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Responding to Complementary-Asset Discontinuities: A Multilevel Adaptation Framework of Resources, Demand, and Ecosystems

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Responding to Complementary-Asset Discontinuities: A Multilevel Adaptation Framework of Resources, Demand, and Ecosystems

We examine how incumbent organizations respond to complementary-asset discontinuities—technological changes that introduce new manufacturing, distribution, and sales assets but leave the incumbents' core knowledge preserved. To examine this increasingly common but relatively overlooked phenomenon, we conducted an inductive study of how six newspapers adapted to Internet distribution during 1995–2019. Our contribution is a framework that highlights three levels of adaptation (resources, demand, and ecosystem) with related mechanisms and necessary outcomes. At the resource level, incumbents adopt the new complementary assets according to the perception of synergies with their existing core knowledge. At the demand level, the extent to which incumbents update their beliefs about value creation depends on how much they experiment with customers. At the ecosystem level, higher experimentation in the ecosystem helps incumbents to update their beliefs about value capture. The research offers important implications for the technological change, strategic management, and business model innovation literature.

Introduction

A primary focus of innovation management research has been on technological changes devaluing the *core knowledge* of incumbent organizations in the form of competence-destroying discontinuities (Tushman and Anderson 1986), architectural knowledge changes (Henderson and Clark 1990), and disruptive innovations (Christensen and Bower, 1996). The literature shows that incumbents struggle and often fail when facing similar “core-knowledge discontinuities” (e.g., Anderson and Tushman 1990, Tripsas and Gavetti 2000). However, following Teece (1986), research has also shown that *complementary assets* are important for incumbents to adapt. Complementary assets are resources such as manufacturing, distribution, and sales that permit incumbents to capture the value produced by their core knowledge. When the core knowledge becomes obsolete after a core-knowledge discontinuity, a main predictor of incumbents' successful adaptation is whether their complementary assets remain valuable. If the complementary assets also lose value, meaning that they are not useful for commercialization purposes, incumbents are likely to fail, but if they retain their value, incumbents can survive by leveraging their preserved complementary assets to access or develop a new core knowledge (Mitchell 1989, Roy and Cohen 2016, Rothaermel 2001, Tripsas 1997, Wu et al. 2014).

Despite the demonstrated importance of complementary assets for adaptation, scholars have not fully analyzed how incumbents adapt to technological changes that destroy complementary assets while preserving the core knowledge. However, a similar situation of complementary-asset discontinuities has been a common phenomenon throughout industrial history and technological growth over recent decades has made it ever more relevant from a practical perspective. During the 1970s and 1980s, radio and

television networks (e.g., NBC, CBS, and ABC) faced the destruction of their complementary assets with the advent of cable- and satellite-based technologies (Ghemawat 1993). The radical advancements from linotype to computer typesetting (Tripsas 1997) represented another complementary-asset discontinuity for publishers (and a core-knowledge discontinuity for typesetter manufacturers). The advent of computer numerical control (Roy and Cohen 2016), magnetic resonance imaging, and computer tomography represented additional complementary-asset discontinuities for car manufacturers and hospitals (and core-knowledge discontinuities for machine manufacturers). Finally, the introduction of telephones, fax, Enterprise Resource Planning software, and the Internet represented complementary-asset discontinuities in many industries where they affected sales, post-sales, and supplier relationships. Cozzolino and Rothaermel (2018) recently compared complementary-asset discontinuities to core-knowledge discontinuities to predict the more appropriate modes of alliances needed for incumbents to adapt after each type of change.

Due to the importance of the phenomenon and the relative paucity of studies about complementary-asset discontinuities, we asked: *What factors influence how incumbents can best adapt after a complementary-asset discontinuity?* To examine this important question, we investigate incumbents' responses to a major complementary-asset discontinuity related to the advent of the Internet in newspaper production and distribution. Internet-based technologies have rendered obsolete newspapers' complementary assets (presses, physical distribution, and sales) while newspapers' core knowledge (their journalistic know-how) has remained useful in doing good journalism online—arguably, editorial knowledge is even more important in times of increased complexity and the diffusion of digital fake news. To determine how incumbents respond to such changes, we conducted an inductive multiple-case study (see, e.g., Eisenhardt 1989) of six Italian newspapers facing the changes brought by the Internet from 1995 to 2019. Our data combine in-depth interviews, multiple internal and external archival sources, and observational data. The data collection effort was also extended to seven new technology entrants (e.g., digital distribution platforms) to gather their perspectives and better understand the competitive landscape and ecosystem in which newspapers operated online. By comparing and analyzing the responses of the six newspapers, we derived a framework of adaptation to complementary-asset discontinuities that shows the importance for incumbents of adapting at three different levels: resources, demand, and ecosystem.

Resource-level adaptation is necessary for combining existing and new core and complementary resources. We found that incumbents are likely to adopt and integrate the new complementary assets with their core knowledge sooner when they have a positive *belief about the synergies* between them. Demand-level adaptation is necessary to account for changes in demand induced by the discontinuity. We found that incumbents that are proactive in *experimenting with customers* are more likely to update their beliefs about value creation. Ecosystem-level adaptation is a necessary response to major changes in the industry ecosystem following the discontinuity. Our data reveal that incumbents that engage in *experimentation with ecosystem actors such as competitors* are more likely to update their beliefs about value capture. Overall, a complementary-asset discontinuity initially requires resource adaptation, but then the new complementary assets can induce changes for customers that require companies to update their value creation strategies, which in turn can affect the system within which the company is embedded, thus also meaning that ecosystem-level adjustments are needed to capture value. Therefore, to fully adapt their business models, incumbents need multiple levels of adaptation. That is consistent with the fact that innovations often take place at a specific hierarchical level (Clark 1985) but might then require adjustments at other levels.

Our key contribution is a framework of incumbents' adaptation to complementary-asset discontinuities. While incumbent adaptation is well understood after core-knowledge discontinuities (e.g., Anderson and Tushman 1990, Benner 2010, Eggers and Kaplan 2009, Sosa 2011), we revealed new adaptation mechanisms and outcomes after complementary-asset discontinuities. The value of this contribution is to integrate established models of company adaptation as a step toward understanding a relatively overlooked but increasingly relevant phenomenon, particularly in these years of ongoing digital transformation. Additional contributions derive from our more specific findings. The finding about the two mechanisms of “experimentation with customers” and “experimentation with the ecosystem” contributes by connecting a demand-based view of strategy highlighting the role of customers in value creation (e.g., Adner and Zemsky 2006, Priem 2007) with a scholarly focus on ecosystems emphasizing the interdependences between ecosystem actors (e.g., Adner and Kapoor 2010, Jacobides et al. 2018). The finding that incumbents can update their beliefs about value creation and capture contributes to the growing body of business model innovation literature concerned with understanding how companies can innovate value creation and capture (McDonald and Eisenhardt 2020, Zott and Amit 2007, Zuzul and

Tripsas 2020). Results from our study are expected to be generalizable to industries where new manufacturing and distributive technologies (e.g., the Internet and blockchain) are impacting incumbents' complementary assets and business models (e.g., TV, higher education, food production, and service sectors).

Technological Discontinuities

Core-Knowledge and Complementary-Asset Discontinuities

Most of the management literature has focused on technological changes destroying incumbent organizations' *core knowledge*. The seminal contribution by Tushman and Anderson (1986: 442) noted that incumbents are challenged when “the skills and knowledge base required to operate the *core* technology shift.” Those authors use the term “competence-destroying discontinuities” to refer to changes introducing a radically new knowledge that renders the incumbent's core knowledge obsolete and that offer a discontinuous price/performance improvement. In this paper, we refer to similar changes as “core-knowledge discontinuities.” An extensive body of literature has examined the difficulties experienced by incumbents in adapting to core-knowledge discontinuities resulting from competence destruction (Anderson and Tushman 1990), cognitive traps (e.g., Tripsas and Gavetti 2000, Eggert and Kaplan 2009), inertia in reallocating resources (Christensen and Bower 1996), legitimacy of past core competences (Danneels et al. 2017), and inaccessibility of new competences (Sosa 2011).

Following the seminal work by Teece (1986), the literature has also investigated the role of *complementary assets* to adapt to core-knowledge discontinuities. Complementary assets are manufacturing, distribution, and sales assets that allow companies to commercialize and therefore capture the value created by a core knowledge. According to Teece (1986: 304), when those assets are specialized to the core knowledge in question, they are difficult to replicate and find promptly on the market, hence they grant strong value appropriation to their owner. When those assets are generic, they are easily available on the market and competitors can appropriate part of the value by using them. The literature has capitalized on this insight by examining how incumbents adapt to core-knowledge discontinuities when their specialized complementary assets are preserved.¹ In particular, Mitchell (1989) showed that incumbents in the medical

¹This situation, also referred to as “low transience” (Abernathy and Clark 1985), arises when the commercialization resources of market/customer linkages are preserved. Although they do not use the term complementary assets, those authors essentially refer to the same concept when they discuss the role of market/customer linkages.

diagnostic industry used their preserved complementary assets to enter new knowledge domains after a core-knowledge discontinuity. Tripsas (1997) showed that incumbents in the typesetting industry were buffered from core-knowledge destruction by their preserved complementary assets, but they struggled when their complementary assets were also destroyed. Scholars have also shown that incumbents can use their preserved complementary assets to commercialize the new core knowledge of entrants, thus forming vertical alliances with them. That adaptation strategy has been documented for the joint ventures in the 1980s between pharmaceutical incumbents possessing preserved complementary assets and new biotechnological startups possessing new R&D knowledge (e.g., Arora and Gambardella 1990, Pisano 1990, Rothaermel 2001). Researchers have also demonstrated that preserved complementary assets allow incumbents to select emerging core technologies and to enter new markets after a competence-destroying change (e.g., Eggers 2012, Kapoor and Furr 2015, Taylor and Helfat 2009, Wu et al. 2014). Preserved complementary assets such as sales and distribution also help incumbents to innovate by providing information about preferences, as was the case for machine tool manufacturers facing destruction by computer numerical control (Roy and Cohen 2016). Finally, the combination of preserved complementary assets and in-house users also helps strategic renewal, as in the case of incumbent manufacturers of charge-coupled device sensors adapting to the radical advancement of complementary metal oxide semiconductor sensors (Roy et al. 2018).

Our research complements those studies by focusing on discontinuities that destroy incumbents' complementary assets (instead of preserving them) and do not introduce new core knowledge. Cozzolino and Rothaermel (2018) used the term "complementary-asset discontinuities" to refer to similar changes destroying incumbents' complementary assets but not their core knowledge. They developed a conceptual model of the type of strategic alliances that incumbents can enter after core-knowledge versus after complementary-asset discontinuities. Despite that growing interest, we still lack a clear understanding of the mechanisms and outcomes of incumbents' adaptation after complementary-asset discontinuities. To contribute to addressing that important lacuna, we explored how incumbent newspapers adapted to the Internet distribution and commercialization technologies which destroyed the value of their physical presses and distribution networks while preserving most of their core editorial knowledge.

Technological Changes and Business Models

Scholars studying technological changes have also been paying increasing attention to business model innovation. A business model is defined as the combination of two key components: value creation and value capture (Teece 2010). Innovating or adapting a business model is particularly challenging, with the failure of incumbents after technological changes often being due to problems in “perceiving and then enacting a new business model” (Chesbrough and Rosenbloom 2002: 532) rather than to technological adaptation.

A good example of that challenge is provided by the transition from film to digital photography. That represented not only a core-knowledge discontinuity for Kodak and Polaroid but also a change destroying the razor and blades business model of traditional photography. While film photography derived most of its profits from selling a complex-to-produce consumable (e.g., rolls of film) at a higher price and traditional cameras at a lower price, digital photography broke that model by eliminating the need for physical pictures and requiring only digital cameras sold at a higher price. Kodak failed to implement the new model for digital photography and pretended to make most of its revenues by continuing to sell consumables such as digital CDs that were commodities and, thus, inappropriate for the new value creation and capture strategy (Gavetti et al. 2005). The Polaroid case (Tripsas and Gavetti 2000) reveals a similar cognitive mistake of not innovating a business model, despite the company’s development of new technical capabilities in digital imaging. More generally, the history of digital photography reveals that a cognitive focus on an existing business model can induce incumbents to attempt to develop and commercialize only products consistent with the traditional model (Benner and Tripsas 2012).

Several factors make business model adaptation difficult for incumbents, including an excessive focus on existing customers (Christensen et al. 2018), required changes in capabilities and processes (e.g., Doz and Kosonen 2010), and the presence of existing beliefs conflicting with new value creation and capture logics (Tripsas and Gavetti 2000, Tripsas 2009). That last factor is particularly insidious, almost to the extent of representing a common denominator due to beliefs being entrenched in a company’s history for all employees (Barr et al. 1992, Eggers and Kaplan 2009), and can prevent correct adaptations (Benner and Tripsas 2012, Massa et al. 2017). The innovation of a business model requires cognitive considerations related to effective business model design even for new entrants, not just for incumbents (McDonald and Eisenhardt 2020, Zuzul and Tripsas 2020). Overall, business model adaptation after technological changes

is important, but it is not well understood (Foss and Saebi 2017). That gap in understanding is even more significant after complementary-asset discontinuities due to the relative lack of research about this type of change. In fact, current studies mainly consider the implications of core-knowledge discontinuities for business models, whereas our investigation holds promise for understanding business model adaptation after a different type of discontinuity.

Methods

We conducted an inductive longitudinal study based on multiple cases (Eisenhardt 1989) to engage in theory elaboration (Eisenhardt 2021, Lee et al. 1999). That approach is appropriate when a phenomenon is not well understood and scholars are endeavoring to develop a more generalizable theory using the replication logic of multiple cases (Eisenhardt and Graebner 2007, Yin 1994). Theory elaboration can connect existing constructs (in our study, complementary assets, discontinuities, business models, beliefs, and ecosystems) in new ways to explain a scarcely understood problem (Gehman et al. 2018, Lee et al. 1999). The unit of analysis in our study is the incumbent trying to best adapt to a changed ecosystem after a complementary-asset discontinuity.

Research Setting

Our empirical setting is the Italian newspaper industry facing the Internet discontinuity from 1995 to 2019. Prior to that period, newspapers controlled a vertical value chain from upstream knowledge creation (core knowledge) to downstream printing, distribution, and sales (complementary assets). The knowledge creation activity took place via the editorial core knowledge of journalists and newsrooms in two main categories: information gathering and editorial analysis. As is still the case today, that editorial knowledge allowed newspapers to differentiate themselves and create value for specific audiences. It is equivalent to the R&D core knowledge of innovation-based companies (Sosa 2011, Teece 1986). Printing presses, a partially controlled distribution network, and in-house ad sales agents were *specialized* complementary assets necessary for commercializing the upstream core knowledge (Teece 1986). Those assets were specialized because each press and ad sales force were developed over time through investments specific to each newspapers' format, colors, and branding. Given their complexity, cost, and level of specialization, such assets were not easily available on the market. Moreover, those complementary assets combined with newspapers' core knowledge to generate positive supply-side *synergies*—that is, benefits from possessing

both resources.² With the advent of the Internet, newspapers faced a major technological discontinuity at the complementary-asset level (see Figure 1). Internet-related technologies, such as general-purpose Content Management Systems (CMSs), hyperlinks, RSS feeds, and mobile devices (introduced circa 1995–2005), and the more specialized platforms for content and ad distribution and sales (introduced circa 2005–2019), were discontinuously superior in any measure of price/performance to presses, physical distribution, and sales (Tushman and Anderson 1986). Therefore, they represented a discontinuity that destroyed incumbents’ downstream complementary assets without introducing new upstream technologies to challenge newspapers’ core knowledge.³ Table 1 provides detailed evidence from our data of that complementary-asset discontinuity.

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In terms of business models, newspapers traditionally operated as a two-sided market matching readers and advertisers, thereby selling their products to both groups (Parker and Van Alstyne 2005, Seamans and Zhu 2014). While value creation occurred through content production, value capture required manufacturing and distribution assets to sell content to readers and ad sales assets to sell audience attention to advertisers. The Internet discontinuity destroyed the entire commercialization part of newspapers’ business models by negatively impacting all physical revenue sources without offering equally solid alternatives online for value capture. For instance, in the United States in 2011, “the print losses were greater than the digital gains by 10 to 1” (PEW 2012). The Organisation for Economic Co-operation and Development (OECD) reported similar impacts across the rest of the world, thus confirming that developing appropriate responses to the changes brought by the Internet had become a global challenge for newspapers (OECD 2009).

² We found that there were supply-side synergies between core knowledge and complementary assets—a feature not commonly documented in the technology literature. A first synergy derived from controlling both content and print/distribution, as explained by the Media Co. circulation manager and head of operations: “Publishers who owned presses and managed distribution efficiently could close their newspapers later at night, giving their journalists extra time to obtain the freshest news.” A second synergy was between content and ad selling: newspapers owning their ad sales houses could sell the ads associated with content at a higher price (through higher bargaining power (*Financial Times*, 2016)).

³ We only considered in this study the Internet and related digital technologies, in both sales and distribution. We did not consider possible future applications of artificial intelligence (AI) to article writing. AI might constitute a core-knowledge discontinuity for newspapers only if it is applied to content creation and human-based journalism is destroyed.

We selected a single country, Italy, on which to conduct a more in-depth analysis. To check the external validity of our findings, we also gathered data and conducted selected interviews with U.S. and U.K. newspapers and startups. The study period of 1995–2019 allowed us to observe the industry before and after the Internet’s arrival, track newspapers’ adaptation strategies to changes in value creation and capture possibilities, and to examine their responses to downstream new entrants.

Data Collection and Analysis

We applied theoretical sampling (Glaser and Strauss 1967) to pairs of three types (national, local, and specialized) of newspapers to introduce variance and enable examination of the best adaptation strategies. We selected two leading national newspapers (*National Gazette* and *National Courier*—the equivalent of *The New York Times* and *The Washington Post* in the United States), two local newspapers (*Local North* and *Local South*—of different sizes and geographies to avoid potential biases toward high-end companies), and two sports newspapers (*Specialized Gazette* and *Specialized Courier*—from different regions and publishers). Each of those three pairs also tended to include one early adopter and one later adopter, where possible, as the analysis of polar types can help with the emergence of new theories (Eisenhardt and Graebner 2007). To gain direct knowledge of the dynamics between incumbents and entrants, we also sampled seven new entrants. We distinguished between upstream and downstream entrants based on the entry level with respect to newspapers’ traditional value chains. To gain a deep understanding of the adaptation to the Internet, we conducted 80 interviews at the newspaper level, collected longitudinal archival data from multiple sources, and gathered observational data. We also conducted 11 interviews with entrants. In Tables 2a and 2b we provide a detailed description of the sampled companies and the data collected on each of them.

--Include Table 2a and 2b about here--

We conducted data collection and analysis in two main stages. In the first stage (February 2012 to April 2015), we conducted most of the interviews, collected rich archival data, and participated in industry events to gather observational data. That real-time data collection covered the six newspapers and the external actors (entrants, but also associations, regulators, and media experts from the industry and academia). To increase the accuracy of our findings, we gathered historical data (Pettigrew 1990) from archival sources dating back to 1995. During this stage, we developed a deep understanding of the

transformation, challenges, and incumbent responses by constantly iterating between theory and empirical data (Miles and Huberman 1994). In the second stage (May 2015 to December 2019), we continued to refine our findings and theory elaboration by gathering updated data and systematically reviewing the most recently published literature.

Of the 80 semi-structured interviews, 63 were conducted with representatives of the six newspapers and 17 with multiple external actors in the ecosystem referring about the six newspapers. We interviewed presidents, CEOs, and executive editors in charge of strategic decisions, and managers and employees from all along the newspaper value chain. We followed a purposeful sampling technique (Lincoln and Guba 1985) in interviewing informants from the upstream editorial newsrooms and the downstream manufacturing, distribution, and sales fields in both old offline and new online businesses. To control for external perspectives that may not have been immediately visible from interviewing newspaper employees, we interviewed regulators, industry federations, sector association leaders, industry analysts, advertising agencies, media studies professors, and digital media entrepreneurs, both nationally and internationally. For the 11 interviews with entrants, we interviewed upstream entrants among the online digital content producers (e.g., *The Huffington Post* and Populis Media) and downstream entrants among the online platforms (e.g., *Google* and *Watchup*). We stopped the interview process when we reached theoretical saturation (Strauss and Corbin 1990). The interviews lasted from one to two hours, were primarily face-to-face, and were mostly audio-recorded and transcribed.

Rich archival and observational data added to our interview findings. We gathered archival data from annual reports, company websites, archival public interviews in print and video, reports by journalism institutions (e.g., Nieman Journalism Lab at Harvard, Reuters Institute for the Study of Journalism (RISJ) at Oxford), reports produced by regulators, associations, and agencies (e.g., the Italian Federation of Newspaper and Periodical Publishers (FIEG), the Italian Communications Authority (AGCOM), the Italian Antitrust Authority (AGCM), the OECD, Nielsen Media Research, Audipress, and Audiweb), investment banking analyses, specialist blogs, publications, and books. Observational data completed our data collection. Observation took place at international industry events where industry leaders debated sector developments. Such events included the International Journalism Festival (IJF) in Perugia (regularly attended by representatives of *The New York Times*, *The Economist*, Google, and

Facebook), the annual meetings of the Interactive Advertising Bureau (IAB) in Milan, the *TechCrunch* conference in Rome, and the Online News Association (ONA) meeting in the United States. When not able to attend in person, we accessed video-recorded interviews and panel discussions from the events (during 2014–2019).

To analyze our data, we started by reconstructing the history and responses of each newspaper to the discontinuity. We then engaged in cross-case comparisons (Eisenhardt 1989, Miles and Huberman 1994) to identify common traits and differences in adaptation. Each case was treated as an independent experimental setting (Yin 1994). This method, based on replication logic, permits the emergence of more generalizable findings than single-case studies (Eisenhardt 1989). Finally, we extended the analysis to the industry level by also considering entrants, in addition to other competing newspapers, to examine whether the discontinuity also required specific ecosystem-level responses from incumbents. To guarantee our findings' trustworthiness (Lincoln and Guba 1985), we triangulated our multiple data sources, used tables and figures to support the analysis (Miles and Huberman 1994, Santos and Eisenhardt 2009), and revised our results whenever we noted discrepancies between the findings and the literature. The resulting theoretical framework should provide a sufficiently complete and accurate understanding of incumbent adaptation to complementary-asset discontinuity.

Findings: Reshaping Companies' Assets and Business Models

Our data indicate that incumbents' responses to complementary-assets discontinuities require three levels of adaptation: (1) resource-level adaptation; (2) demand-level adaptation; (3) ecosystem-level adaptation. Our data also revealed specific mechanisms and outcomes characterizing the three levels.

The first adaptation level requires the adoption of the new complementary assets to be combined with incumbents' existing core resources. We found that a “belief about synergies” between the new complementary assets and the existing core knowledge is a mechanism inducing an earlier adoption of new complementary assets. The second adaptation level involves a demand-based response to the discontinuity. “Experimentation with customers” was found to be a mechanism helping incumbents to develop new additional beliefs about how to create value. The third adaptation level involves an ecosystem-based response to the discontinuity. “Experimentation with the ecosystem” was found to be a mechanism through which incumbents develop new additional beliefs about value capture. Taken together, the

characterization of the three adaptation levels allows us to explain how incumbents can respond more comprehensively to complementary-asset discontinuities. While a first level of recombination of resources can be essential after complementary-asset destruction and tends to represent an initial response to the discontinuity, we found that incumbents eventually also needed to update their beliefs about value creation and capture (second and third levels) to adapt an entire business model to changing market conditions. We observed variance across the six newspapers in navigating these adaptation levels, as detailed below.

Level 1: Resource-Level Adaptation

Our data show that incumbents initially respond to complementary-asset discontinuities by trying to adopt the new complementary assets, then only later do they adapt to changing demand and ecosystems. The timing of such adoption depends on whether the incumbent believes that the new complementary assets can generate synergies with its preserved core knowledge. Without similar beliefs about the synergies, adoption might be postponed through fears of cannibalization or other inertial factors, as revealed by three of the examined newspapers (*Specialized Courier*, *Local North*, and *Local South*). Instead, an earlier belief about the synergies may counterbalance the adoption challenges and foster earlier adoption, as revealed by the other three newspapers (*National Gazette* and *Specialized Gazette* as early adopters, and *National Courier* as an intermediate adopter). The identified adoption mechanism is a supply-side or producer-side synergy (Ye et al. 2012) regarding which we also highlighted the importance of incumbent beliefs. For what follows, we defined “belief about the synergies” as the extent to which an organization believes that the combination of its traditional core knowledge and the new complementary assets will produce benefits. The “adoption of the new complementary assets” is instead defined as the speed of adoption and use of new complementary assets. *National Gazette* and *Specialized Gazette* were early adopters and provide the first two examples.

National Gazette was a pioneer in using the Internet and launched in 1997 one of the first websites with a “dedicated online newsroom.” The company believed in the potential synergies between Internet technologies and their journalistic knowledge, as explained by the managing editor of *National Gazette’s* website:

For the first time in history, the web has allowed us to reach audiences worldwide and in real-time. The process of gathering and fact-checking news has become more effective and efficient.

An additional indicator of beliefs about synergies was that the company rapidly integrated the digital venture into its core business, as the above informant further explained:

We conveyed to people a sense of integration between print and the web, and a sense of common identity. Identity because the managing editor of the printed newspaper understood that the website belonged to him, while other newspapers have not adopted the same reasoning.

The company also believed that its online success derived from the use of traditional journalists and that the printed content would live on online (see quotations in Table 3). To gather additional perspectives on the issue, we also interviewed print and distribution managers, who confirmed that the company had a similar positive belief about the synergistic benefits presented by the Internet. The director of printing presses said:

I think that our publisher believed that the online technologies would balance the expected decline of print readership. Hence, we accelerated the substitution in expectation of economic returns that did not arrive!

The effect of the belief about synergies was that the company early adopted and used the new complementary assets. By 1998, many of its journalists had leveraged their editorial knowledge online by also publishing their blogs on the newspaper's website. The parent company's support for digital adoption was demonstrated by it establishing a digital technology subsidiary in 1999. Over the years, *National Gazette* continued to adopt every digital distributive technology early and leverage its editorial knowledge through the new channels. For instance, it was already offering its content on mobile websites in 2000, on mobile apps in 2007, and on social networks in 2008.

Specialized Gazette, the other early adopter, also revealed that the adoption of the new complementary assets was driven by a belief about supply-side synergies. In fact, this sports newspaper rapidly adopted Internet technologies to leverage its content and journalistic competences online. In doing so, it became the first sports newspaper available for an online audience. In a 1997 editorial article in the printed newspaper, a sports editorialist wrote how their historical sport database was deployed for the benefit of the website:

We have chosen to go online by using already available and new resources... *SpecializedGazette.it* will provide not only real time news and in-depth analyses but also a multitude of historical data about sport matches that we have collected over more than a century for print readers. (Source: Bettini 2006)

The belief in synergistically benefiting from the combination of print and digital channels was also pursued through the printed newspaper sponsoring the website, which in turn sold historical front pages of the

printed newspaper to sports fans. The same mindset was also reflected by the company's choice to use traditional journalists to develop new online products such as *Fantacalcio*—a fantasy football game invented by *Specialized Gazette*. The belief in exploiting synergies between editorial knowledge and the online channels was further shown by the immediate integration of the offline and online businesses (in contrast to the approach of the U.S. newspapers examined by Gilbert 2005, 2006).⁴ As the director of the Media Co. digital division explained:

Our company and other Italian newspapers created an online newsroom near the print newsroom, with the same editor in chief and common working activities. The Anglo-Saxon world reached our starting point at the end: U.S. and U.K. newspapers started with a separate structure and two distinct directors, and only later did they integrate the newsrooms.

As an effect of this strong belief in the synergies, *Specialized Gazette* adopted and used Internet technologies early. In 1997, its websites hosted the first forums, then in 1998 it developed a significant video section in partnership with IBM, and added audio comments by sports journalists in 1999. Over time, the company was an early adopter of all mobile and social network technologies, and it frequently restyled the website.

National Courier demonstrated intermediate adoption times. It launched its websites in 2001, four years after *National Gazette* and *Specialized Gazette*, but before the other three remaining newspapers. More precisely, it purchased its Internet domains in 1995 (to repurpose the PDF-versions of its printed copy online), but it did not open a dedicated online newsroom until June 2000. This case is interesting because *National Gazette* and *Specialized Gazette* belonged to the same publisher, Media Co., but adoption by *National Gazette* was significantly slower. We found that *National Gazette* did not immediately believe in the benefits of the Internet due to perceived initial challenges or dyssynergies that induced the company to wait. A *National Courier* editorialist and union member explained the initial challenges and perception of dyssynergies:

The internal labour union of *National Courier* was historically stronger than those of *Specialized Gazette* and provided major resistance. The challenges were the fear of cannibalization of journalists' employment and the desire to have new contractual arrangements to write for the web.

⁴ Gilbert (2005, 2006) found that a group of U.S. local newspapers went online by separating their digital ventures from the parent newspapers. O'Reilly and Tushman (2004) studied *USA Today* and observed a tension between separating the digital venture and integrating it into the newspaper and TV stations to share news content across the three platforms.

Beyond believing that the web could cannibalize print and force journalists to work more for the same salary,⁵ the *National Courier* newsroom also seemed not to see the new opportunities, according to a media analyst:

The delay at *National Courier* seems to be due to the hesitation of the editorial newsroom, which was not sure about the potential of the web. (source: Bettini 2006)

A gradual change regarding the beliefs about the web took place after 2001, when the online success of its competitors *National Gazette* and *Specialized Gazette* became clearly visible. From that moment, *National Courier* adopted and used the digital technologies in combination with its best journalists. By 2004, Media Co.'s two newspapers had started to collaborate online by sharing updates about sports and non-sports news, thus using the web to seize upon editorial synergies.

The other three newspapers, *Specialized Courier*, *Local North*, and *Local South* were “late adopters” and took a similar approach of using the web initially for a simple repurposing of their printed copies. Only later, from around 2007, did they exploit the synergies with their core editorial knowledge. Consistent with their late adoption, they did not initially show any belief about synergies. Rather, they showed the aforementioned cognitive resistance from core-knowledge workers (fear of cannibalization and the need for new contractual arrangements), additional managerial resistance, and resource concerns. For instance, the *Local North* vice managing editor told us that print journalists were initially afraid to publish local news online to avoid favoring their printed competitors—hence, they perceived a dyssynergy with the online media. Table 3 provides additional evidence about the three newspapers lacking an initial belief about synergies and their related late adoption.

Overall, our finding regarding the belief about the synergies is important in explaining when and why incumbents adopt new complementary assets after a complementary-asset discontinuity. We found that incumbents believing that synergies can be generated with their preserved core knowledge will be quicker to adopt the new complementary assets. That specific mechanism integrates scholarly knowledge about the mechanisms of adopting new technology. While traditional adoption mechanisms can also apply to the case of complementary-asset discontinuities (e.g., adoption to replace destroyed resources), we

⁵ A media expert further clarified the resistance to change: “In journalistic institutions, work relationships are tightly regulated by contracts not adapted to the digital revolution; they are made vulnerable by their structural rigidity” (Giornalismo d'altri 2015).

emphasized the beliefs about the synergies, as they help to explain part of the variance in the time of adoption and are novel to the literature.

--Include Table 3 about here --

Level 2: Demand-Level Adaptation

Although the adoption of new complementary assets can be necessary after a complementary-asset discontinuity, it might not be sufficient. For effective adaptation, discontinuities may also require changes to business models (Chesbrough and Rosenbloom 2002, Christensen et al. 2018, Teece 2007). Similar changes can also be needed after complementary-asset discontinuities because the availability of radically new complementary assets can favor new ways of creating value. However, adapting an existing business model after a discontinuity is a typically complex endeavor due to resistance to change and uncertainty over both new customer preferences and market needs (e.g., Benner and Tripsas 2012, Doz and Kosonen 2010, Kapoor and Klueter 2015, Markides 2006, Tripsas 2009). Incumbents' existing beliefs are a major source of resistance, as outdated beliefs about value creation and capture are often applied to situations requiring new business models (Osiyevskyy and Dewald 2015, Tripsas and Gavetti 2000).

Our data indicate that incumbents can be more likely to update their existing beliefs about value creation if they experiment with customers in the new technological space. The mechanism of “experimentation with customers” is defined here as the extent to which an organization experiments with customers and new solutions to create value in the new technology. The outcome of similar experimentation is the “update of beliefs about value creation,” which we define here as the addition of new ideas regarding what creates value that do not necessarily eliminate existing beliefs but, instead, constitute an enlargement of them. Only three of the six newspapers studied were particularly active in experimenting with customers online, and those three updated their beliefs about value creation the most (*National Gazette*, *Local North*, and *Specialized Gazette*).

Before illustrating those findings, we need to summarize newspaper professionals' traditional beliefs about value creation. Our informants indicated that they perceived newspapers as content producers employing professional journalists—this was their belief about their identity. They perceived their role as informing people about what is relevant and explaining its meaning—this was broadly their

belief about how they create value. The National Gazette Co. director of digital content and product development expressed this traditional belief about value creation:

Reputable newspapers create value by giving a hierarchy of news by selecting what an audience needs to know for the day.

The belief that newspapers create value by selecting and explaining what matters was also indicated by the National Gazette Co. president:

News is like flowers, and newspapers are like bouquets; receiving one flower is valuable, but there is more value in a well-composed bunch of selected flowers. (Interviewed by *Corriere della Sera* in 2017)

National Gazette represents a first good example of how incumbents can gradually update their beliefs about value creation by experimenting with customers in the new technological space. As Table 4 indicates, the newspaper engaged in a significant number of experiments with customers online. For instance, National Gazette Co. launched its first blogs and forums in 1998 to enable people to write on its dedicated websites, created in 1999 a network of crowdsourced online school newspapers written by students, has maintained a community of self-publishing authors since 2008, and, since 2011, run a citizen video journalism initiative experimenting with solutions to enable people to contribute to its news website. While some of those experiments were successful and others were not, what mattered for the company was to learn a new mindset from users, as expressed by the digital division general manager:

The experiment with the schools allows us to have a connection with the young generations and learn from them about new tools and crowdsourcing solutions.

A company manager and founder of the self-publishing author platform explained to us that:

Our self-publishing community showed the rest of the company that we can create collaborative businesses in a legacy media.

The same manager wrote on his blog on *medium.com* how publishers incorporated the new beliefs:

In the end, publishers understood it and now it is normal: (...) that everybody can publish a book without passing through a book publisher, similar to how it is possible to write an article without passing through a newspaper; (...) and that it is possible online to collaborate on ideas and involve the readers.

Other informants at *National Gazette* told us about the newspaper's calls for citizens to report facts online—yet more evidence of the updating of beliefs at a traditionally journalist-centered organization. A final form of experimentation with customers that led to a similar outcome was the engagement with readers during journalism festivals, which were also broadcast online. Since 2012, *National Gazette* has

launched a series of festivals across Italy to meet with audiences to discuss cultural and social ideas. The experimentation with live audiences brought an additional change of mindset for a publisher that traditionally never met with its readers. All those experiments with customers permitted an upgrading of the company's beliefs by integrating the notion of co-creation with users (see, e.g., Von Hippel 2005). The significant support those experimental projects received from the company's top management and the newspaper itself suggests that the new beliefs were gradually filtering into and across the entire company.

Local North provides a second important case. Despite its late adoption of internet technologies, once started the experimentation with customers was significant and enabled a company mindset update. Table 4 summarizes the most relevant evidence. The company gathered hard news from citizens and experimented with social media users to understand their desires, invited readers into the company to develop or co-develop new products, and experimented with younger generations to build a network of collaborators. Through those processes, it gradually became clearer to the newspaper that its journalist-focused culture needed to change, as explained by the *Local North* vice editor in chief:

We journalists understand that we have become web users. We use many sources of news online and are aware that we need to do the same: to give our news to readers on platforms. On *Twitter* we provide the news, but we also receive it from people!

A journalist and media consultant working at the company referred to social media experimentation as a way in which the company was thinking differently about value creation:

Through *Facebook* we asked and learned what customers wanted from us. They wanted a radical new tool, the "match analysis," which we developed for them.

The experimentation with customers did not only take place online, so it led to a hybrid of physical and digital bundles. The same informant told us that they had invited readers to the newspaper to rethink the value creation possibilities and to start applying a prototyping method to editorial product development:

Through those meetings, they reinvented a newspaper section (*CompassBiz*) to make it a community for companies based on business advice and physical events. The meetings also trained an internal team of employees to focus on customers and to use a trial-and-error method of experimentation as a prototype for other products.

The interaction and experimentation with customers allowed existing *Local North* beliefs to be upgraded without being substituted, as confirmed by its vice editor in chief:

While remaining a reputable newspaper, we came to the conclusion that our new value is in the community we aggregate; local newspapers should act as the central voice of reference for their communities.

The company updated its beliefs about what was valuable for readers in terms of content and services. For instance, Local North Co. discovered that their customers did not want additional content on social media—contrary to the company’s predictions—but instead desired a verticality of selected content online and the chance to attend physical events with journalists. Readers were placed at the center of the activities and subscribers were kept engaged with weekly videos. A major recent experiment involved an education platform developed to train young generations in newsgathering and reporting, with the intention of developing a pool of external collaborators. All those experiments constituted a radical updating of *Local North*’s core beliefs from its traditional content-centric mentality, not oriented to product development, to an audience-centric view where customers give ideas and validate proposals for new products.

Specialized Gazette represented a final case of high levels of experimentation with customers and updated beliefs. Table 4 provides multiple pieces of evidence regarding that experimentation activity, including blogs and forums, user-based online gaming, and high interactivity via comments on articles. The managing editor of the *Specialized Gazette* website told us: “A group of us understood, back in 1997, that our website was an incredibly powerful tool to engage with readers using news updates.” The online newsroom rapidly updated its mindset to account for the new role of readers, as summarized by the managing editor:

A journalist online does not live by their words only: multimediality and interactivity are the real revolution. An online article can be commented on instantaneously. It’s the readers’ feedback that gives us the pulse of the situation. (cited in Pilla 2008)

The other three newspapers showed limited experimentation with customers, and their value creation beliefs did not change significantly. *National Courier* was relatively more active within this group, but it did not engage directly in crowdsourcing projects or brainstorming activities with customers to experiment with new solutions, nor did it start any systematic conversation with readers through physical events, despite being comparable to *National Gazette* in terms of resources and brand. *National Courier* was quite late in acquiring a successful user-generated content platform (in 2014). By not exposing itself to direct and frequent experimentation with customers, the company’s mindset remained almost unchanged and focused mainly on value creation through journalists, as the vice president of digital publishing said:

I strongly believe in user engagement, but I do not see the reason why we should create a specific product for it. We need to get better at engaging users on our quality products where the real value is.

Even when *National Courier* recognized the changing habits of readers, the main response was still based on the traditional belief that only professional journalism creates value, as the website managing editor said:

Readers' habits have changed: they want selection, value-added explanations, and aggregation. Newspapers need to give less—only intelligent things that create value.

Local South was another example of no experimentation with customers and a persistent mindset oriented toward a traditional way of working. A journalist collaborating with the newspaper until 2012 told us:

Even though they had a website, the publisher never spoke about it or about any apps; they were only concerned about writing for print.

The value creation beliefs at *Local South* remained unchanged to the extent that, even as recently as 2019, the company was still launching new printed products using professional journalists. When we asked whether the publisher had considered entering different businesses, such as events, consulting, or new online services, the CEO emphasized only their traditional belief:

We are a newspaper. If we need to sell something different, it is better to shut down and start a new business! We believe in what we do, in the function of journalism.

Specialized Courier was the final case showing both limited customer experimentation and no significant change in value creation beliefs (see Table 4).

Our data suggested that a higher degree of experimentation with customers is likely to contribute to more updating of incumbents' beliefs about value creation than when the experimentation level is lower or absent. That is important because existing beliefs influence the direction of an adaptation, thus eventually hindering change (Benner and Tripsas 2012, Tripsas 2009) if not addressed, so understanding the mechanisms for doing so is critical. The importance of further considering a demand-side view within technological adaptation studies (Adner 2002, Christensen and Bower 1996, Priem et al. 2012, von Hippel 2005) is also revealed by our finding that customer experimentation can expose incumbents to novelties and help the process of belief change.

--Include Table 4 about here --

Level 3: Ecosystem-Level Adaptation

Our data show that there is a further, broader level of adaptation used by incumbents to navigate a complementary-asset discontinuity: the ecosystem of which they are a part. Scholars have argued that ecosystem-level responses are often necessary after systemic radical innovations (Adner and Kapoor 2010,

Teece 2018). We found that incumbents need to enact similar ecosystem-level responses, because complementary-asset discontinuities can favor new competitive landscapes, thus making available radically new complementary assets and enabling excess entry (Abernathy and Utterback 1978). To defend themselves and capture value, incumbents may need to cooperate in the post-discontinuity ecosystem (Browning et al. 1995, Cozzolino and Rothaermel 2018).

However, companies have pre-existing beliefs about how to capture value (e.g., Tripsas and Gavetti 2009), so updating their related strategies can be challenging. We found that incumbents are more likely to update their beliefs about value capture if they experiment with the ecosystem. “Experimentation with the ecosystem” is defined here as the extent to which an organization experiments with new solutions and competitors or third parties to capture value in the new technology. “Update the beliefs about value capture” is defined here as the addition of new ideas which do not necessarily eliminate prior value capture beliefs but rather constitute an enlargement of them.

Only three of the six newspapers were particularly active in experimenting with the ecosystem and updating their beliefs about value capture (*National Gazette*, *National Courier*, and *Specialized Gazette*). The ecosystem in which the newspapers operated after the discontinuity included incumbent and new digital content producers, technology companies offering discovery and publishing services for content and advertising, advertising agencies, and users/audiences. As we have already examined demand-level adaptation separately due to its specificities, we do not refer again to users/audiences in the examination of ecosystem-level adaptation.

Before illustrating our key findings, we briefly summarize newspapers’ traditional beliefs about value capture, then discuss the challenges brought by entrants’ new ways of capturing value. The Media Co. circulation manager and head of operations explained how and why publishers believed that print and distribution were critical to capture value:

In any economy of knowledge, the manufacturing and distribution assets play a key role. Newspapers controlling the entire physical chain had a time advantage and a better positioning in the newsstands.

Equally strong was the conviction that the monetization of readers’ attention required the ownership of advertising sales houses, as expressed by the *Local South* CEO:

When we bought out newspaper back in 1997, it was managed without a proprietary sales house and, indeed, was in a terrible financial condition. To create distinctive value and trustworthy

relationships with our local advertisers, we developed competences and built our own ad sales house.

In sum, newspapers' traditional beliefs about value capture were consistent with Teece (1986), as publishers believed that they needed to control manufacturing, distribution, and advertising sales.

Digital entrants, especially those introducing the new downstream assets, caused significant challenges for incumbents' value capture, thus forcing them to rethink and update their value capture strategies. Entry after a discontinuity can take place upstream (in knowledge creation) or downstream (in commercialization via the new complementary assets). We observed that upstream entrants (e.g., digital content producers) do not represent a major challenge for incumbents after a complementary-asset discontinuity, as the incumbents' core knowledge is preserved and such entrants do not introduce any radically new knowledge.⁶ Downstream entrants do however represent a challenge in terms of value capture, because they can specialize in offering new downstream services without bearing the cost of producing upstream products. Put another way, they can capture part of the value produced by incumbents by controlling new specialized assets that offer new distribution and commercialization services. In our context, the downstream entrants were distribution and sales digital platforms. As they provide services on top of the core products produced by incumbents, they are referred to in the industry as "aggregators," "orchestrators," "disruptors," and "over-the-top (OTT) players" (BCG 2016). By availing themselves of that privileged positioning, such entrants not only became central actors in the digital ecosystem through their distribution and sales platforms (new specialized complementary assets) but also captured most of the value produced by incumbent publishers (*The Economist*, 2017). While we interviewed both upstream and downstream entrants, for brevity we discuss here only downstream entrants, as they challenged newspapers the most.

A former executive from Downstream Entrant1, a leading search engine, explained to us how they entered the market by satisfying the need for searchability of incumbents' products:

⁶ Several pieces of evidence show that startups entering upstream in online content production have more difficulties in sustaining their businesses online than established newspapers. For these upstream startups, researchers have found that survival is success (Bruno and Nielsen 2012). More recently, even the few cases of real success beyond simple survival, such as *The Huffington Post* and *BuzzFeed*, have seen cutbacks and layoffs (*The Guardian* 2019). Those upstream entrants were not the real challenge for incumbents, however, and they sometimes even became engaged partners for newspapers, as shown by the joint ventures formed by *National Gazette* with both *Business Insider* and *The Huffington Post*.

What is important for online readers is searchability. Whether you want to consume news, or books, or scientific publications, the first thing you want is to be able to identify what you are looking for, since it is easy to get lost online.

Other downstream entrants specialized in improving efficiency and targeting. An executive from Downstream Entrant2, a new technology company offering online retargeting advertising services, explained:

Due to the infinite number of digital sources, advertisers face a new problem today: how to allocate efficiently and effectively ad budgets online. Searching for customers is potentially more challenging online, whereas offline there were just a few news outlets to consider.

Social networks such as *Facebook* and *Twitter* were other leading downstream entrants in news distribution and advertising sales, often capturing advertising revenues at the expense of news publishers. An international expert and journalist explained how:

Publishers are at risk of becoming interchangeable. With Moments and Instant articles, Twitter and Facebook seem happy to take content from publishers without ever sending people back to their sites—you know, the place where publishers earn their money. (*TechCrunch* 2015)

National Courier and *National Gazette* were the two most active newspapers in initiating multiple experiments with the ecosystem to face the challenges introduced by downstream entrants. Those newspapers held discussions with various members of the ecosystem in different contexts, including industry association meetings (held by FIEG, the Italian Association of Newspaper Printers, Audipress, and Audiweb), regulatory and governmental consultations (with AGCOM, AGCM, and the Ministry of Communications), and industry festivals (IJF, *TechCrunch* Italy, IAB, and the Italian Internet Festival). Those contexts acted as experimental spaces (Bojovic et al. 2020) where the two national newspapers considered possible ecosystem-level solutions. For example, since 2007, the two national newspapers have met at the annual IJF in Perugia to discuss how to innovate and defend their business from downstream entrants. Others have joined that conversation over the years, including the two sports newspapers (in particular, *Specialized Gazette*). *National Courier* and *National Gazette* have launched several ecosystem-level experiments (see Table 5). In 2009, they created the first incumbent-only consortium—the *Premium Publisher Network* (PPN)—to pool publishers' classified ad spaces to compete with Google's *AdWords*. The consortium experimented with new solutions through an intermediary technology startup (Tech Partner1) acting as a partner in the ecosystem of traditional newspapers. By 2013, 80 competing newspapers were

involved in the consortium, including all the newspapers in our sample.⁷ Another ecosystem-level experiment was the formation in 2012 of a common digital newsstand *Edicola Digitale*, which has been promoted by *National Gazette* and *National Courier* ever since. In 2013, National Gazette Co. formed a new video syndication platform with competing local newspapers, without the help of *National Courier*. In 2014, *National Courier*, *National Gazette*, and *Specialized Gazette* created a new ecosystem-level alliance for video ads, *Gold 5*, also including a TV broadcaster and a blog network. In 2019, *National Courier* created the Media Co. Academy in cooperation with an employment agency, leading employers, and a university to teach master's courses with the journalists as instructors.

Thanks to the experimentation in the ecosystem, new beliefs about value capture were developed. The former vice president of Media Co.'s digital division, as co-founder of the *PPN* consortium, told us about the new mindset of pooling incumbents' products together in the new ecosystem:

The problem of publishers today is the abundance of web properties and the presence of actors of the size of Facebook aggregating them. To protect their premium prices and avoid their CPM [cost per mille (i.e. thousand)] going down, publishers need to sell their online audiences without disintermediation, offering advertisers a pool of selected properties.

The new belief was different from the traditional view that each newspaper needed to sell its products in isolation through its complementary assets. A Tech Partner¹ senior manager told us why incumbents understood the importance of pooling their resources together:

The digital value chain today is characterized by orchestrating platforms that bring efficiency and measurement into the system, and advertisers are getting used to it. Since their demand is moving in that direction, large publishers have to develop similar competences through proprietary networks.

That novel mindset was developed by experimenting together on new solutions to mimic the offer of entrants acting as aggregators and to protect the incumbents' core business. The CEO of *National Courier's* ad sales house told us in 2013 that:

We are increasingly working on the possibility of cooperating with other newspapers to sell our premium adv, and this is clearly the way to go.

The president and CEO of *Tech Partner1* further explained:

⁷ The examples provided of cooperation among incumbents should not be confused with cases of tacit collusion. They were all legal entities in the form of official consortia or alliances made by newspapers and often supported by industry federations and the government. The real challenges from the AGCM perspective were Google and Facebook, both of which are considered quasi-monopolists in the new online advertising market. We thank one of the reviewers for helping us to clarify this important point.

By building their internal and private assets to aggregate and sell ad spaces, publishers maintain the ownership of their readers' data. If instead you let an ad exchange sell your ad spaces, they can follow your readers through cookies on other websites and sell your customers to advertisers on cheaper websites!

The logic behind *Edicola Digitale*, the other experiment to sell digital copies jointly through a proprietary platform, was illustrated by the National Gazette Co director of development and innovation:

We are launching a digital newsstand, called *Edicola Digitale (Digital Newsstand)*, on which the major Italian publishers will sell their digital newspapers in conjunction, offering readers a fixed price to read all our different publications. This is something that U.S. publishers are also doing. We'll make it by developing our own system, rather than going on external platforms like iTunes' *Newsstand*.

The experiment was another major belief update, as the desire for a distinctive identity traditionally meant that publishers did not combine their content. A *National Courier* journalist explained to us the traditional mindset of newsrooms with respect to cooperation:

Newspaper websites don't link to other newspapers and external sources spread across the web. They are content producers, and this creates a conflict: they want to maintain their identity and editorial distinctiveness.

Therefore, the experimentation for a joint digital newsstand involved an additional upgrade of the mindset from being a competition-based ecosystem to being a collaborative one. A new value capture logic was also accepted for selling bundles of competing newspapers for a fixed price under an all-you-can-read logic, which is the opposite of a newspaper subscription model. Several international publishers have conducted similar online experiments (e.g., in Austria, Germany, France, Spain, the United Kingdom, and the United States).

Further evidence that *National Gazette* and *National Courier* were updating their mindset about value capture was provided by the ecosystem-level experiments being extended to other product categories over the years. The National Gazette Co. web and mobile marketing director explained: "We are discussing the introduction [within the consortium] of other product categories such as display and video ads to build the 'premium equivalent' of Google's *AdSense* or Microsoft's *Ad Exchange*." In another experiment, *National Gazette* pioneered a video syndication platform in the local newspaper ecosystem. The National Gazette Co. digital division general manager explained:

Our video-sharing platform allows us and external local publishers to exchange news videos and redistribute their advertising revenues. Viewers benefit from the variety of news sources, and advertisers get different targets.

The *Gold 5* experiment in 2014 constituted a further upgrade of the value capture beliefs in an even broader ecosystem. Indeed, that new joint platform included not only *National Courier*, *National Gazette*, and *Specialized Gazette* but also a competing TV broadcaster and a blog network. The National Gazette Co. general manager explained how they intended to push back together against the power of Google's *YouTube* with a high-quality offer: "Advertisers can buy from the online properties of *Gold 5* with the guarantee of quality targets and optimized purchasing." Similar overseas alliances in response to *YouTube* included *La Place Media* by French publishers, *AdAudience* in Germany, and *Aunia* in Spain.

Such updating of beliefs was not however achieved without difficulties. A PPN founding manager told us that the consortium members' contrasting views caused internal tensions and implementation problems. Consortia managed directly by different publishers often did not last, whereas those that transformed themselves under separate leadership were more sustainable. The PPN was able to transform itself from being initially managed directly by publishers to being managed by the intermediary Tech Partner1, their initial technology supplier, and thus managed to overcome the tensions between different publishers. U.S. newspapers took a similar approach by creating their consortia then delegating management to a third party (e.g., Local Media Consortium). The *Edicola Digitale* ecosystem-level experiment was less successful because the implementation was frequently postponed due to its members' differences of opinion, but the tension was partially overcome by accepting, over time, the leadership of another intermediary startup, Tech Partner2, which simplified coordination between the publishers.

The other four newspapers were less proactive in experimenting with new solutions in the ecosystem, although some joined the above projects at a later stage (*Specialized Gazette* was the first). Local South Co. was one of those that joined the video syndication platform to access quality national videos in exchange for its local ones. However, when it needed to develop its own projects, *Local South* simply applied a traditional value capture logic, as revealed by its CEO: "In 2014, we merged with two local newspapers to increase our circulation." *Specialized Courier* revealed a similarly traditional value capture mindset when it acquired in 2017 and 2018 the license to sell the advertising spaces of small incumbent media. *Local North* did not engage in major experimentation with the ecosystem and did not show signs of developing new beliefs. Overall, the newspapers less active in experimenting with the ecosystem maintained mostly unaltered beliefs about value capture.

A last consideration regarding the beliefs about value capture can be made in relation to paywalls—the mechanisms to ask readers to pay for content online. After several ecosystem-level discussions in various experimental contexts, both *National Courier* and *National Gazette* launched their paywalls (in 2016 and 2017, respectively), thus updating their original belief that news cannot be sold online. For almost 20 years, newspapers had believed that: “We needed to accept the rules of the game: Internet is free” (National Gazette Co. president in 2013). Therefore, a paywall represented another mindset update, as expressed by the *National Courier* managing editor:

Rather than chasing huge numbers of page views...our objective will be to have an intimate relationship with our readers also online by offering them content which is worth paying for. (2016 Internal Report on the paywall)

None of the other four newspapers introduced paywalls for their websites. A final ecosystem-level experiment was the attempt by *National Courier* and *National Gazette* to force Facebook to pay for their premium content on Facebook Instant Articles. While not fully successful, it revealed another similar shift of mindset, from freely sharing to instead restricting access to fewer paying users.

In sum, we found that experimentation with the ecosystem helps incumbents to update their beliefs about value capture. We also found that the difficulties of experimenting effectively in an ecosystem can sometimes be reduced by delegating the implementation role to third parties.

--Include Table 5 about here--

Final Outcome: Adapting the Business Model

The previous findings have revealed key mechanisms and outcomes regarding three levels of incumbent adaptation to complementary-assets discontinuities. We conclude this section by reporting the final outcome of the entire adaptation framework—the new business model utilized after the discontinuity (see Table 6). A new or adapted business model in this paper is one containing significantly new features compared to an initial model. Consistent with the variance observed within the three levels of adaptation, variance was also observed in the adaptation of the business models. Only three newspapers introduced significant new features compared to their traditional model. National Gazette implemented the highest degree of change by introducing significant new features in both the value creation part of the model (e.g., self-publishing author platform) and the value capture part (e.g., proprietary joint platforms for advertisers and sponsored regular events). The level of innovation for *National Courier* was equally high but

predominantly in the value capture part of the business model (the formation of a business school and new platform-based advertising). The novelty for *Specialized Gazette* was medium to high and referred mainly to value creation. *Local North* engaged in intermediate adaptation of its business model by introducing new features for value creation, while *Specialized Courier* and *Local South* hardly changed their business models at all but simply transferred them to the web. Only *National Gazette* and *National Courier* established real paywalls for their websites. Table 6 provides details. What is important from a theoretical standpoint is not the final business model per se but rather the evidence that the three levels of adaptation worked as antecedents for a final business model adaptation.

--Include Table 6 about here--

Discussion and Conclusions

A Framework of Multilevel Adaptation to Complementary-Asset Discontinuities

We conducted an inductive multiple-case study of six newspapers facing the changes brought by the Internet from 1995 to 2019 to investigate how incumbents can adapt to a complementary-asset discontinuity. We started by showing that the Internet represented a complementary-asset discontinuity for newspapers by destroying their specialized complementary assets (printing, distribution, and sales) but not their core knowledge (their editorial know-how). We then examined our research question regarding how incumbents can best adapt to a complementary-asset discontinuity. Our main contribution is a theoretical framework explaining how incumbents can respond to such a change. Table 6 summarizes the framework of the three levels that may be necessary to adapt effectively to the change: resources, demand, and ecosystem. Examining the variance among the six newspapers, our data revealed mechanisms and outcomes behind each adaptation level.

At the resource level, we found that incumbents facing a complementary-asset discontinuity may adopt early the new complementary assets if they believe that doing so will generate synergies with their preserved core knowledge. As is the case with most technological developments, fear of cannibalization of the existing complementary assets and other inertial problems mean that adopting new complementary assets is not without difficulties. However, we discovered that a belief about the synergies can balance the resistance and induce more rapid adoptions. The two newspapers with strong beliefs that Internet technologies could be beneficial to the deployment of their preserved editorial knowledge early adopted

the new technologies by 1997. In stark contrast, it took until 2007 for the three newspapers which did not believe in the synergies to follow suit. Therefore, the timing of adoption is affected by the belief about the synergies and not simply by whether the new complementary assets are generic or specialized (Teece 1986, 2018).⁸ Our finding is relevant not only for the incumbent adaptation literature but also for resource-based view studies (Barney 1991), because it suggests the importance of a synergistic combination of producers' resources (core and complementary resources) to sustain a competitive advantage after technological discontinuities. Overall, we expect that:

Proposition 1: *After a complementary-asset discontinuity, incumbents that believe in synergy between the new complementary assets and their existing core knowledge are more likely to adopt the new complementary assets earlier.*

At the demand level, we found that incumbents can update their beliefs about how to create value post-discontinuity. The mechanism for doing so is experimentation with customers in the new technological space. Those newspapers that experimented more with customers online (three out of six in our sample) were also those to develop new beliefs about how to create value. Examples of such new beliefs were the conviction to use customer co-creation, to engage with customers directly on platforms, and to create high-quality communities. We also observed that all newspapers maintained their traditional beliefs and identity (Tripsas 2009) with the help of their preserved core knowledge.⁹ Therefore, we do not expect that experimentation with customers can entirely change the dominant logic of a company, but rather we observed that it can be enhanced through learning and exchanges with customers. Our finding is relevant for studies taking a demand perspective of innovation (Adner and Snow 2010, Priem et al. 2012, Tripsas 2008), as we emphasize the importance of experimenting with customers to avoid partial adaptations and failure (Adner 2002, Christensen and Bower 1996). Overall, we can expect that:

Proposition 2: *After a complementary-asset discontinuity, incumbents that proactively experiment with customers are more likely to update their beliefs about value creation.*

⁸ When the new complementary assets are generic, they are available on the market and can be adopted more easily, provided the incumbent has an incentive, such as the possibility of exploiting synergies (our contribution). When the new complementary assets are specialized, they are rarer and more complex/expensive, hence there is a further barrier. The adoption of specialized radio and TV technologies by newspapers took more time than for general-purpose Internet technologies. However, because the adoption mechanism was similar (the synergy), many newspaper publishers ultimately adopted radio and TV technologies (e.g., Hearst Communication).

⁹ In the language developed by Tripsas (2009), we can categorize a complementary-asset discontinuity as an “identity-preserving technology” (because, by preserving the core knowledge, it preserves the core identity of incumbents). The Tripsas theory shows that “identity-challenging technologies” render incumbent adaptation difficult. Our study can integrate this theory by suggesting that, in the specific case of complementary-asset discontinuities, even “identity-preserving technologies” can be difficult for incumbents to adapt, because the challenge derives from the complementary asset’s destruction.

At the ecosystem-level, our data show how incumbents can update their beliefs about value capture after a discontinuity. The mechanism for doing so is experimentation with competitors and third parties. Those newspapers that experimented more with the ecosystem (two out of six were particularly proactive) developed new beliefs about value capture. Examples of such new beliefs were the new ideas of competition as an ecosystem against new entrants, new payment systems, and the value capture in new types of businesses using the existing core knowledge. Similar to the above cases, we do not expect that experimentation with the ecosystem can entirely change a company's mindset, but it can help to develop additional beliefs about value capture by permitting the learning of new ecosystem-level solutions in a new competitive landscape. Our finding is relevant for a growing body of research taking an ecosystem-level perspective (Jacobides et al. 2018) and for related studies about technologies and cooperation (Browning et al. 2015, Cozzolino and Rothaermel 2018). We hence conclude that:

Proposition 3: *After a complementary-asset discontinuity, incumbents that proactively experiment with the ecosystem are more likely to update their beliefs about value capture.*

The outcomes of the three levels of adaptation (resource adoption, updated beliefs about value creation, and updated beliefs about value capture) are, in turn, the antecedents of business model adaptation—the final outcome. We describe below three specific contributions of our study.

Types of Discontinuities and Incumbent Adaptation

Our framework offers a relevant contribution to the literature on discontinuities and adaptation. Most research has focused on discontinuities affecting incumbents' core technological and R&D knowledge, such as the advent of biotechnology for pharmaceutical companies (e.g., Sosa 2011), electronics for mechanical calculator producers (e.g., Danneels et al. 2017), and digital imaging for the photography industry (e.g., Benner and Tripsas 2012). The literature also confirms that to adapt to similar core-knowledge discontinuities, it is essential to possess preserved complementary assets (Rothaermel and Hill 2005, Roy and Cohen 2016, Roy et al. 2018, Tripsas 1997, Wu et al. 2014). Our empirical study instead provides new insights into the opposite case presented by complementary assets being destroyed while the core knowledge is mostly preserved—namely, complementary-asset discontinuities (Cozzolino and Rothaermel 2018). We extend the understanding of this relatively overlooked change by unveiling the levels, mechanisms, and outcomes behind incumbent adaptation (the framework summarized above). Our

findings are novel compared to predictions for core-knowledge discontinuities, through which incumbents often access new core knowledge by allying with (Rothaermel 2011) or acquiring (Tripsas 1997) the entrants pioneering the new know-how. After complementary-asset discontinuities, we instead found that incumbents tend to adopt new complementary assets themselves to increase their supply-side synergies and gain an advantage (Level 1). In core-knowledge discontinuities, incumbents often create new value by collaborating with the entrants possessing the new knowledge (Pisano 1990). However, after complementary-asset discontinuities, we found that incumbents can create new value by experimenting on new solutions with customers (Level 2). Finally, in core-knowledge discontinuities, incumbents use their preserved complementary assets to enter new markets (Pisano 1990, Sosa 2011) or to cooperate with entrants (Arora and Gambardella 1990). We found however that after complementary-asset discontinuities, incumbents instead experiment with existing competitors and third parties to prevent downstream entrants from appropriating the value produced by incumbents' preserved core knowledge (Level 3). Taken together, our data offer a new comprehensive framework of how incumbents can respond effectively to complementary-asset discontinuities. Our empirical findings also contribute further insights into research by Cozzolino and Rothaermel (2018), who theorized about the different types of alliances possible for responding to both complementary-asset and core-knowledge discontinuities (horizontal versus vertical alliances, respectively) and their contingencies (appropriability regime and time). We extend that work by unveiling entirely novel mechanisms and outcomes, especially at the resource and demand levels (beliefs about synergies and experimentation with customers) but also at the ecosystem level (when we show that third parties can be needed for implementing ecosystem-level cooperation).

Combining Multiple Levels: Resources, Demand, and Ecosystem

Another key contribution is to the debate around the correct level of analysis needed in examining innovation and competitive advantage. Strategy literature rooted in the resource-based view (Barney 1991) has emphasized the role of an internal bundle of resources (Mahoney and Pandian 1992) to explain variance in competitive advantage among companies and their ability to adapt (Helfat and Peteraf 2003). While the resource-based view has been highly influential and has the merit of focusing attention on an organization's internal capabilities and assets, scholars have also recognized the importance of focusing on external factors. In particular, the demand-side view of strategy (Priem 2007, Priem et al. 2018) has

emphasized the external perspective of customers. Innovation scholars have pioneered the demand-level focus to show that companies fail when they do not anticipate customer preferences (Adner 2002, Christensen and Bower 1996), but they can adapt when they carefully segment customers (Adner and Snow 2010, Tripsas 2008) and experiment with them (Von Hippel 2005). A third perspective then emerged to focus on another external factor: the ecosystem within which companies operate. The ecosystems literature has remarked on the importance of looking at the interdependences among multiple actors in a value network (Adner and Kapoor 2010, Jacobides et al. 2018) to innovate and gain an advantage, often through collaborations. Our framework reveals that all three perspectives together can be necessary to explain and permit full adaptation. Our contribution is that incumbent adaptation may require an arsenal of mechanisms from the three levels: seizing supply-side synergies (resource-level), experimenting with customers (demand-level), and experimenting with the ecosystem (ecosystem-level). Those mechanisms can be necessary for adopting and reconfiguring resources (Level 1), developing new value creation strategies (Level 2), and forming new value capture strategies (Level 3) after a discontinuity. Therefore, our data suggest the benefit of integrating the three research streams to study incumbent adaptation from a holistic perspective instead of treating resources, demand, and ecosystems in isolation.

Antecedents of Business Model Adaptation after Discontinuities

We also contribute to studies on business model adaptation and its antecedents. While a broad body of literature has focused on the definitions and functioning of business models (Massa et al. 2017, Zott et al. 2011), there are relatively few studies on business model innovation (for an exception, see McDonald and Eisenhardt 2020), and even less research has been conducted on business model adaptation by incumbents. That is surprising because incumbents facing radical technological changes often need to readapt their business models (Doz and Kosonen 2010). Despite the problem's importance, there remains a very limited understanding of business model adaptation antecedents (Foss and Saebi 2017). Our three-level framework helps to address that lack of understanding. Our main contribution to this literature is to specify two types of experimentation that have differential effects on beliefs about value creation and capture. Experimentation with customers particularly helps in developing new beliefs about value creation, while experimentation with the ecosystem helps in developing new beliefs about value capture. By identifying and connecting specific types of experimentation to specific beliefs, we link two emerging

streams in business model studies; one on experimentation and learning (McDonald and Eisenhardt 2020, Zuzul and Tripsas 2020) and the other on managerial cognition (Aspara et al. 2013, Osiyevskyy and Dewald 2015, Gavetti and Tripsas 2000).

Generalizability, Limitations, and Avenues for Future Research

The proposed framework can easily be generalized to industries where core knowledge is mostly preserved and the complementary assets are destroyed, especially by generic assets first, then by more specialized assets. As we derived the framework from a single industry, future research is needed to test its validity in other contexts. Examples of such contexts would be music, television, academia, book publishing, and video gaming. Those industries have experienced complementary-asset discontinuities caused by the Internet and adopted general-purpose digital technologies to deploy their preserved core knowledge online (e.g., MIT OpenCourseWare), some of their leading incumbents have experimented with new ways of creating value with customers (e.g., CNN's iReport), and most of their incumbents have experimented in the ecosystem to capture value online (e.g., Hulu in the entertainment industry). As it also affects incumbents' complementary assets, blockchain is another suitable technology to which the framework could be further extended. Despite the differences between blockchain and the Internet, we see some analogies in incumbent responses, such as incumbent food producers collaborating in their ecosystem and with a third party (IBM) to develop common blockchain solutions (the IBM Food Trust blockchain).

Future research could also investigate the organizational preconditions necessary for incumbents to activate the adaptation mechanisms. We have not examined those preconditions to understand the reasons why some incumbents perceive a synergy with the new technology and are prone to experimenting with customers and the ecosystem. Anecdotal evidence in our data suggests that entrepreneurial culture and ambidexterity (O'Reilly and Tushman 2004), an ability to link with customers (Foss et al. 2011), and interorganizational power (Pfeffer and Salancik 1978) may be preconditions for the adaptation mechanisms, but additional research is needed. Finally, future studies could also examine the temporal sequences between the three levels of adaptation (resources, demand, and ecosystem) and their dynamic interdependencies under different contingencies.

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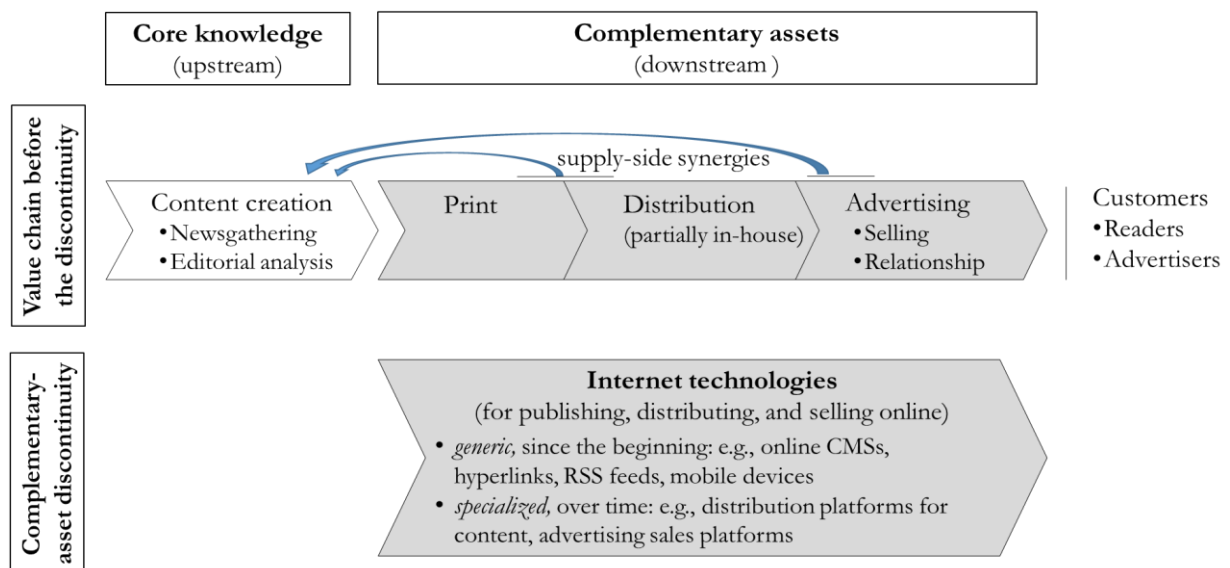
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Figure 1: Newspaper Value Chain and Impact of Internet Discontinuity



The first arrow indicates synergy deriving from controlling both content and print/distribution (to produce content until late at night). The second arrow indicates synergy deriving from selling advertising space associated with content at a higher price (when the ad sales house is owned by newspapers).

Table 1: Detailed Evidence of Complementary-Asset Discontinuity for Incumbents

	Value after the change	Quotes illustrating the discontinuity
Core knowledge		
Newsgathering (1 st component)	partially retained	<ul style="list-style-type: none"> • “Our highest rigor in fact-checking and our know-how in interpreting and selecting news make readers turn to us when important events happen” (Website editor in chief, <i>National Gazette</i>). • “Some of my colleagues and I have the highest number of followers [on social networks]! The work of a journalist is more fun today, and we like sharing our work and discussing it online” (Editorialist, <i>National Courier</i>). • “Breaking news often comes out on <i>Twitter</i> before news agencies like Reuters or Associated Press react. This is because everyone has a smartphone and an account to write! Any organization and citizens, including politicians, can tweet” (Vice managing editor, <i>Specialized Courier</i>). • “Internet is flux; speed and capacity matter. We have gradually developed all the additional skills by operating online since 1997, and now we are the top news website in Italy and among the most followed on <i>Facebook</i>” (Editor in chief, <i>National Gazette</i>).
Editorial analysis (2 nd component)	retained	<ul style="list-style-type: none"> • “However, in a flux [internet], you also need to hold the news that brings meaning! We do this thanks to our vast traditional knowledge accumulated over years of professional experience in the printed business. We have a method, rules, and invaluable columnists who have been correspondents from war zones or politically critical cities for decades. That is why in 2013 Warren Buffet acquired 63 local newspapers and Jeff Bezos acquired <i>The Washington Post</i>. These traditional newspapers are repositories of knowledge and value” (Editor in chief, <i>National Gazette</i>). • “After almost 20 years of the digital revolution, we can say that the transition has been more successful for those [newspapers] employing their print journalists on the web. What attracts audiences are the video comments and tweets of reputable columnists with grey hairs” (CEO, <i>Local South</i>).
Complementary assets		
Print presses	destroyed	<ul style="list-style-type: none"> • “Printing and distributing newspapers require large physical investments and trained human capital with an industrial engineering background. Online you have to invest, but much less, and anyone can learn to use digital tools” (Director of plant technologies, <i>National Gazette</i>). • “Digital technologies have made the job of reporters frictionless compared to when they needed to go down to typography or wait to be sure that all articles were perfect before preparing the metal plates for the presses” (Vice managing editor, <i>Specialized Courier</i>).

Distribution and sales network	destroyed	<ul style="list-style-type: none"> • “Publishers had a very peculiar process of measurements and certification of their copies sold [distribution]. Each newspaper collected estimates of its daily copies sold with a statistical significance that moves from 12 to 50 percent on the following second and third day, and that reached 100% in one week. Then the data were made officially available to advertisers only after the certification of the Audit Bureau of Circulation [ADS in Italy]. The process of counterchecking took three months. Instead, websites measure their audiences in real-time and can be certified by simply asking Nielsen, Comscore, or Google to use their standard tools on their web pages” (Director of distribution, Media Co.). • “Through our websites and apps, we have extraordinary tools for informing millions of people and have a more direct conversation with them. Moreover, by controlling our digital channels we can instantaneously measure our results in terms of data traffic. Then we also need to be on all social networks because people stay there; through them, we spread our content” (Director of digital division, National Gazette Co.). • “Since <i>Twitter</i> is not owned by publishers, it is problematic for journalists to report their breaking news on a distribution platform where we have no control” (Managing editor, <i>Specialized Gazette</i>).
Ad selling (1 st component)	destroyed	<ul style="list-style-type: none"> • “The algorithms that some technology companies are developing permit advertisers to reduce the dispersions in ad investments typical of the first years of the web, when companies just spread their ad budget around. Now they can search and target their ideal customer” (Head of media market analysis, AGCOM). • “To respond to advertisers’ problem of targeting the right audience in a cost-effective way, we developed a technology that allows them to retarget each user as they move across websites” (Executive, Downstream Entrant2).
Ad relationship (2 nd component)	partially destroyed	<ul style="list-style-type: none"> • “Advertisers do not value our online ad spaces as much as they valued the printed product” (Vice managing editor, <i>Specialized Courier</i>). • “Today our ad sales house offers online video ads, metrics, and any digitally sponsored communication. Pure digital websites, instead, do not have dedicated structures like the one we have; they are forced to accept that Google sells their ad spaces for nothing. To sit at the table with big advertisers you need competences, brands, and historical contacts” (Director of digital division, Media Co.).

Table 2a: Description of Sample and Data (Incumbents)

Incumbent Newspapers	Type and Founding Year	First Online Newsroom^a	Number of Interviews with Internal Informants	Number of Interviews with External Informants	Archival Data and Events Attended
<i>National Gazette</i> (by National Gazette Co.)	National (Est. 1976)	1997	29 (president and owner; CEOs, directors and functional executives for multiple areas, including production plants, distribution, digital division, web and mobile division, marketing; website editor in chief; multiple journalists; trade union member)	3 (industry associations, technology partners, and incumbent competitors)	Company's annual reports, investment decks, press releases, extensive media coverage, books, public videos, conferences, and events
<i>National Courier</i> (by Media Co.)	National (Est. 1876)	2001	15 (president; CEOs; Media Co. directors of digital divisions, production and operations, circulation, diffusion, ad sales house, marketing; journalist and editorialist; and former managing editor)	4 (industry expert, technology partners, and incumbent competitors)	Company's annual reports, investment decks, press releases, extensive media coverage, books, online videos, and conferences
<i>Specialized Gazette</i> (by Media Co.)	Specialized (Est. 1896)	1997	8 (president; CEOs and directors at Media Co.; marketing director; senior controller; website editor in chief; journalist in the labour union)	3 (ex-employee, industry experts, and incumbent competitor)	Press releases, extensive media coverage, books, online videos, and conferences
<i>Specialized Courier</i> (by Specialized Courier Co.)	Specialized (Est. 1924)	2007	1 (vice managing editor). Media interviews of two managing editors and one head of UI/UX	3 (experts football fans and readers, incumbent competitor)	Media coverage and archival interviews, books, online videos
<i>Local North</i> (by Local North Co.)	Local (Est. 1892)	2007	5 (CEO; assistant editor in chief; media consultant)	1 (incumbent competitor)	Extensive media coverage, online videos, and company website
<i>Local South</i> (by Local South Co.)	Local (Est. 1995)	2007	5 (CEO; journalist)	3 (competitor, external journalist, and sales agent)	Extensive media coverage

Table 2b: Description of Sample and Data (Entrants)

Entrants	Type and First Launch	Number of Interviews (with Internal Informants)	Archival Data and Events Attended
Tech Partner1	Ad tech partner of Newspaper Consortia (2009)	2 (chairperson and CEO; chief revenue officer)	Company website, online videos, partner newspapers, and extensive media coverage
Downstream Entrant1	Search Engine, News Aggregator (2002), Ad Exchange (2007)	2 (partnership executive)	Company reports and white papers, regulatory reports, extensive media coverage, online videos, and conferences
Downstream Entrant2	Retargeting ad platform (2007)	1 (head of business development)	Extensive media coverage, online videos, and academic articles
Downstream Entrant3	News video aggregator (2012)	1 (CEO and founder)	Extensive media coverage, online videos, and events
Downstream Entrant4	Semantic ad technology (2010)	1 (CEO)	Extensive media coverage, company website, and online videos
Upstream Entrant1	International network of blogs (2010)	1 (president and co-founder)	Company website, extensive media coverage, online videos, and events
Upstream Entrant2	Digital-native media company (2008)	1 (president and co-founder)	Company website, extensive media coverage, and online videos
Upstream Entrant3	Citizen journalism platform (2008)	2 (co-founder and developer)	Extensive media coverage, and online videos

^a The year indicates when the newspaper created its first dedicated online newsroom (whereas the website to publish a PDF-replica was launched before 2000).

The number of interviews with each newspaper was proportional to its size (expressed by its circulation and revenues) and depended on when we reached theoretical saturation. Our extensive archival data collection further added to our interview findings.

Table 3: Excerpts of Resource-Level Adaptation

Mechanism		Outcome
Beliefs about the synergies between an incumbent’s core knowledge and the new complementary assets		Adoption of the new complementary assets
Definition	The beliefs that combining incumbent’s core knowledge with the new complementary assets will produce benefits.	Speed of adoption and use of new complementary assets.
<i>National Gazette</i>	+++ High perception of synergies since the beginning. <ul style="list-style-type: none"> • “Our news website has become the Italian leader because it is made of people coming from our traditional newsroom who have transferred their invaluable skills and expertise on the web” (Website managing editor, <i>National Gazette</i>). 	+++ Website in 1997 (early adoption). <ul style="list-style-type: none"> • Immediate allocation of journalists to the new website and investments in a technology company to support it.
<i>National Courier</i>	++ Initially, a belief of dyssynergies due to “cannibalization concerns” and demotivation to “work for two channels for the same salary.” <ul style="list-style-type: none"> • “<i>National Courier</i> has chosen more separation between the Internet and the printed edition than <i>National Gazette</i>, and it arrived later” (Union official, <i>National Gazette</i>). Higher sense of synergies later: “ <i>Twitter</i> and the other digital tools improve what we do as journalists (Editorialist, <i>National Courier</i>).	++ Website in 2001 (intermediate adoption). <ul style="list-style-type: none"> • Until 2001, a “pdf replica” and no allocated journalists. • After 2001, real-time online content production. • Only in 2004, a supporting “digital division.”
<i>Specialized Gazette</i>	+++ Strong belief that journalists, the website, and the readership were synergic: <ul style="list-style-type: none"> • “We immediately perceived that the website permitted the constant updates that supporters of a sports team want” (Managing editor, <i>Specialized Gazette</i>). • Printed newspaper used to publicize the website, which was in turn used to sell historical frontpages of the printed newspaper. 	+++ Website in 1997 (early adoption). <ul style="list-style-type: none"> • Online newsroom immediately located “near the printed newsroom,” sharing “same managing editor.”
<i>Specialized Courier</i>	+ Low perception of synergies for a long time. Until 2005, only the printed business was considered strategic: <ul style="list-style-type: none"> • “In 2005 we completed the process to become a full-color printed newspaper. That was extremely strategic, because it was requested by advertisers and because our first pages were used as posters by readers” (Vice managing editor, <i>Specialized Courier</i>). 	+ Website in 2007 (late adoption). <ul style="list-style-type: none"> • After 2007, a portal for updated sports news.

<i>Local North</i>	<p>+</p> <p>Low perception of synergies until about 2007 and a belief that “the website could favor competitor”; also offline local expansion was still prioritized:</p> <ul style="list-style-type: none"> • “Journalist working for print believed that giving their news online could favor their competitors, it’s a reasonable cultural inertia” (Vice managing editor, <i>Local North</i>). <p>Later beliefs about synergies: “The publishers believed that the same print newsroom should also work for the website, a peculiarity of our group” (Vice managing editor, <i>Local North</i>).</p>	<p>+</p> <p>Website in 2007 (late adoption).</p> <ul style="list-style-type: none"> • In 2001, a website provided a basic online presence with just a PDF copy of the day’s print newspaper posted at 9 pm every day. • In 2007, full adoption with a team of print journalists.
<i>Local South</i>	<p>+</p> <p>Frame of dyssynergies for long time:</p> <ul style="list-style-type: none"> • “The website cannibalizes the printed revenues; we seized the opportunity that the Internet was not diffused in our local area to postpone the launch” (CEO, Local South). <p>Later, synergies with print “quality and brand” transferred online.</p>	<p>+</p> <p>Website in 2007 (late adoption).</p>

To summarize our evidence about the degree reached by each newspaper in the adaptation mechanism and outcome, we assigned “+,” “++,” and “+++.” The same visual representation has been used in Tables 4 and 5 below.

Table 4: Excerpts of Demand-Level Adaptation

Mechanism		Outcome
Experimentation with customers		Update the beliefs about value creation
Definition	Experimentation on new solutions with customers to create value in the new technology.	Addition of new ideas regarding what creates value that do not necessarily eliminate the prior beliefs but rather constitute an enlargement of them.
<i>National Gazette</i>	<p>+++</p> <p>High experimentation with customers:</p> <ul style="list-style-type: none"> ● Users' blogs since 1998. ● Schools' community online newspapers since 1999. ● Virtual community of self-publishing authors since 2008. ● Experimentation on social media since 2008. ● Experimentation with citizens to crowdsource video journalism since 2011. ● Community engagement via physical festivals since 2012. 	<p>+++</p> <p>Several new beliefs, including “co-creation with users” and “acceptance to deliver to customers where they are.”</p> <ul style="list-style-type: none"> ● “The strength of a newspaper is... the community of readers it aggregates” (Managing editor, <i>National Gazette</i>, at the Turin 2017 Future of Newspapers event). ● “The cognitive mechanism applied by most was: there is print, radio, photography, TV, and now the Internet. It is a fallacy! Internet is not another medium, it is a disintermediated universe and those who propose a traditional mediation on it are in trouble” (Director of development and innovation, National Gazette Co.). ● “With the online social sharing, newspapers are realizing that their role of gatekeepers is gone” (Director of digital content and product development, <i>National Gazette</i>).
<i>National Courier</i>	<p>++</p> <p>Moderate experimentation with customers:</p> <ul style="list-style-type: none"> ● Since 2007, readers can comment on articles or send pictures. ● “User-generated content” only in 2014 through the acquisition of a suitable platform. 	<p>++</p> <p>Few new beliefs about “co-creation with users” and “acceptance to follow customers on platforms” but strong “focus on traditional quality and professionalism.”</p> <ul style="list-style-type: none"> ● “The acquired user-generated platform will allow us to engage readers in a new way and to expand our video offer” (General manager, media division, Media Co., in 2014 Press release). ● “I believe that inviting our readers to participate in our newspapers is more stimulating for them than writing for user-generated content websites would be” (Vice president of digital publishing, Media Co.). ● “Increasingly, readers associate our brand with what we put on platforms” (<i>National Courier</i> 2016 Internal Report on the payroll).
<i>Specialized Gazette</i>	<p>+++</p> <p>High experimentation with readers since the beginning:</p> <ul style="list-style-type: none"> ● Online communities and forums since 1997. ● User-based and news-based online gaming 	<p>+++</p> <p>Strong new beliefs about “co-creation with users” and “use of quality to create communities.”</p> <ul style="list-style-type: none"> ● “On the night of August 10, 1997, we posted 10 topics on our forums for readers to discuss, but in the morning we found that users had ignored our topics and proposed

	<ul style="list-style-type: none"> • Three interaction forms by 2001: forums by people, blogs by journalists, and “SayYourOpinion” for free comments on journalistic articles. • By 2012, 2,000 comments uploaded by users every day. 	<p>hundreds of new topics they wanted to discuss” (Website managing editor, <i>Specialized Gazette</i>).</p> <ul style="list-style-type: none"> • “The publisher already understood in 1997 that interactivity is the differential value of the web when people were adding their own topics on our forums” (Website managing editor, <i>Specialized Gazette</i>, at the Florence 2011 Ussi Ast Lsdi Event). • “It is the quality of our journalists that attracts readers, thus creating engaged communities” (Marketing director, <i>Specialized Gazette</i>).
<i>Specialized Courier</i>	<p>+ Limited experimentation with customers. By 2016, new products still developed mostly for print, “relying exclusively on professional journalism.”</p>	<p>+ Scarce evidence of new beliefs, mostly continued “focus on quality.”</p> <ul style="list-style-type: none"> • “Professional journalism has a social function: to inform about troublesome issues, even irritating ones. To narrate things that no one else can or wants to tell. This is the exact opposite of the ‘like’ logic [of social media]” (Vice managing editor, <i>Specialized Courier</i>, personal blog 2015). • “Sometimes I have the feeling that we make newspapers the most beautiful possible for ourselves and then we forget to interpret what readers really want” (Managing editor, <i>Specialized Courier</i>, at the 2017 Order of Journalists (ODG) Event).
<i>Local North</i>	<p>++ Initially moderate, then after 2010 significant experimentation with customers:</p> <ul style="list-style-type: none"> • Readers and social media (e.g., suggesting using the match analysis to create new editorial product). • Readers and small companies (e.g., invited to the newsroom to reinvent newspaper sections such as <i>CompassBiz</i>). 	<p>+++ New beliefs about “customer-centric approach,” “co-creation with users for new product development,” and “engagement of customers on platforms.”</p> <ul style="list-style-type: none"> • “The journalistic activity can be seen as a collective action and it is not clear where citizen and bloggers become input and output of our productive and distributive process of newsgathering” (Manager, Local North Co.). • “The publisher invited readers to the company for focus groups about what they wanted from the newspaper and what they were willing to pay for” (Media consultant & journalist, Local North Co.).
<i>Local South</i>	<p>+ No evidence of experimentation with customers. By 2019, new product development still only with professional journalists (e.g., new printed inserts as recently as 2019).</p>	<p>+ Maintained only the belief that “publishers alone produce content.”</p> <ul style="list-style-type: none"> • “On the external side, others can do citizen journalism because they are not institutional media, they do not have a brand! If I was asking for systematic citizen contribution, I should pay for it” (CEO, <i>Local South</i>).

Table 5: Excerpts of Ecosystem-Level Adaptation

Mechanism		Outcome
Experimentation with the ecosystem		Update the beliefs about value capture
Definition	Experimentation with competitors or third parties to capture value in the new technology.	Addition of new ideas regarding how to capture value that do not necessarily eliminate the prior beliefs but rather constitute an enlargement of them.
<i>National Gazette</i>	<p>+++ High experimentation with the ecosystem:</p> <ul style="list-style-type: none"> ● Meeting with existing and new competitors in multiple contexts to discuss “the state of the industry” and “develop new solutions to capture value” (joint platforms, paywalls). ● Started many ecosystem-level collaborations, e.g., <i>PPN</i>, Italian Newsstand, <i>Gold 5</i>, and a video-syndication platform. ● Collaborated with third parties to resolve tensions. 	<p>+++ New beliefs about “competition as an ecosystem against new entrants,” “new payment systems,” and “capturing value in new businesses using the existing core knowledge.”</p> <ul style="list-style-type: none"> ● “The Italian Newsstand is a systemic initiative incorporating 80% of newspapers and its president is the director of the newspaper industry federation, FIEG, to stress its systemic nature. Our readers don’t pay the single publisher but the consortium which then shares” (Director of development and innovation, National Gazette Co.). ● In 2012: “If you want to ask readers to pay for something, then all newspapers need to do it. If only <i>National Gazette</i> does it, <i>National Courier</i> would gain a huge advantage in audience” (Website managing editor, <i>National Gazette</i>). ● “At the beginning it was difficult to get people to read online, imagine if we had charged them! Now, instead, we are thinking of a paywall like that of <i>The New York Times</i>” (President, National Gazette Co.). ● “One idea is to charge people to attend the physical festivals our journalists hold; for the moment, revenues come from advertising sponsors” (President, National Gazette Co.).
<i>National Courier</i>	<p>+++ High experimentation with the ecosystem:</p> <ul style="list-style-type: none"> ● Experiments and ecosystem-level initiatives developed in conjunction with <i>National Gazette</i> (see corresponding cell above for details). ● Development of Media Co. Academy in collaboration with an employment agency and a university, with journalists as instructors. 	<p>+++ New beliefs about “competition as an ecosystem against new entrants,” “new payment systems,” and “capturing value in new businesses using the existing core knowledge.”</p> <ul style="list-style-type: none"> ● “I believe that the Italian publishers need to cooperate in making a joint strategic effort” (Vice president of digital publishing, Media Co.). ● “Initially, Google sold our online targeted ads but then we understood that we needed to regain control on prices and quantities, and then we formed a consortium to make the activity by ourselves” (Managing editor, <i>National Courier</i>). ● “We are ready to enter in the space of education and we believe we can exploit our great dynamism” (President, Media Co., in an interview by <i>DailyOnline.it</i> in 2019). ● “We have an enormous [editorial] value to help professional development. [Media Co. Academy] will generate continuous synergies among students, journalists, and academics” (General director of news, Italy, Media Co. In an interview by <i>Corriere della Sera</i> in 2019).

<i>Specialized Gazette</i>	<p>++ Medium experimentation: Later joined the development of some ecosystem-level digital platforms (e.g., <i>PPN</i> and Italian Newsstand).</p>	<p>++ Later developed new beliefs about “competition as an ecosystem” and “new value capture solutions.”</p> <ul style="list-style-type: none"> • “We had already thought of charging online readers in 2005 when we had the highlights of the Serie A football league. But it was too early and we interrupted the paywall” (Vice president of digital publishing, Media Co.).
<i>Specialized Courier</i>	<p>++ Medium-low experimentation: Did not join the development of common digital platforms. Very late to experiment with an ecosystem-level mechanism for the printed business.</p> <ul style="list-style-type: none"> • In 2017, syndicated other newspapers to sell their ads but without developing a platform. 	<p>+ Very late and no major changes of beliefs about value capture.</p>
<i>Local North</i>	<p>+ Low experimentation: Did not join the development of common digital platforms but much later joined some final platforms (e.g., <i>PPN</i> in 2018).</p>	<p>+ No major changes in beliefs about value capture.</p>
<i>Local South</i>	<p>+ Low experimentation: Did not join the development of common digital platforms. Implemented late an ecosystem-level mechanism in the traditional business.</p> <ul style="list-style-type: none"> • In 2014, merger with two newspapers to increase control. 	<p>+ No significant changes in the beliefs about how to capture value.</p>

Table 6: Framework to Adapt to Complementary-Asset Discontinuities and Final Outcome

	Resource-Level Adaptation	Demand-Level Adaptation	Ecosystem-Level Adaptation	Final Outcome: New Business Model
Mechanism (M)	Belief about the synergy between core knowledge and complementary assets	Experimentation with customers	Experimentation with competitors	-
Outcome (O)	Adoption of new complementary assets	Updated beliefs about value creation	Updated beliefs about value capture	Reconfiguration of resources, both existing and new, and strategies, for value creation and capture, to adapt to the market condition post-discontinuity. A new business model shows new additional features compared to an old model.
<i>National Gazette</i>	<ul style="list-style-type: none"> ● M: Strong belief about synergies ● O: Early adoption 	<ul style="list-style-type: none"> ● M: High experimentation with customers ● O: Updated beliefs about value creation 	<ul style="list-style-type: none"> ● M: High experimentation with the ecosystem ● O: Updated beliefs about value capture 	<p><i>High novelty</i></p> <p>Three new features: new businesses based on customer co-creation (e.g., self-publishing author platform), new revenues from physical events (advertising sponsors), and new ad sales mechanisms through proprietary joint platforms. Readaptation of existing features to the online market: revenues from advertising and a soft paywall to charge online readers.</p>
<i>National Courier</i>	<ul style="list-style-type: none"> ● M: Later developed beliefs about synergies ● O: Intermediate adoption 	<ul style="list-style-type: none"> ● M: Moderate experimentation with customers ● O: Almost the same beliefs about value creation 	<ul style="list-style-type: none"> ● M: High experimentation with the ecosystem ● O: Updated beliefs about value capture 	<p><i>High novelty</i></p> <p>Three new features: new business based on customer co-creation (video citizen journalism), new platform-based ad sales, and new revenues from education (creating a business school). Readaptation of existing features to the online market: revenues from advertising and a metered paywall (generating 35% of total digital revenues in December 2019).</p>
<i>Specialized Gazette</i>	<ul style="list-style-type: none"> ● M: Strong belief about synergies ● O: Early adoption 	<ul style="list-style-type: none"> ● M: High experimentation with customers ● O: Updated beliefs about value creation 	<ul style="list-style-type: none"> ● M: Later high experimentation with the ecosystem ● O: Some updated beliefs about value capture 	<p><i>Medium-high novelty</i></p> <p>Two new features: developed customer co-creation solutions, and ad sales through proprietary joint platforms. Readaptation of only some existing features to the online market: advertising only, without charging online readers.</p>
<i>Specialized Courier</i>	<ul style="list-style-type: none"> ● M: No belief about synergies until very late 	<ul style="list-style-type: none"> ● M: Limited experimentation with customers 	<ul style="list-style-type: none"> ● M: Very late and limited experimentation with the ecosystem 	<p><i>Low novelty</i></p> <p>Similar to the printed business model with the difference of not charging online readers. Only advertisers are charged.</p>

	<ul style="list-style-type: none"> ● O: Late adoption 	<ul style="list-style-type: none"> ● O: No update of beliefs about value creation 	<ul style="list-style-type: none"> ● O: No update of beliefs about value capture 	
<i>Local North</i>	<ul style="list-style-type: none"> ● M: No belief about synergies until very late ● O: Late adoption 	<ul style="list-style-type: none"> ● M: Late but then high experimentation with customers ● O: Updated beliefs about value creation 	<ul style="list-style-type: none"> ● M: Limited experimentation with the ecosystem ● O: No update of beliefs about value capture 	<p><i>Medium novelty</i></p> <p>A new feature: several new businesses developed via customer co-creation (e.g., <i>CompassBiz</i> and match analysis). Readaptation of existing features: advertisers continue to pay online, but online readers are not charged.</p>
<i>Local South</i>	<ul style="list-style-type: none"> ● M: No belief about synergies until very late ● O: Late adoption 	<ul style="list-style-type: none"> ● M: Limited experimentation with customers ● O: No update of beliefs about value creation 	<ul style="list-style-type: none"> ● Limited experimentation with the ecosystem ● O: No update of beliefs about value capture 	<p><i>Low novelty</i></p> <p>Only a translation of the existing business model to the online space, with the difference of not charging online readers.</p>