry's dominant logic. Identifying the factors that might trigger change in that logic can help companies develop strategies to enable them to capture greater value from their innovations by disrupting that logic. Based on analyzing the changes that biotechnologies and bioinformatics have brought to the drug industry, we identify and characterize three triggers of change that can create disruptive business models. We suggest that, in mature industries experiencing strong discontinuities and high technological uncertainty, entrants' business models initially tend to fit into the industry's established dominant logic and its value chains remain unchanged. But as new technologies evolve and uncertainty decreases, disruptive business models emerge, challenging dominant industry logics and reshaping established value chains.

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1. Introduction

Biotechnology and bioinformatics have brought strong technological discontinuities to the traditional ways of discovering and developing drugs. Research in technology innovation and management offers multiple definitions of terms around innovation and technology management [101]. Technological discontinuities are "*those rare, unpredictable innovations which advance a relevant technological frontier by an order-of-magnitude and which involve fundamentally different product or process design*" [7] but – surprisingly – those that have occurred in the drug industry seem (thus far) to have reinforced rather than challenged the positions of industry incumbents: the overall industry logics have not really changed, either in how business is done, or in how diseases are prevented or cured.

Scholars have argued that technological discontinuities lead to industry shake-outs that can nullify incumbents' competitive advantages [42,78,79]. An emblematic case was that of digital photography [10,63], where the technological discontinuities disrupted the dominant logic of the entire photographic industry and led to the reshaping of its value chain. We define the value chain as "*the linked set of value-creating activities all the way through from basic raw material sources for component suppliers to the ultimate end-use product delivered into the final consumer's hands*" [38] — and in this case, its reshaping allowed new competitors to enter the industry who introduced new ways of both creating and capturing value.

Prahalad and Bettis [73] originally defined dominant logic at the firm level as "*the way in which managers conceptualize the business and make critical resource allocation decisions*". A dominant logic can keep organizations focused on the road ahead — or it may act as set of blinkers, restricting managers' peripheral vision [72]. Dominant industry logics evolve and change over time, influencing how

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strategists conceive their business models and – in some cases – their company business model portfolios [82]. The evolution of dominant logics in high-tech industries has been recognized as being driven by the technologies involved [1]. Industries follow general lifecycles from emergence to maturity [3], which are sometimes disrupted by technological discontinuities that may lead either to the industry's decline, or to a new emergent phase [1]. However, the drug industry, which has been facing several waves of technological discontinuities, does not seem to be following that path when technological discontinuities occur [4,32,46,75], which questions the notion of drivers of evolution in technology based industries. But when technological discontinuity does not lead to disruptions of its dominant logic, what other forces lead to such change? The aim of this article is twofold: to provide an understanding of the engines that drive the evolution of industry logics, and to propose a complement to current theories [65,93,99] by suggesting that technological discontinuities are not the only trigger for industry evolution. We argue that the convergence of business models from different industries can lead to challenges to dominant logics. While technological discontinuities can initiate industry evolution, business model innovation can also play a central role in driving change in dominant industry logics: so we examine how and why new business models emerge.

The pharmaceutical industry has experienced several waves of technological discontinuities, any of which could potentially have led to the emergence of new industry logics. This paper analyzes the triggers of the evolution of the drug industry's dominant logic by interviewing industry experts and analyzing the business models of new entrants. Our findings contribute to understanding the boom, bust and recovery of biotechnology and bioinformatics by following the stories of those promising technologies that encouraged stakeholders to believe in drug industry revolution. For years, entrepreneurial firms failed to deliver the expected financial and scientific performances partly because they found it difficult to fit their business models into existing dominant industry logics in profitable ways [4,14,57]. But now, by testing new business models, young entrepreneurial entrants are renewing the promise of their new technologies.

The article first explains the concepts of dominant industry logic and of business models, and provides insights (based on industry lifecycle theory) into the effects of technological discontinuities on mature industries. We then describe our data collection and analysis methods, consider the drug industry's established dominant logic, and analyze the business models of seven young bioinformatics companies. Next, we outline the triggers for change in the industry's dominant logic — new healthcare philosophies, new patterns of collaboration, and new modes of network orchestration and finally discuss our findings and the links between industry evolution and business model innovation.

2. Theoretical foundations

2.1. The dominant logic of an industry

Prahalad and Bettis have drawn on Kuhn's work on the notion of a paradigm – "*a way of defining and managing the world and a basis of action in that world*" [49] – to argue that managers make critical resource allocation decisions within the framework of a 'dominant logic' [73]. The authors originally developed this concept at the firm level, first from diversification-driven and then from environmentally-driven organizational change approaches [12]. They argue that actors evolving in the same industry develop similar mental maps of that industry, and that this dominant industry-level logic can be seen as a "*mind set or a world view or conceptualization of the business and the administrative tools to accomplish goals and make decisions in that business*" [73]. So the dominant logic provides a general framework within which industry firms conceive what their customers want and define how to best serve their needs, and thus – depending on what opportunities they detect – design their strategies and business models. This shared logic guides the perceptions of top managers and leaders about how best to create and capture value in the industry, and so which business models will enable their company to be profitable — but they also risk becoming overly dependent on such mental models of their competitive landscape, leading to 'cognitive inertia' [44]. Phaal et al. [67] identify three components of a dominant logic at the industry level: value context, value creation and value capture. The *value context* is the industrial landscape within which opportunities occur for creating and capturing value, and *value creation* refers to "*the competences and capabilities used by organizations to generate products and services*": the competencies have technology or knowledge-based components, while the capabilities are rooted more in processes and business routines [56]. And *value capture* refers to "*the mechanisms and processes used by organizations to appropriate value through delivering products and services*" ([67]: 223). Von Krogh et al. [96] also suggest a strong relationship between the dominant industry logic as perceived by top managers and their firms' performance.

2.2. Business models

The business model concept – a hot topic in research today [9] – comes from practitioners of the late 1990s, and is seen as distinct from strategy: "*strategy refers to the choice of business models through which the firm will compete in a marketplace*" [17]. Teece [91] argues that business models translate leaders' anticipations: "*a business model reflects management's hypothesis about what customers want, how they want it, and how an enterprise can best meet those needs, and get paid for doing so*". In his definition, a business model is organized around the hypothesis of what customers want, so the unit of analysis of a business model is its value proposal. Demil and Lecocq [21] also argue that a business model refers to the articulation between different areas of a firm's activity designed to produce a value proposition for customers. In practice several different value propositions may coexist within a specific industry, each of which may dictate the use of different business models based on services or products offered by firms at different steps of the industry's value chain. The changes in managers' perceptions of their firm's opportunities will influence the continuous evolution of the business models it

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