Kodak's Surprisingly Long Journey Towards Strategic Renewal: A Half Century of Exploring Digital Transformation in the Face of Uncertainty and Inertia

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Draft

January 11, 2022

Acknowledgments: We thank Jaeho Choi, Felipe Csaszar, Anne Marie Knott, Dan Levinthal, Jade Lo, Metin Sengul, Patricia Thornton and seminar participants at Drexel University, HEC Paris, 2022 Strategy Science Conference, and 2022 Strategic Management Society meetings for their helpful feedback. We are also grateful to Phebe Dickinson, Leah Glickman, Mia Wells and the Lippincott Library staff at the University of Pennsylvania, Andrea Reithmayer and staff at University of Rochester Library special collections, Todd Gustavson and Ken Fox at the George Eastman Museum, Melissa Murphy and staff at Harvard University's Baker Library special collections, as well as Scott Brownstein, Terry Faulkner, Brad Hunt, Tone Kelly, Glenn Kennel, Robert LaPerle, Ken Parulski, Brad Paxton, Jim Patton, and Steve Sasson for their help in locating the documents used in this project and Jax Kirtley for tirelessly connecting us with fellow MIT alumni. We thank Catherine Schrand and Brian Bushee for their help in interpreting Kodak's financial statements, Luis Rios for his help with patent data, and Dmitriy Vinokurov for his programming assistance.

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ABSTRACT

Kodak's failure to transition from film to digital technology has become a canonical example of a dominant incumbent failing in the face of an industry transition. In this paper, we undertake a systematic study of Kodak's decision-making from its earliest efforts in digital technology in the 1960s and 1970s through its bankruptcy in 2012. We draw on a comprehensive combination of primary and secondary sources that include the company's internal documents such as organizational charts, speeches by the company executives, employee newspaper, and technical reports on individual technologies as well as letters to the shareholders, annual reports, and SEC filings. Our analysis of Kodak's decision-making over the half-century leading up to its bankruptcy finds limited evidence of inertia and extensive evidence of strategic renewal efforts which included sustained and substantial R&D investment, commercialization of multiple digital products, as well as acquisitions of firms with promising imaging technologies. From 1980s onwards, Kodak dedicated standalone business units to developing and commercializing digital technology, incubated start-ups, and diversified by leveraging its competencies in adjacent fields. In understanding why these efforts fell short of staving off Kodak's demise, we consider how high aspirations and uncertainty with respect to emerging technology shaped Kodak's exploratory search. Our findings point to the need to account for incumbent aspirations and technology substitution dynamics in understanding incumbent performance in industry transitions.

Keywords: Technological change, Inertia, Adaptation, Decision-making, Eastman Kodak

Why do incumbents fail to navigate industry transitions stemming from new technologies and business models? In answering this question, scholars have focused on the role of inertia in incumbent failure, arguing that an incumbent's success can hinder its ability to adapt and transform itself. Specifically, scholars unpacking incumbent failure have documented economic, organizational, and cognitive antecedents of inertia. The economic antecedents include a disincentive to invest in a potentially cannibalizing new technology (e.g., Arrow, 1962; Henderson, 1993; Reinganum, 1983, 1989). The organizational antecedents include resource allocation processes, invention, and commercialization routines that favor prevailing technologies and business models (e.g., Ahuja, Lampel and Tandon, 2008; Gilbert, 2005; Tushman and Anderson, 1986). The cognitive antecedents include applying mental models rooted in the firm's competencies, identity, business model and complementary assets to the new technology (e.g., Henderson and Clark, 1990; Tripsas and Gavetti, 2000).

The Eastman Kodak Company's (Kodak) failure to transition from film to digital photographic technology has become a canonical example of a dominant incumbent failing in the face of an industry transition within both practitioner and academic accounts (e.g., Ansari and Krop, 2012; Benner, 2010; Binns et al., 2014; Josephy et al. 2017; Kaplan and Henderson, 2005). These accounts have tended to attribute Kodak's failure to inertia, portraying an incumbent that underestimated the likelihood of technological change, underinvested in the emerging digital technology, and failed to develop relevant new competencies. Despite the prevalence of this view, we lack an in-depth account of Kodak's experience with digital transformation that spanned over half a century, starting as early as the 1960s up to its eventual bankruptcy in 2012. Having such a detailed historical understanding is essential to not only validating existing explanations of Kodak's failure as it relates to incumbent inertia but also potentially highlighting

new explanations and mechanisms that might help develop a more holistic perspective of incumbency during periods of industry transitions. Such a perspective can help elucidate how incumbent failure might be more accurately explained by considering the broader strategic and organizational context around incumbent's decisions rather than by pointing to specific inertial processes ex post.

In this paper, we undertake a systematic study of Kodak's decision-making from its earliest efforts in digital technology in the 1960s and 1970s through its bankruptcy in 2012. We draw on a comprehensive combination of primary and secondary sources that include the company's internal documents such as organizational charts, speeches by the company executives, employee newspaper, and technical reports on individual technologies as well as letters to the shareholders, annual reports, and filings with the Securities and Exchange Commission (SEC). Our secondary sources include the coverage of Kodak in major newspapers, general interest business magazines, trade press, as well as financial analyst reports. We supplemented our analysis of these archival materials with semi-structured interviews with 27 key decision-makers involved in Kodak's digital transformation. Our interviewees included executives and technologists, representing different functional perspectives and different levels in the organizational hierarchy whose tenure with the company averaged 24 years. Our analysis of the archival sources and interviews allowed us to arrive at a rich nuanced contextual understanding of the contingencies that shaped the paths Kodak managers considered and pursued with respect to digital technology.

We find that instead of being blindsided by the impact of digital technology, Kodak began working with wireless transfer of photographic images in the 1950s and by 1970 committed to incorporating electronics in its cameras. As early as 1978, Kodak forecasts

anticipated the substitution of film photography by digital photography in the 2000s. Kodak leaders addressed the threat of such replacement with a combination of decisions aimed at participating in the digital future. These decisions made under different leadership regimes, included early significant investment in digital capabilities, a broad exploratory search of non-film technologies, as well as the development and commercialization of different types of digital products in existing and new organizational units.

For instance, the letters to the shareholders in Kodak's annual reports describe dozens of digital products commercialized in the 1980s, 1990s and 2000s. Top managers' discussion of these products in the letters to the shareholders attests to the products' prominence in managerial decision-making. Moreover, in addition to investing in the development of new products based on digital technologies, Kodak managers also attempted a range of corporate development initiatives, that included incubating start-ups, pursuing diversification (e.g., acquiring a pharmaceutical company), divestitures of non-imaging businesses (e.g., Eastman Chemical), strategic alliances and even actively soliciting acquisition bids for Kodak itself in the mid-1990s.

Our systematic study of Kodak's half a century of attempted transformation into a digital enterprise points to a theoretical puzzle. Over this extensive period, Kodak's managers engaged in purposeful transformation efforts that are generally consistent with the guidance in the extant literature on incumbent adaptation and strategic renewal. Scholars have argued that managing industry transitions requires incumbents to balance their efforts to exploit existing technologies with the need to explore emerging technological developments (e.g., Agarwal and Helfat, 2009; O'Reilly and Tushman, 2003; Taylor and Helfat, 2009). Such renewal efforts around an emerging technology can take the form of investing in R&D (e.g., Knott and Posen, 2009), regular introduction of new products (e.g., Dougherty, 1992b; Helfat and Winter, 2011; Turner,

Bettis and Mitchell, 2010), and innovation through acquisitions (e.g., Capron and Mitchell, 2009; Karim and Mitchell, 2000; Vermeulen and Barkema, 2003; Zhao, 2009). Over time, firms can develop dynamic capabilities with respect to strategic renewal (e.g., Helfat et al., 2007; Teece, 2019). Scholars have also argued that senior leadership changes can facilitate incumbent firm adaptation to industry transitions (e.g., Chen and Hambrick, 2012; Henderson, Miller, and Hambrick, 2006; Tushman and Rosenkopf, 1996). In the decades leading-up to the industry transition, Kodak invested heavily into R&D of digital technologies, commercialized numerous digital products, pursued multiple acquisitions to move the company away from its reliance on film and acquire new digital capabilities, and even hired two outsider CEOs with proven track records in digital technology-based businesses.

So why did these efforts fall short of staving off Kodak's demise? Despite recognizing the shift to digital technology decades before it took place, investing in developing the relevant capabilities over half a century, and commercializing numerous digital products, why did Kodak succumb to the "inevitable"? Kodak's strategic renewal efforts constituted an elaborate process that unfolded over decades, involved multiple leadership teams, and a broad array of strategic initiatives that explicitly recognized the limited shelf life of Kodak's core film photography business and embraced the opportunities presented by digital technologies.

Our in-depth analysis of this process reveals three contextual mechanisms that have not been considered in the extant literature on incumbents navigating industry transitions. First, we found clear evidence of Kodak's aspirations of matching the profitability of its existent film franchise playing a role in its leadership's assessment of their digital initiatives through the late 1990s. Second, there was uncertainty around how the digital technology would evolve, when and how customers would adopt digital photography, and what business models would be

economically viable (e.g., Anderson and Tushman, 1990; Eggers, 2012; Rotolo et al., 2015). The combination of the high levels of uncertainty and aspirations meant that none of the digital initiatives were yielding expected business outcomes, and there was no consensus in terms of which products or markets could help Kodak become a leader in the digital imaging landscape.

Third, the transition from film to digital imaging represented a technology substitution regime that could be characterized as illusion of resilience (Adner and Kapoor, 2016). Such a regime entails a protracted and vibrant trajectory of old technology in the face of the threat from the new technology, the growth of which has been delayed. While the commercialization of early versions of digital cameras took place during the mid-1980s, the consumer market for digital cameras did not take off until the late 1990s. This period coincided with Kodak's aggressive push towards digital imaging, but without any significant favorable economic outcomes. At the same time, the film business continued to grow and stay highly profitable during this period.

Together, the high levels of aspirations and uncertainty around digital imaging, and the illusion of resilience associated with the film to digital technology substitution regime made it extremely difficult for Kodak to persevere with the digital transformation efforts that were not yielding the desired outcomes compared to a thriving film business. These difficulties brought about frequent changes in CEOs, as well as exploration of disparate strategies, capability bundles, and markets that could help Kodak sustain itself as an industry leader in a changing landscape. However, such explorations were not only costly in terms of financial outlays but they also created a context in which employees lacked clarity and conviction around Kodak's strategic direction.

By offering a novel account of Kodak's half a century of attempted transformation around the emerging digital technology, we show that characterizing Kodak's failure as

stemming from inertia would be an incomplete (and inaccurate) explanation. Rather, by highlighting the explicit interaction between the process of technological change and the efficacy of organizational transformation efforts, we suggest that incumbent failure might be more accurately explained by considering the broader strategic and organizational context around incumbent's decisions rather than by pointing to specific inertial processes ex post.

THE CHALLENGES OF INCUMBENCY

Incumbent failure in the face of technological change is a phenomenon of long-standing interest to organizational scholars (e.g., Eggers and Park, 2018). In exploring this phenomenon, scholars have shed light on several explanations regarding why incumbents struggle to adapt to technological change. Economists have considered the role played by incentives in inhibiting incumbents' response to emerging technological threats (e.g., Kaplan and Henderson, 2005). This perspective explores the conditions under which incumbent firms reaping monopoly profits from products based on an existing technology might lack the incentives to invest in a new technology (e.g., Arrow, 1962). These conditions include the extent to which the new technology poses a threat of cannibalizing the incumbent's existing business as well as the likelihood of incumbents' investment enabling the replacement of the existing technology by the new technology and hastening such replacement. Theoretical work in this perspective has considered the possibility that uncertainty with respect to the likelihood of new technology adoption may attenuate the incumbents' disincentive to invest in the new technology (e.g., Reinganum, 1983, 1989).

In addition to incumbents' incentives, scholars have also sought to understand the role organizational routines play in hindering large firms' ability to deal with external changes (e.g., Gilbert, 2005; Hannan and Freeman, 1984). Specifically, organizational scholars taking this

perspective have argued that the survival of large organizations is predicated on their ability to deliver consistent results to their stakeholders. This ability is grounded in developing replicable processes and routines which both help the organization meet the needs of the existent customers and make it difficult for the organization to adapt to environmental changes by slowing down organizational adaptation.

Such inertial forces are particularly pronounced in dramatic industry transitions: "individual organizations are subject to strong inertial forces, that is, that they seldom succeeded in making radical changes in strategy and structure in the face of environmental threats" (Hannan and Freeman, 1984, p. 149). Some organizational scholars have argued that organizational success and inertia are two sides of the same coin: "In stable worlds, we tend to view the codification of past experiences as wisdom. In changing environments, we tend to view this same phenomenon less favorably and term it inertia" (Levinthal, 1997, p. 168).

In examining the inertial forces, scholars have considered how incumbents' strengths and superior performance in their existing markets can hinder their adaptation to the new technology. A firm's core competencies that enable its success in existing technologies can become core rigidities preventing the firm from developing capabilities in new technologies (e.g., Ahuja and Lampert, 2001; Danneels, 2010; Dougherty, 1992a; Leonard-Barton, 1992; Teece, Pisano, and Shuen, 1997). Evaluating the new technology using existing financial metrics can lead to an underappreciation of the technology's potential (e.g., Baldwin and Clark, 1994; Christensen, Kaufman and Shih, 2008) with the firm's established resource allocation routines limiting investment in new technologies (e.g., Gilbert, 2005). This underinvestment can be further exacerbated by financial analysts penalizing a firm's efforts to experiment with new technologies (e.g., Benner, 2007, 2010, Noda and Bower, 1996). Finally, even if the new technologies are

developed, the focus on the needs of existing customers (e.g., Christensen, 1993; Christensen and Bower, 1996; Rosenbloom, 2000) and lack of access to complementary assets relevant to the new technology (e.g., Teece, 1986; Tripsas, 1997) can hinder incumbent commercialization of new technologies.

Scholars have also unpacked the cognitive antecedents of organizational inertia, suggesting that managers' mental models rooted in existing technology may hinder their ability to anticipate the impact of the new technology on the firm's existing business (e.g., Henderson and Clark, 1990). Scholars have also argued that fixed ideas about the firm's identity (e.g., Tripsas and Gavetti, 2000), managerial commitment to the existing business model (e.g., Chesbrough, 2002; Gilbert, 2006; Kapoor and Klueter, 2015) and access to complementary assets compatible with the existing technology (e.g., Wu, Wan, Levinthal, 2014) can translate into challenges in commercializing innovations based on the new technology.

In parallel with the studies of the challenges faced by incumbents in technological transitions, the research on exploration and strategic renewal points to investments in incremental renewal efforts as helping companies survive and thrive through large discontinuous changes (e.g., Agarwal and Helfat, 2009). Such investments can take the form of R&D activities (e.g., Cohen and Tripsas, 2018; Leiblein and Madsen, 2009), regular introduction of new product generations (e.g., Dougherty, 1992b; Helfat and Winter, 2011; Turner, Bettis and Mitchell, 2010), and innovation through acquisitions (e.g., Karim and Mitchell, 2000; Vermeulen and Barkema, 2003; Zhao, 2009). To protect the emergent technology development from competition for resources within large firms, scholars have advocated for the establishment of separate organizational units dedicated to the experimentation with new technology (e.g., Andriopolous and Lewis, 2009; Danneels, Verona, and Provera, 2018; Westerman, McFarlan, and Iansiti,

2006). Leadership changes and, in particular, the recruitment of external CEOs and senior managers from outside the firm can help a firm keep up with environmental changes (e.g., Chen and Hambrick, 2012; Henderson, Miller, and Hambrick, 2006; Tushman and Rosenkopf, 1996).

These efforts can help evolve, substitute, and transform a firm's existing capabilities (e.g., Lavie, 2006) and reconfigure a firm's resource base (e.g., Helfat et al., 2007). Over time, firms can develop dynamic capabilities with respect to strategic renewal (e.g., Teece, 2019). Taken together, the studies of organizations that successfully navigated industry transitions by pursuing strategic renewal point to the importance of combining the management of a firm's existing business (i.e., exploitation activities) with purposive continued investment in new technologies (i.e., exploration activities).

In understanding the contribution of inertia to incumbent failure, the Kodak case presents an important opportunity. Kodak was one of the largest companies to have failed in navigating digital transformation in a knowledge intensive industry. Its efforts at navigating the digital transformation took place over decades and were documented in a range of primary and secondary archival sources. And yet, despite its size and well-known struggles with navigating the digital transformation, we lack an in-depth account of Kodak's experience with digital transformation over the half century leading up to its 2012 bankruptcy and the role played by inertia in Kodak's failure.

The few scholarly accounts that have considered Kodak's digital transformation have done so by focusing on a specific mechanism such as the role of securities analysts (Benner, 2010) or viewing the transformation from a perspective of a single theoretical lens such as institutional theory (Munir, 2005). These accounts while informative, have offered a somewhat limited depiction of the rich context around decision-making by Kodak's managers in the face of

significant uncertainty. The limited scope of existing scholarship on Kodak is puzzling given that in the 1980s, the company accounted for 2% of all industrial R&D performed in the United States, employed more than 145,000 people, and even in decline, led the U.S. in the number of patents generated and held top market share in digital cameras in the mid-2000s.

Moreover, as compared to other organizations of similar size facing industry transitions, Kodak's efforts to navigate the digital transformation received surprisingly limited scholarly attention.[2] For instance, the difficulties Nokia faced in its transition from feature phones to smartphones have been covered in more than 80 articles and books including articles in top management and business history journals as well as peer-reviewed books (e.g., Aspara et al., 2013; Doz and Wilson, 2017; Laamanen et al., 2016; Lamberg et al., 2021; Van Rooij, 2015; Vuori and Huy, 2016, 2022). By contrast, management and business history scholars have provided only a somewhat cursory view of Kodak grappling with the industry transition.

SOURCES, METHODS, AND CONTEXT

In seeking to understand Kodak's experience with digital transformation we employ historical analysis. Historical analysis is a method well-suited for documenting the nuanced patterns of causality in firms' innovation processes and managerial decision-making (e.g., Cattani, Dunbar, and Shapira, 2017; Graham and Shuldiner, 2001). We began our research by interviewing key decision-makers at Kodak involved in Kodak's digital transformation efforts. Our interviewees included R&D scientists who developed digital technology, middle managers who championed the commercialization of the resultant innovations, and senior managers who sought to balance the stewardship of the existent film franchise and the need to invest in the future. We used

[2] Peak employment at Smith Corona was 5,300 people; Polaroid—21,000 people, Fujifilm—81,000 people; and Nokia—132,000 people.

theoretical sampling to ensure that our interviews represented a variety of functional backgrounds, e.g., R&D, demand forecasting, finance, and legal as well as levels in organizational hierarchy that ranged from project manager to President and CEO.

As we were interested in covering managerial decision-making over a multidecade period, we sought to interview decision-makers whose tenure at Kodak spanned overlapping but different time periods. Figure 1 displays the interviewees' collective experience with Kodak.

[Insert Figure 1 about here]

In our interviews, we followed a semi-structured interview protocol. The interviews took place on Zoom or via phone. We recorded and transcribed the interviews and shared our transcripts with the interviewees to resolve any ambiguities. Altogether, we interviewed 27 key decision-makers whose tenure at Kodak averaged 24 years, exchanged emails with several others and met in person with Brad Paxton who led Kodak's Electronic Photography Division in the 1980s, Steve Sasson—the inventor of the first portable digital camera, and Robert Shanebrook—an expert on Kodak's film technology. Table 1 displays the interviewees' names and last three positions they held at Kodak.

[Insert Table 1 about here]

The interviews offer a glimpse of the world-class talent Kodak employed. For instance, the R&D scientists we interviewed included a number of digital technology pioneers: in addition to Steve Sasson, we spoke with Ken Parulski—architect of Kodak's first and second generation consumer digital still cameras: Apple QuickTake 100, Apple QuickTake 150, and the Kodak Digital Science DC40 camera; Majid Rabbani—developer of digital image compression algorithms and one of the founders of the Joint Photographic Experts' Group (JPEG) standard for digital images, Edward Giorgianni—expert in digital image color management; and Scott

Brownstein—the inventor of the Photo CD and photo kiosk technology. Our interviewees shared details of decisions and meetings that related to Kodak's approach to digital transformation.

To address the possibility of retrospective bias or omissions in the interviewees' recollections, we complemented the interviews with extensive archival research. We began the archival work by collecting Kodak's annual reports for 1958-2006. We selected this period because Kodak did not publicly discuss its work on electronics until the 1960s and 2006 was the last year for which the company produced an annual report featuring a letter to the shareholders. We also analyzed the annual 10K filings Kodak submitted to the Securities and Exchange Commission for 1968-2012, from the earliest reports we could locate to the year of Kodak's bankruptcy. Annual reports and letters to the shareholders have long been used in the management scholarship to understand top managers' beliefs, priorities, and interpretations of current events (e.g., Bowman, 1984; Eggers and Kaplan, 2009; Fiol, 1995; Kiss and Barr, 2015).

We also accessed collections of executives' speeches, organizational charts, and the employee newspaper from the Kodak archives in the special collections at the University of Rochester Library and consulted trade publications in the library of the George Eastman Museum in Rochester, NY. We supplemented our collection of primary sources by asking each of the interviewees to share with us any reports or documents from their time at Kodak relevant to our research project. The materials they shared included technical and marketing reports on specific technologies, the interviewees' contemporaneous and ex-post notes on their work at Kodak, including forecasting models of digital technology adoption, as well as the interviewees' and their colleagues' reflections on Kodak's experience with digital transformation.

Our analysis of secondary sources included financial analyst reports obtained from Thomson Reuters, articles in major newspapers, (e.g., *Wall Street Journal*, *New York Times*);

business magazines (e.g., *Business Week*, the *Economist*, *Forbes*, *Fortune*), trade press (e.g., *Modern Photography*, *Popular Photography*), and articles in academic journals. We supplemented these sources with books about the history of Kodak (e.g., Ackerman, 1930; Brayer, 1996; Collins, 1990; Swasy, 1997; West, 2000) as well as more recent self-published accounts of Kodak watchers and employees (e.g., Larish, 2012; Paxton, 2020; Snyder, 2013). To compare Kodak's experience with that of its competitors, we also analyzed annual reports, trade press articles, and books on the history of Fujifilm, Polaroid, and Xerox (e.g., Fierstein, 2015; Kearns and Nadler, 1992; Komori, 2015). We supplemented the archival work by examining the artifacts in the comprehensive photographic technology collection of the George Eastman Museum which spans medieval precursors to photography (e.g., camera obscura) to modern smartphones and verified our understanding of the role the different innovations played in shaping the photographic technology trajectory with Todd Gustavson, the collection's curator.

Our analysis of these sources reflects three key aspects of an historical approach: source criticism, triangulation, and hermeneutics (Kipping, Wadhwani, and Bucheli, 2014). Source criticism entails the need to establish both the authenticity (time and source of production) and validity (the reliability of the informants producing the documents) of the sources. Triangulation requires drawing on multiple sources to establish a more accurate understanding of the relevant context, overcoming the biases in the individual sources. Finally, hermeneutics necessitates interpreting the sources with an understanding of how the production of the source material fit into the historical context.

Following these guidelines, we started by carefully establishing the provenance of each document and contacting the documents' authors to resolve any ambiguities, such as acronyms, we encountered in the archival documents. We triangulated the reports about the focal events of

interest across multiple sources. We then read the available materials about Kodak's history before the digital transformation and contemporary business press to understand the broader context for Kodak's managerial decision-making processes. Finally, in developing the historical case study, we iterated between the narrative emerging from the case and the source materials to inductively derive the main factors that shaped managerial decision-making with respect to industry transition.

In developing the case study, we first mapped Kodak's evolution in terms of the company's market capitalization, its patenting in digital technology, and its R&D intensity. Figures 2a and 2b map Kodak's market capitalization and patenting in digital technology against the worldwide sales of digital cameras. Figure 2c compares Kodak's R&D expenditures as percentage of sales to those of Fujifilm—a competitor that challenged Kodak's dominance in photographic film and survived the digital transformation.

[Figure 2 about here]

Figure 2a shows the decline in Kodak's market capitalization that coincides with the increase in the sales of digital cameras. Figure 2b shows Kodak's intensive patenting in digital technology in the lead up to the digital camera sales take-off. Figure 2c shows that Kodak allocated a similar percentage of its sales to R&D to Fujifilm. Together the three charts in Figure 2 offer a view of the puzzle that motivated our research. If Kodak invested early and extensively in developing digital capabilities over half a century, what factors could account for the company's demise?

In analyzing the source materials to answer this question, we followed the methods of historical analysis seeking to develop a narrative that most closely fit the facts. In this process, we started by developing a timeline of the key decisions in Kodak's recent history. Altogether

we identified 24 decisions between 1972 and 2007 that included leadership changes (5), key product introductions (10), and corporate development initiatives (9). Figure 3 contains a timeline of the decisions.

[Figure 3 about here]

In developing this timeline, we drew on the letters to the shareholders between 1958 and 2006 as an important source of information about the senior managers' priorities by selecting decisions that were highlighted in the letters. We identified a leadership change decision if the event was unexpected or if multiple contenders for the CEO or President position were identifiable from the annual reports. For instance, we classified the promotion of Walter Fallon to CEO in 1972 as a decision because it broke with Kodak's tradition of promoting the person in the President position (at the time it was Gerald Zornow) to CEO. We did not classify the promotion of Colby Chandler to CEO in 1983 as a leadership change decision because Chandler had been the heir apparent to Fallon since 1976 when he was appointed Kodak's President with no other obvious contenders in the running. For leadership change decisions, we supplemented our reading of the letters to the shareholders with contemporaneous business press to get a richer description of the decision-making process within Kodak than what the annual reports offered.

For key product introductions, we looked for products that were featured first in the management's discussion of new product development in the letters to the shareholders and were described as innovative, leading, or revolutionary, e.g., "In February 1982, we announced a new era in amateur photography: the coming of the Kodak disc camera and Kodacolor HR disc film" (Eastman Kodak Company, 1982, p. 1). Our goal was to identify products that were not just innovative from a technological perspective but were highlighted by the managers as important

signifiers of Kodak's overall direction. We did not include product introductions based on existing technology, such as Kodak's introduction of disposable cameras in 1987.

For corporate development decisions, we included major acquisitions and divestitures as well as organizational restructurings discussed in the letters to the shareholders.

We used the interviews to help us make sense of sequences of decisions in the timeline and to supplement the decisions we identified from the letters to the shareholders by asking each interviewee to identify the managerial decisions that were critical to Kodak's engagement with digital technology. These questions helped us identify a managerial search process not covered in the annual reports—namely the CEO's and CFO's efforts to identify a strategic buyer for Kodak and soliciting acquisition bids—that took place in the mid-1990s. The interviewees involved with the process shared with us the names of the potential buyers, the terms discussed, as well as their contemporaneous notes from the search process. Since the search process did not ultimately lead to an acquisition, we describe it separately from our decision timeline.

After developing the timeline, we investigated how Kodak's identity claims evolved during this period. Managerial commitments to the organization's identity are an important explanation for incumbents' failure in the face of industry transitions (e.g., Tripsas and Gavetti, 2000). From 1971 onwards, the SEC required all public companies to provide "a brief description of the business done or intended to be done by the registrant and its subsidiaries" (Securities and Exchange Commission, 1969, p. 23) with any misstatements potentially triggering financial and legal penalties. We analyzed the evolution of Kodak's business descriptions in the SEC 10K filings between 1971 through 2012, with the changes in the business descriptions reflecting Kodak senior managers' search for a new identity.

[Insert Figure 4 about here]

Figure 4 charts the word count of the business description section of the company's 10K reports submitted to the SEC for 1971-2012.[3]

While the description remained virtually unchanged between 1971 and 1993, the numerous changes in the company's business descriptions from 1994 onwards, coincided with the tenures of the last three CEOs—two of whom were external hires. A 1994 jump in the business description wordcount reflected the spin-off of Sterling Drug and other non-imaging businesses under the leadership of George Fisher who became the CEO in late 1993. After a period of relative stability in the late 1990s, business descriptions changed again in 2000s to reflect the new CEO Dan Carp's definition of Kodak's industry as infoimaging. After Antonio Perez became CEO in 2005, the descriptions highlighted the role of "graphic communications" in Kodak's business description—a change that reflected Kodak's pivot to inkjet printing. Finally, in 2012, the company's bankruptcy year, the business description documented the company's exit from the consumer business. The evolution of the business descriptions in Kodak's financial reports reflects an ongoing search for a new identity in Kodak's approach to the digital transformation. If Kodak neither delayed investment in digital technology nor was bound to a fixed identity, what accounts for the company's failure?

In presenting our findings, we start with a historical background on the origins of the Eastman Kodak Company. We then describe the company's efforts at developing digital products, the alternative pathways Kodak managers explored in addressing the digital transformation, and, finally, how Kodak's identity evolved in addressing the digital technology.

FINDINGS

Historical Background

[3] For text of the business descriptions see Appendix B.

The Eastman Kodak Company was founded by George Eastman in 1879 and played a prominent role in the development and popularization of amateur photography, most importantly by marketing easy-to-use photographic film cameras. Table 2 offers a timeline of the company's historical milestones.

[Table 2 about Here]

In addition to his technological innovations in photography, Eastman also developed a novel business model—one in which the sales of a low-margin hardware product (i.e., cameras) built a customer base and drove the sales of a compatible high-margin consumable (i.e., film). This camera-film business model became more popularly known as razor-blade following the introduction of Gillette razors at the beginning of the 20th century.

Rather than using its scale to raise prices, Kodak focused on offering low-cost easy-to-use cameras which expanded demand for the company's photographic film and paper products that included film-processing equipment. Kodak distributed its cameras through drugstores and other mass-market outlets, making its products easily accessible. From the 1890s onwards, Kodak invested in international distribution of its products, forming subsidiaries in the U.K., Germany, France, and Australia.

From the company's early days, George Eastman emphasized investment in innovation as critical to the company's success. Eastman hired the first research chemist in 1896 and in 1912 founded Kodak Research Laboratories, funding the work of 20 people with an annual budget of $53,797 (about $1.25 million in 2012 dollars)— (Eastman Kodak Company, 1977, p. 18). Over the decades that followed, the company invested heavily in R&D, regularly introducing new products for amateur and professional photography. In the early 1930s, Kodak Research Laboratories developed Kodachrome—one of the first successful color films which remained in

production until 2009. The investment in product and manufacturing R&D meant that no competitor could match the quality of Kodak film until the 1980s.

Beyond products targeted at amateur and professional photographers, from WWII onwards Kodak also worked on federal government projects which involved supplying the photographic equipment to surveillance satellites and space missions. Kodak's work with surveillance satellites in the 1950s introduced the possibility of filmless transfer of images. Rather than sending film to earth to be processed, the E-1 Camera system, invented for the SAMOS satellite program in 1956, developed the film in space and scanned in the images in analog form for subsequent transmission to Earth using radio signal.

The work with the space programs offered Kodak early exposure to the evolving field of electronics including the "manufacture of miniaturized electronic circuits that can withstand shock 20,000 times the force of gravity" and "the design of systems that combine the capabilities of photography, optics, mechanics, and electronics" (Eastman Kodak Company, 1967, p. 14). Kodak also gained experience with the manufacture of integrated circuits which would be incorporated in a range of Kodak's products ranging from cameras to photocopiers.

1972–1983—The Fallon Era: Exploration and Inertia

In anticipation of new technologies emerging to compete with film photography and cinematography, in 1972 Kodak founded Eastman Technologies—a division responsible for acquiring companies developing promising new technologies with imaging applications. In the same year, Kodak acquired Spin Physics, a manufacturer of heads for magnetic video recording equipment. The acquisition was motivated by the TV studios' emergent use of magnetic video recording for shooting news and entertainment shows. The use of magnetic video recording threatened to undermine Kodak's motion picture film business by changing the industry-

dominant information storage medium from Kodak's high-margin proprietary film to magnetic tape, the manufacturing of which was commoditized. Acquiring Spin Physics, which also offered refurbishment services for the industrial video tape recorders, gave Kodak a window into the evolution of magnetic recorder technology.

In 1975, Steve Sasson, an electrical engineer in Kodak Apparatus Division (the division responsible for photographic equipment manufacturing) research laboratory completed the prototype of the first portable digital camera that was based on the charge-coupled device (CCD) technology developed by Bell Labs. After multiple presentations to senior management, Sasson and his manager Gareth Lloyd filed for a patent which was granted, but Kodak did not commercialize the technology due to concerns about lack of customer interest in seeing the photos on a TV screen, the relatively low resolution, and the high cost of the cameras.

The development of electronic technology at Kodak proceeded despite senior management concerns about potential cannibalization of film-based photography. The concern that the technology developed in Kodak's labs would facilitate the cannibalization of film photography by other technologies predated Kodak's investment in digital. In commenting on Kodak's research on photocopiers in the 1950s, C.E.K. Mees, the founding director of Kodak's research laboratories, commented: "While I find the work interesting, I hate to see you doing it, since it will only help make it easier for others eventually to displace silver-halide [film] photography" (Collins, 1990, pp. 342–343). Thus, Kodak managers encouraged the research into digital technology while expressing misgivings about the implications of such technology's success for the company's existing product lines.

The first product based on digital technology that Kodak commercialized was Kodak's 1976 Ektaprint copier—the first plain paper copier that used a microprocessor. David Kearns

who subsequently became Xerox's CEO described the superior quality of the Kodak copier as an atomic bomb being dropped at Xerox (Kearns and Nadler, 1992, p. 82). However, Kodak's successes in research and development were not matched by managerial commitment to the products' commercialization. While Kodak invested some resources in making its copier business a success, the company's management did not invest in building a national sales and service organization to challenge Xerox on its home turf. Part of Kodak's hesitancy with respect to investing into the copier business had to do with a mismatch between its business model in photography of selling its products to dealers and the prevalent business models in copiers of renting expensive equipment directly to customers and charging by the copy. Indecision characterized Kodak's approach to managing its copier business. In 1989, it acquired IBM's copier business, but in 1997, Kodak sold off its copier business to a copier servicing firm.

As this account suggests, during the 1970s, Kodak developed state of the art electronic design and manufacturing capabilities, created a business unit focused on understanding and investing in emerging technologies, pioneered digital technology for photography, and commercialized the first copier that used digital technology. These efforts monitored the emergence of video technologies with potential to substitute for film and put Kodak at the forefront of inventing (and patenting) the first portable digital camera.

However, Kodak's technological success with copier development met with managerial misgivings about aggressive investment into a business that required a different business model. Kodak managers' concerns about the lack of fit between Kodak's traditional business model and the business model prevalent in copiers are consistent with accounts of cognitive inertia in which senior managers' commitment to the existing business model hinders investment in developing

new complementary assets and capabilities (e.g., Tripsas and Gavetti, 2000; Wu, Wan, and Levinthal, 2014), i.e., a national sales organization as well as lease-accounting competencies.

Kodak's pioneering efforts in digital photography also met with significant resistance and skepticism internally because of management concerns around cannibalizing a highly profitable film franchise, and doubts about the viability of the digital technology for its core consumer market, due to its low resolution and likely high price. While the managerial concerns about cannibalization underlying Kodak's decision not to pursue the commercialization of its digital camera resonate with economic accounts of inertia (e.g., Arrow, 1962; Kaplan and Henderson, 2005), despite these concerns Kodak continued to invest in developing its digital capabilities.

[Figure 5 about here]

As Figure 5 indicates, Kodak was successful in pioneering many digital technologies and developing dozens of products using electronic technology many of which it commercialized before the demand for digital cameras materialized.

Thus, Kodak's early digital transformation efforts only partially fit with the existing inertia accounts. Next, we discuss the subsequent phase of Kodak's efforts at digital transformation during 1980s-2000s that go beyond inertia-based explanations of Kodak's failure.

1984–1993—Chandler/Whitmore Era: Broad exploratory search

On August 24, 1981, in Tokyo, Sony became the first company to publicly demonstrate prototype of an electronic still camera. Industry observers saw the demonstration as heralding the arrival of digital age in amateur photography. This foray by a diversifying entrant forced Kodak senior managers to seriously reckon with the prospect of a digital future. At 279,300 pixels, Sony's MAVICA (Magnetic Video Camera) prototype's resolution was slightly better than that of a conventional television set (but orders of magnitude lower than the resolution of

conventional film which was comparable to 18-20 million pixels for a frame of 35mm film). The camera stored images on a 2-inch floppy disk, capable of recording 50 images. Viewing the images required a viewer device that displayed the images on a TV set or a monitor. Sony was also in the process of developing a printer for the electronic images (Popham, 1981). While Sony first estimated the price of the camera to be about $660, the viewer—$220, and each disk—$2.60 (Drukker, 1981), at the time of its U.S. launch in 1987, the Mavica camera cost $4,000.

Sony's delay in commercializing Mavica gave Canon a chance to market the first electronic still video camera in July of 1986. The RC701 was priced of $2,595 and offered a resolution of 380,000 pixels. Along with the camera, Canon also introduced devices for working with the electronic images—a viewer for displaying the images on a monitor or TV ($2,695), a color printer ($6,500), and a transceiver for transmitting the images via phone lines ($19,900) (Durniak, 1986). *Popular Photography* described the quality of prints from Canon's printer as: "roughly equivalent to photographs reproduced on low-quality newsprint—one of the media for which this system is intended" (Callahan and Goldberg, 1986, p. 63).

Matching competitors' efforts in low-resolution digital photography. Kodak pursued research and development of digital products in multiple business units. Its immediate response to the demonstration of the Mavica was localized in the Kodak Research Laboratories (Kodak's centralized research organization) and advanced product development in Kodak Apparatus Division (the division responsible for photographic equipment manufacturing). In 1984, Kodak's Eastman Technologies Division began a start-up incubation program offering $25,000 in seed money to employee start-ups with promising ideas. More than half of the start-ups in the program, including Videk, Edicon and Sayett, focused on digital technology. Also in 1984, Kodak created a Consumer Electronics business unit. In 1986, Kodak renamed the unit

Electronic Photography to reflect the shift in focus on marketing the still video (as electronic photography products were called) from consumer to commercial applications. At the same time, the government systems division pursued the development of professional digital cameras while the motion picture division conducted work on developing products for the cinematographers.

In 1987, Kodak's Electronic Photography business unit introduced a still video system—a set of devices for working with images generated by electronic cameras to compete with Canon and Sony. The broadest line of still video components by any manufacturer at the time, the system included electronic image player/recorders; a TV-video transfer stand that converted prints and slides to the electronic format, and a transceiver that transmitted electronic images over phone lines (Atkinson, 1987). As Table 2 shows, Kodak's pricing was competitive with that of the other manufacturers

[Table 2 here]

Kodak's transceiver deployed a sophisticated image compression algorithm that would be later simplified for the JPEG standard. In 1989, the transceiver enabled the transmission of images from Tiananmen Square to CBS News in New York, thus, bypassing a video satellite blockade imposed by the Chinese government. In recognition of this technological achievement, in 1989 Sony and Kodak shared the Emmy award for "Still Picture Transmission Technology for News."

Leading the development and commercialization of high-resolution digital cameras. In addition to commercializing industrial and commercial products to match the competitors' offerings in low-resolution digital photography, in 1986, Kodak built the first megapixel CCD (charge-coupled device) imager the resolution of which exceeded 1.3 million pixels. Within a year, the device was incorporated into a stationary megapixel camera for scientific and industrial applications and the world's first portable megapixel digital camera. The stationary camera was

produced by Kodak's Videk subsidiary, incubated as a start-up in the Eastman Technologies Division. The camera featured a 15-pound power supply and was priced between $11,500 and $18,000. The 1.3 megapixel black and white camera became one of the first cameras to yield 5"x7" prints comparable in resolution to film.

Starting with the portable camera developed by Kodak's Government Systems business unit for the military, over the next 15 years Kodak developed and brought to market dozens of digital cameras for professional photographers (McGarvey, 2004). In 1991, Kodak introduced DCS—the first commercially-available, single-lens reflex (SLR) digital camera. The six models of DCS ranged in price from $20,000 to $25,000 with 974 units sold between 1991 and 1994. The cameras paired Nikon F3 film camera bodies with Kodak's electronics, incorporating the first megapixel color CCD and were advertised as a means for professional photographers to "Convert to a new digital system without switching cameras." In 2002 Kodak introduced the DCS Pro 14n camera. Its 14-megapixel resolution and $4,995 price tag compared favorably with Canon's preannounced 12-megapixel camera priced at $9,000. Despite the Professional Photography Division's success at developing technological breakthroughs, in 2002 it was yet to make a profit leading to a decision to shut down the business.

Search beyond imaging—diversifying into pharmaceuticals. In addition to spurring Kodak's investment in digital photography, Sony's interest in entering the photography market also prompted Kodak's senior managers' search for opportunities to diversify away from photography. This diversification was motivated by a mismatch between the lean margins of the consumer electronics business—Kodak managers' worst-case scenario for digital photography—with Kodak's cost structure derived from decades of manufacturing high margin film. Consequently, they searched for higher margin businesses by acquiring multiple small

companies with promising new technologies and running an in-house start-up incubator (e.g., Chandler, 1986; Kanter et al., 1991).

In parallel with these efforts, in 1988, Kodak acquired Sterling Drug—a pharmaceutical company. At the time, the purchase price of $5.1 billion dollars was the highest amount paid for a pharmaceutical company in an M&A transaction. Kodak managers believed that the Sterling acquisition would provide the company with the product development and marketing capabilities necessary to turn the chemicals it developed in support of its film business into pharmaceuticals.

While some financial analysts were concerned about Kodak overpaying for its acquisition and taking on debt in the process, others saw a good strategic fit between Kodak and Sterling. Adding to the appeal of leveraging Kodak's expertise in chemistry, Kodak executives saw the pharmaceutical industry's profit margins, while lower than those in photographic film as significantly higher than those in consumer electronics.[4]

Hybrid products to shape digital technology in consumer photography. The *Wall Street Journal* described Kodak's approach to marketing digital consumer products in the 1980s as one characterized by cannibalization concerns and uncertainty about the technological trajectory of digital photography (Johnson, 1985). When assessing the threat from digital cameras to amateur photography, Kodak managers operated in an environment in which 80% of film cameras in use cost less than $50 and offered image quality comparable to digital camera resolution of more than 2 million pixels. By comparison, the resolution of the electronic still video cameras while better than that of individual frames captured by a video camera or displayed from VHS tapes,

[4] Following similar rationale in its desire to find a non-film application for its capabilities in chemistry, Kodak's smaller competitor Fujifilm pursued diversification into both pharmaceuticals and cosmetics.

was much lower than that of conventional film. Market researchers saw the price of electronic cameras as a further handicap for consumer acceptance.

Kodak managers believed that a combination of existing film and digital technology could offer consumers a superior value proposition compared to the electronic cameras. In keeping with the hybrid system logic, in 1982 one year after Sony's demonstration of the Mavica prototype, Kodak demonstrated a film-to-digital photo viewer at Photokina, the world's largest photography trade show. The device scanned in the negative images from film, displayed them as positive images on a TV screen, and also allowed the users to zoom in on different features of the photograph or to make color corrections, enlargement, and cropping choices that could then be passed on to the photo processor for printing (Ortner, 1985). At the 1984 Photokina, Fuji demonstrated its Photo-TV system—a device that allowed consumers to view their photos on the TV screen by first using a photo processing service that would save their negatives on a 2-inch still video floppy disk (West, 1984). Fuji priced the TV-Photo System in Japan at about $200.

For Kodak, the film-to-digital photo viewer prototype became the basis of two hybrid products—the Photo CD announced in 1990 and introduced in 1992—and the imaging kiosk—introduced in 1997.[5] The Photo CD brought together digital and film technology, allowing consumers to receive not just developed film, but also a CD with digital image files from their photo processor. The images could then be displayed on a TV set using a specialized device—Photo CD viewer. Unlike the Fuji's TV-Photo viewer, which used film negatives converted into lower resolution images, the Photo CD, capable of storing 100 images at approximately 18 megapixels each, preserved the high resolution of the film images.

[5] The kiosks enabled customers to manipulate and print their images at the local photofinishing provider, becoming the only hybrid product that turned a profit.

At introduction a Photo CD from the photo processor cost $20 and the Photo CD viewer, manufactured by Philips cost $350-$500, a value proposition that compared favorably to the Sony Mavica camera which was priced at $900 at the time of the Photo CD's launch (Maremont, 1992). Table 4 compares the value proposition of the Photo CD to other contemporary photographic image storage options:

[Insert Table 4 about here]

A *New York Times* technology columnist described the output of electronic still cameras like Sony's Mavica as inferior to that of the Photo CD. Moreover, the differences in resolution also translated into superior print quality with Photo CD prints yielding an electronic image that "looks like a photograph, not like a bad, dot-filled reproduction" (Grundberg 1990, p. 67).

The Photo CD was not successful commercially, in part, due to a mismatch between the audience it was best suited for and the audience it was marketed to. While Photo CD was designed to satisfy the needs of business customers in real estate, professional photography, and other image-heavy applications, Kodak marketed the product to the consumers. This was because the consumer business was the largest business within the company and could expend significant resources towards the commercialization of the Photo CD. However, the benefits of this hybrid product did not appeal to consumers. The Photo CD's poor uptake by consumers was consistent with Sony's experience with Mavica. While Mavica was originally developed the with the consumer market in mind, by mid-1980s, Sony shifted to commercial users (Ansberry, 1987).

Hybrid products to forestall the advance of digital in cinematography. In the motion picture arena, when Sony aggressively marketed its NTSC digital standard—seeking to replace film with digital cameras, Kodak responded by developing Cineon—a system of products that allowed the users to edit motion-picture film using digital technology. The Cineon system consisted of a

high-resolution scanner to digitize the 35mm film, a computer workstation with software to manipulate the images, and a laser recorder to transfer the images back to film. Kodak started researching the system in 1989 and introduced the Cineon Digital Film system in 1992 (Hunt, 1994).

Cineon offered the motion picture directors and cinematographers the convenience of digital editing while continuing to use their film equipment and consuming film. Cineon also enabled the digital remastering of animation classics such as Disney's 1937 Snow White. The introduction of Cineon allowed Kodak to extend the life of its motion picture film franchise. Extending the life of the motion picture film franchise was important because motion picture film manufacturing accounted for 10-15 percent of Kodak's film manufacturing volume—allowing the company to spread its factory overhead over larger production volumes and thus maintain lower unit costs (Shih, 2016).

In summary, Kodak's approach to the digital transformation in the 1980s consisted of intentional renewal acts which included forming separate organizational units to develop and market digital products for industrial and professional applications. Kodak pursued digital transformation in a combination of standalone business units with dedicated marketing and sales teams as well as business units also marketing film products. The standalone business units experimented with different business models, by using a direct salesforce to market to industrial customers.

During this period, Kodak invested aggressively in non-film technology. Kodak went beyond matching its competitors' efforts in low-resolution digital photography by pioneering the development of high-resolution digital cameras for professional photographers. The resultant products offered superior cost and quality vis-à-vis competitive offerings but failed to yield

profits in the niche markets for digital industrial and professional products. Kodak also rolled out hybrid products that sought to shape the evolution of consumer digital photography and forestall the adoption of digital technology by cinematographers.

Also during this period, Kodak managers actively pursued diversification, continuing the program of smaller acquisitions that Kodak started in the 1970s as well as incubating start-ups and buying a major pharmaceutical company. Kodak's efforts during this period are consistent with the notions of strategic renewal in the existing literature; however, these efforts met with negative feedback—particularly salient in contrast to a thriving highly profitable film franchise. As in the 1970s, Kodak managers faced with uncertainty about the timing of digital technology adoption, continued undertaking a broad search.

Despite achieving technological leadership in high resolution digital photography, Kodak's efforts fell short of achieving profitability. Similarly, the Sterling acquisition failed to produce favorable economic outcomes. Dissatisfied with Kodak's progress in navigating the digital transformation, in 1993 the Kodak Board of Directors fired the incumbent CEO Kay Whitmore, in part in response to the lack of immediate pay-off from the Sterling acquisition.

1993-2000—Fisher Era: Exploratory Search in Consumer Digital

Whitmore's replacement George Fisher recruited from Motorola, became the first outsider CEO in Kodak's history. Fisher described Kodak when he joined as needing to make choices about its direction. Specifically, Fisher divested of both the chemical and the pharmaceutical divisions to focus the company on photography, framing Kodak's business as the picture business. Fisher also created a Digital and Applied Imaging group to focus Kodak's digital efforts.

Unlike the previous organizational units which focused on digital technology in the 1980s, the new group was expected to be profitable. To accomplish this goal, Kodak hired managers from Apple, IBM, and Silicon Graphics to bring in external expertise in marketing and digital product development. Kodak moved aggressively to enter the digital camera market. Kodak's first consumer digital camera was marketed by Apple in 1994 as Apple Quicktake 100.

Priced at $749 and with a resolution of 0.1 megapixel, Quicktake targeted the low-cost market segment compared to the higher priced professional digital cameras. Despite being hailed as a "price/performance breakthrough" by market observers (e.g., *Future Image Report* quoted by Benner, 2008, p. 116), the QuickTake's 40,000 units in sales were a disappointment to Apple which discontinued the cameras a few years after launch.

Kodak's digital efforts in the early 1990s were similarly stymied by a lack of consumer demand for digital cameras which meant that Kodak's investment translated into major losses. In 1997—the year Fisher expected the company to start breaking even on digital, Kodak lost $440 million dollars on its digital initiatives. Fisher commented on how the uncertainty of the exact timing of the transition affected Kodak's approach to digital photography: "We thought that digital would come fast, and when it did not, we had to come up with an interim strategy."

The interim strategy included the introduction of more hybrid products. The Advanced Photo System was conceived in the mid-1980s to stimulate demand for film. Work on the new system commenced in 1991 in partnership with four Japanese photography companies: Fuji, Minolta, Canon, and Nikon (Cohen and Tripsas, 2018) and was guided by two criteria: ability to produce 4"x6" prints that were as sharp as those obtained from 35mm negatives from a smaller film format and the desire to take advantage of a window of opportunity before the digital photography technology would become competitive (Adams, 1998).

In April 1996, the APS cameras were offered for sale by the participating manufacturers. All cameras featured drop-in cartridge design for loading the film and the higher-end models offered digital features such as an LCD preview, backprinting of image information, and saving the images in a choice of resolutions. However, the new camera system did not appeal to the amateur photographers, in part due to offering lower resolution images than the prevalent 35mm

film. The companies expected to sell eight million cameras in 1997 but ended up with less than half the sales (Deutsch, 1997). The sales failed to recoup the hundreds of millions of dollars spent on developing and marketing the system.

The consumer demand for digital cameras in the 1990s was held up by factors which included high price, inferior resolution, high power consumption, and lack of options for displaying the images. As late as the mid-1990s, digital cameras that could match the resolution of film photography cost thousands of dollars, putting them out of reach of most consumers. For power supply, the cameras introduced in 1991 featured one-pound batteries with later versions needing ten AA batteries that would last for 70 pictures. It was not until the introduction of nickel hydride batteries that the cameras could make 300 pictures without being recharged (*Washington Technology*, 1994). The battery requirements affected the weight of the cameras with a lightweight electronic camera in the 1980s weighing it at four pounds (e.g., Martin 1987).

Another set of technical issues that held up the demand for digital cameras had to do with the lack of technologies available for viewing the digital photos. Originally, the industry targeted TVs with specialized still-video players as output devices for digital photographs. With the diffusion of personal computers, computers became the expected output device. However, the size of the high-resolution image files required the development of image compression algorithms, bigger computer memories, and greater processing power to make digital photography accessible to personal computer users (Schaub, 1995). High quality printing of the digital images also required improvements in PC printers including the development of higher quality inks as well as printer heads that could more accurately deposit ink on paper. In addition to the expense of ink for printing color images, consumers also had to contend with substantial

time delays—printing an 8"x11" color photograph on a Canon inkjet printer in 1996 could take 10 minutes (Gomes, 1996).

While each of these technical issues was eventually resolved, the uncertainty surrounding the timing of such resolution made it difficult to predict the timing of the eventual growth of consumer demand for digital cameras. Despite the uncertainty, Kodak continued to invest in the development of digital cameras and succeeded in introducing digital cameras that appealed to the mass market. In 1999, the first year when the worldwide sales of digital cameras crossed a million-unit threshold, *Business Week* compared Kodak's DC240 digital camera to Fujifilm's MX-1700 and Sony's Cybershot DCS-F505, writing: "They're all impressive examples of digital imaging technology, but the standout on pure picture quality is the Kodak" (Smith, 1999, p. 138).

As the decline of photographic film loomed and Kodak was yet to arrive at a viable business model in digital photography in the mid-1990s, Kodak's executive team attempted to find a company willing to acquire Kodak. Kodak's then CEO George Fisher and CFO Harry Kavetas held merger discussions with companies ranging from cross-town and Silicon Valley rivals including Xerox, Intel, Adobe, and Hewlett Packard to stalwart consumer-packaging giants like Procter & Gamble. At one point during this search, Kodak executives considered acquiring Apple Computer—Kodak flush with cash could have capitalized on Apple's then flailing fortunes, but Kodak's managers anticipated a culture clash between the two companies and did not pursue that option.

Under Fisher, Kodak narrowed its search in areas outside photography, divesting of both its chemical and pharmaceutical divisions. In photography, Kodak commercialized multiple digital cameras for consumers and professional photographers as well as hybrid products aimed at consumers that sought to take advantage of the delay in the demand for digital (e.g., APS,

imaging kiosk). Kodak also created a new standalone business unit to focus its digital efforts and brought in external executives to run the unit. Throughout this period, Kodak continued to invest in digital photography despite lack of positive economic outcomes. Unable to find a strategic buyer for Kodak, George Fisher stepped down in 2000.

2000-2012—From Digital, to Inkjet to Bankruptcy—Last Gasp at Strategic Renewal

2000-2005—Carp Era: Narrower search in consumer digital. Dan Carp, a Kodak veteran who succeeded Fisher kept Kodak on the digital path. In 2002, digital camera volume caught up with those of film cameras. Kodak's persistence in digital camera marketing allowed the Digital and Applied Imaging division to achieve profitability on its consumer digital cameras in the second half of 2003; however, the profits were not sufficient to save the company. During 2004 and 2005, Kodak held the leading market share of digital cameras sold in the U.S.

Despite the technological and marketing success in commercializing digital products, Kodak struggled to achieve profitability in digital photography. To help finance the transition to digital technology, Kodak managers turned to licensing Kodak's patents in digital camera development as source of income for the digital business, requiring other entrants into the digital camera market to acquire licenses for Kodak's fundamental patents in the digital photography arena. This strategy became an important source of revenue for Kodak when the revenues from its film business declined.

2005-2012—Perez Era: Search in consumer inkjet printing. In its second attempt to arrive at a viable digital photography business model following its foray into digital cameras in 2005, Kodak replaced Dan Carp with Antonio Perez, a Hewlett Packard veteran, who became the second outsider CEO in the company's history. Perez sought to leverage Kodak's expertise in chemistry to make ink for inkjet printers more affordable, thus allowing Kodak to undercut the

profit generated by the inkjet printer manufacturers like Hewlett Packard. The entry was motivated in part by industry forecasts of growth in the number of digital images being printed and followed decades of Kodak's experimentation with inkjet printing.

With Perez at the helm, in 2007 Kodak introduced its consumer inkjet printer. In a twist on the traditional razor/blade business model, Kodak offered higher priced hardware (pricing its printers ~$50 above competition), with lower-priced consumables (pricing its ink cartridges 50% below competition). This strategy sought to attract consumers with high printing volumes who would use twice as much ink as the median consumer. Financial analysts expressed skepticism both about Kodak's ability to succeed with a niche strategy in a business that required scale and about the consumers' willingness to pay upfront for the eventual savings on ink.

In attempting to balance the capital requirements of the inkjet business with expenses associated with shutting down the legacy film factories, the pivot to inkjet attempt ran into cash shortfalls, forcing Kodak to seek bankruptcy protection in 2012.

Findings Summary

Our account of Kodak's experience with digital transformation suggests that Kodak's failure was a result of a process different from organizational inertia. From 1950s onward, Kodak made a substantial investment in digital R&D. This investment allowed Kodak to commercialize numerous digital products which both represented technological breakthroughs and met with marketplace acceptance. From 1980s onward, Kodak also undertook multiple corporate development initiatives that could have allowed the company to diversify outside photography. Moreover, the Kodak Board of Directors hired two outsider CEOs with expertise in digital technology-based businesses to guide the company's digital transformation efforts. And yet,

these efforts fell short of staving off Kodak's bankruptcy. In Table 5, we present our findings as they compare to inertial explanations of organizational behavior.

[Insert Table 5 about here]

As Table 5 indicates we find limited evidence of inertia in Kodak's decisions.

We find limited evidence of inertia in Kodak's decisions. While Kodak managers expressed concerns about digital cannibalization of the film business, they continued to invest in developing digital capabilities throughout the period we study. From the early 1980s onwards, Kodak allocated 1/3rd of its research budget to digital technologies. Kodak's experience with copiers in the mid-1970s offers perhaps the closest match to inertia accounts in the existent literature; however, it is difficult to draw a causal connection between inertia in Kodak's decision-making in the 1970s and its bankruptcy in 2012.

The sparse evidence of inertia in Kodak's decision making is in sharp contrast to the extensive evidence of Kodak's strategic renewal efforts summarized in Table 6.

[Insert Table 6 about here]

Starting in the 1970s, Kodak engaged in broad exploration efforts which included investing extensively in R&D, commercializing multiple digital products, and acquiring companies with promising technologies. From an organizational perspective, from 1984 onwards, Kodak managers led several reorganizations, created standalone business units responsible for digital initiatives, diversified into pharmaceuticals, and even attempted to find a strategic buyer for Kodak. Kodak also engaged in multiple CEO changes, hiring two outsider CEO with expertise in digital technologies.

To take one example of Kodak's renewal efforts, Kodak's hybrid products were a response to pressure from Sony which sought to hasten the transformation of photography to

digital—a development that would expand its consumer electronics business to new markets. The extant literature offers contrasting perspectives on whether hybrid products help or hinder the incumbent's transition to the new technology. In Kodak's case, the hybrid products sought to set the direction of the digital transformation by allowing consumers and filmmakers to continue using their existing film equipment while also enjoying the benefits of digital technology.

If Kodak displayed limited inertial behavior and engaged in extensive strategic renewal efforts, what accounts for the firm's failure? Our analysis of the case suggests that Kodak's exploratory search was shaped by three contextual variables—1) aspirations to high performance; 2) uncertainty with respect to digital photography technology, applications, users, and viable business models; and 3) illusion of resilience of the old technology—a technology substitution regime in which the old technology appears to be thriving while the new technology is delayed. In terms of aspirations, Kodak's profitable film business created a high baseline that the new businesses it explored including copiers, pharmaceuticals, and digital photography failed to meet. The uncertainty with respect to the viable business models in digital photography made it difficult for Kodak to learn from its search across the different domains.

Moreover, the delays in the emergence of consumer demand for digital photography together with ongoing demand for film products generated an illusion of resilience with market analysts forecasting continued demand for film for years to come. As late as the early 2000s, digital cameras were expensive, had short battery lives and made it difficult to view and download the images. Furthermore, working with digital images required both access to computers and software expertise limiting digital photography's appeal to the early adopters.

In summary, the combination of high aspirations, uncertainty about the new technology, and illusion of resilience of the old technology forced Kodak to curtail its broad exploratory search for feasible alternatives before the technological uncertainty was resolved.

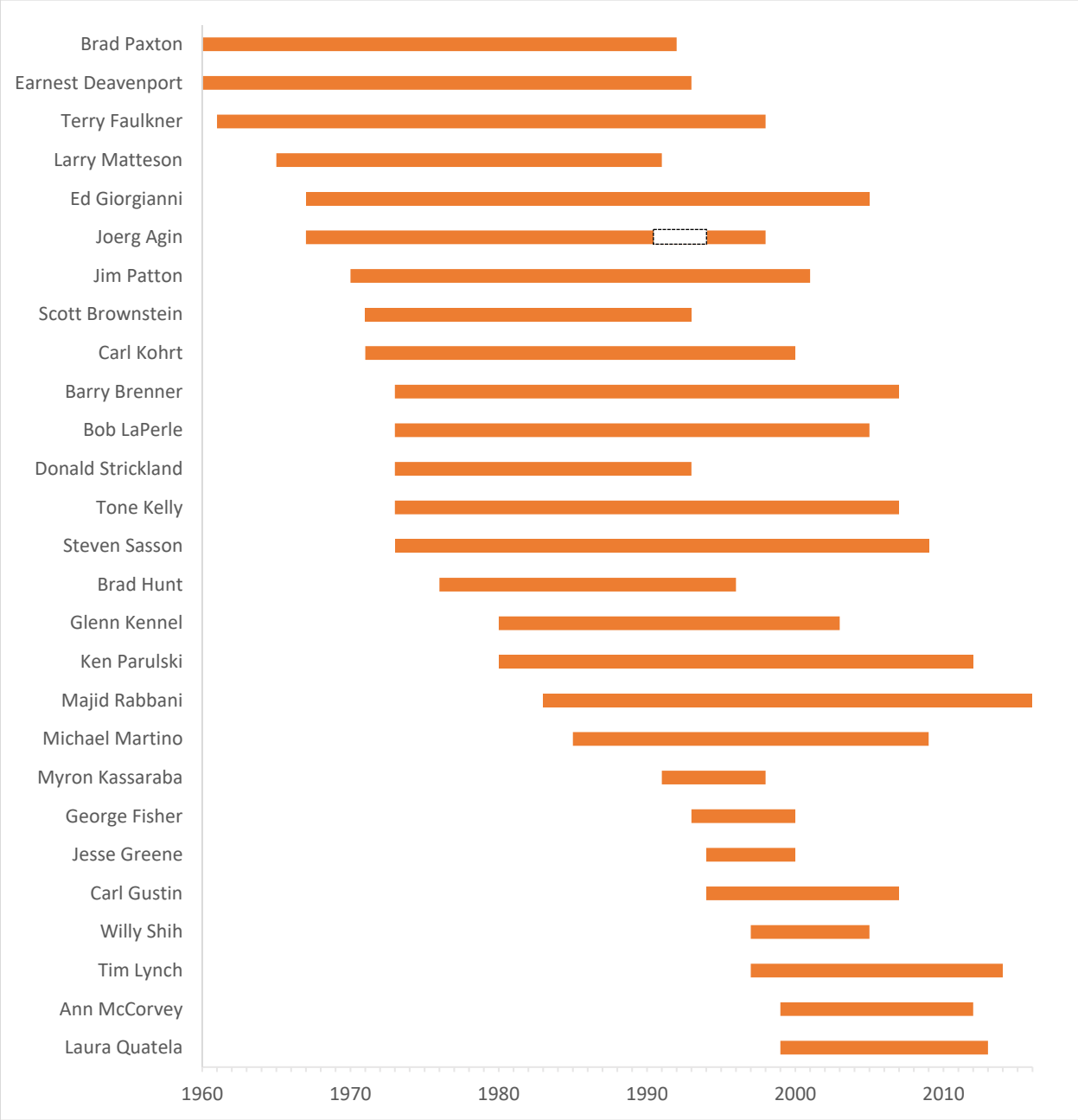
DISCUSSION AND CONCLUSIONS:

Our detailed examination of Kodak's experience with digital transformation makes several contributions to the literature on the role of incumbency in industry transitions as well as to the literature on strategic renewal and organizational ambidexterity (e.g., Agarwal and Helfat, 2009; Tushman and O'Reilly, 2004; Taylor, 2010; Taylor and Helfat, 2009) that consider the pathways available to established firms in overcoming the challenges of industry transitions. The existent literature considers economic, organizational, and cognitive antecedents of organizational inertia (e.g., Kaplan and Henderson, 2005; Danneels, 2010; Tripsas and Gavetti, 2000). Our contribution to these research streams is to suggest that a process other than inertia can lead to incumbent failure in industry transitions. Specifically, we find that high aspirations may limit an incumbent's search before the uncertainty with respect to the emerging technology is resolved.

Kodak's experience with digital transformation has important implications for the challenges faced by incumbents in a wide array of industries that are being reshaped by emerging technologies. Moreover, as in Kodak's case, the impact of a new technology on an established industry might be hard to predict ex-ante. For instance, the use of teleconferencing is transforming industries ranging from real estate to healthcare. In developments similar to the challenges Kodak faced in anticipating and responding to the impact of digital technology on its business during the half a century we study, today's incumbent firms are challenged to anticipate and respond to the changes in their industries stemming from technologies that include 3D printing, artificial intelligence, big data, blockchain, and self-driving cars.

By offering a detailed and nuanced account of Kodak's efforts at strategic renewal we enrich the field's understanding of the complexity of the problem faced by incumbent firms in technological transitions. In so doing, we hope to inform organizational scholars' understanding of both inertia and strategic renewal. Far from being married to Kodak's identity as a film manufacturer or a photography company, its managers anticipated technological change and invested in a broad range of strategic alternatives that could have allowed Kodak to weather the technological transition. Understanding why these efforts fell short of staving off the company's demise is critical for informing future decision-making.

Figure 1: Interviewees' tenure at Kodak[6]



[6] The white box surrounded by dashes indicates that Joerg Agin left Kodak in 1992 and returned to the company in 1995.

Figure 2a: Kodak market capitalization and worldwide digital camera sales

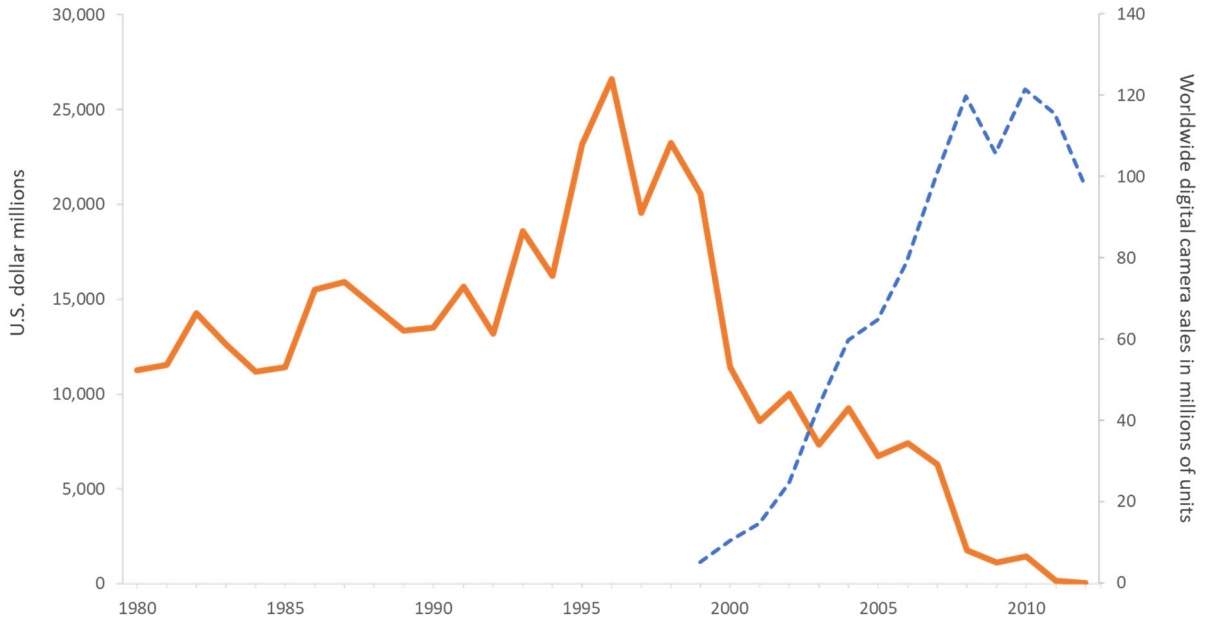


Figure 2b: Kodak patents in electronic photography and worldwide digital camera sales

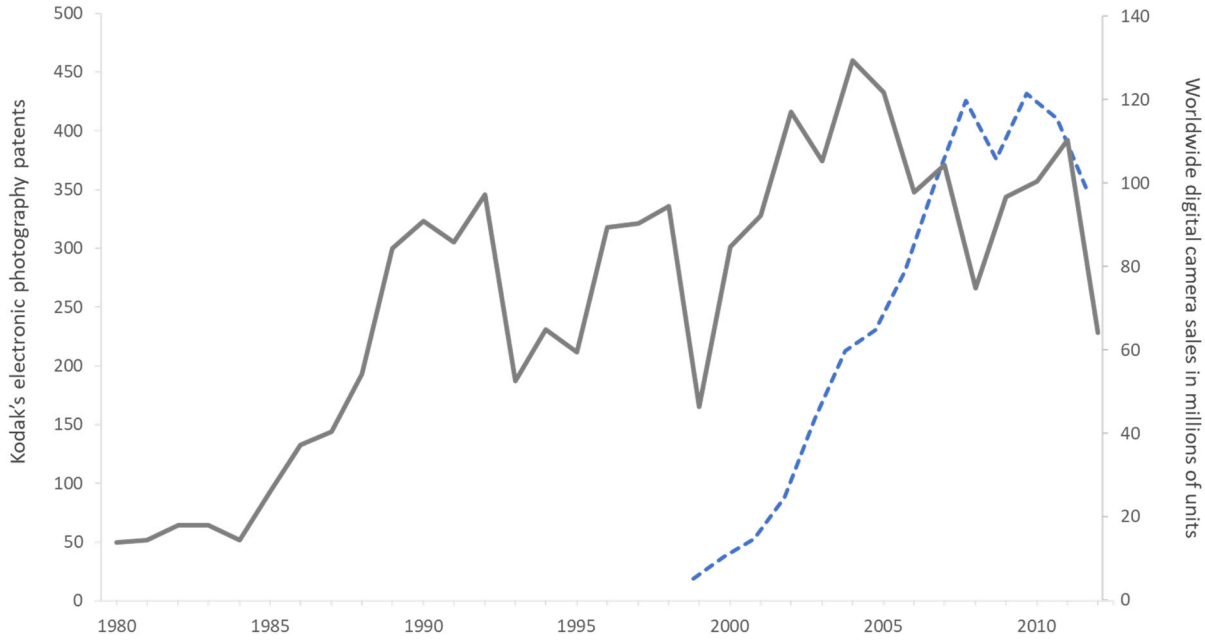


Figure 2c: R&D expenditures as percentage of sales for Kodak and Fujifilm

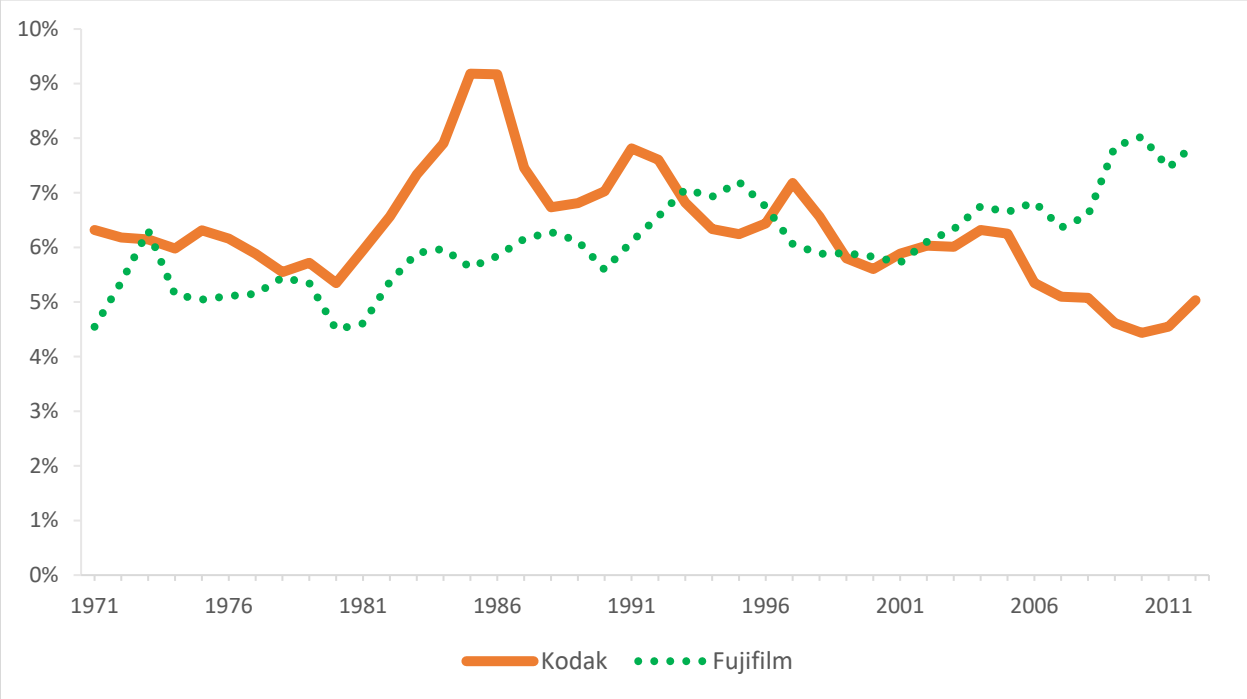
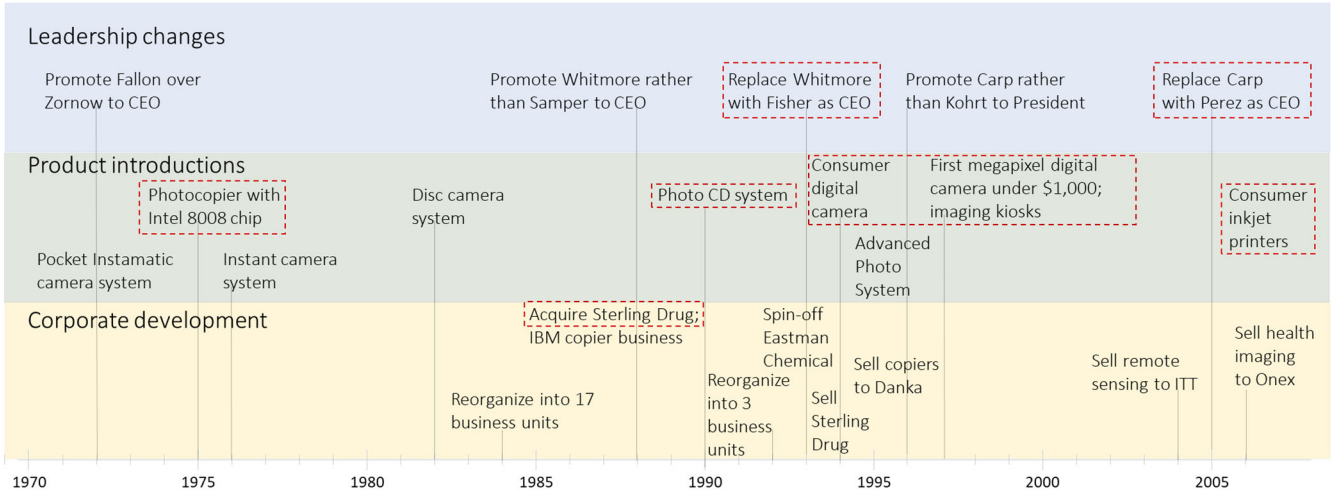


Figure 3: Timeline of decisions[7]



[7] Decisions highlighted with dashed boxes are particularly relevant to the digital transformation.

Figure 4: Word counts of business description in Kodak's 10Ks

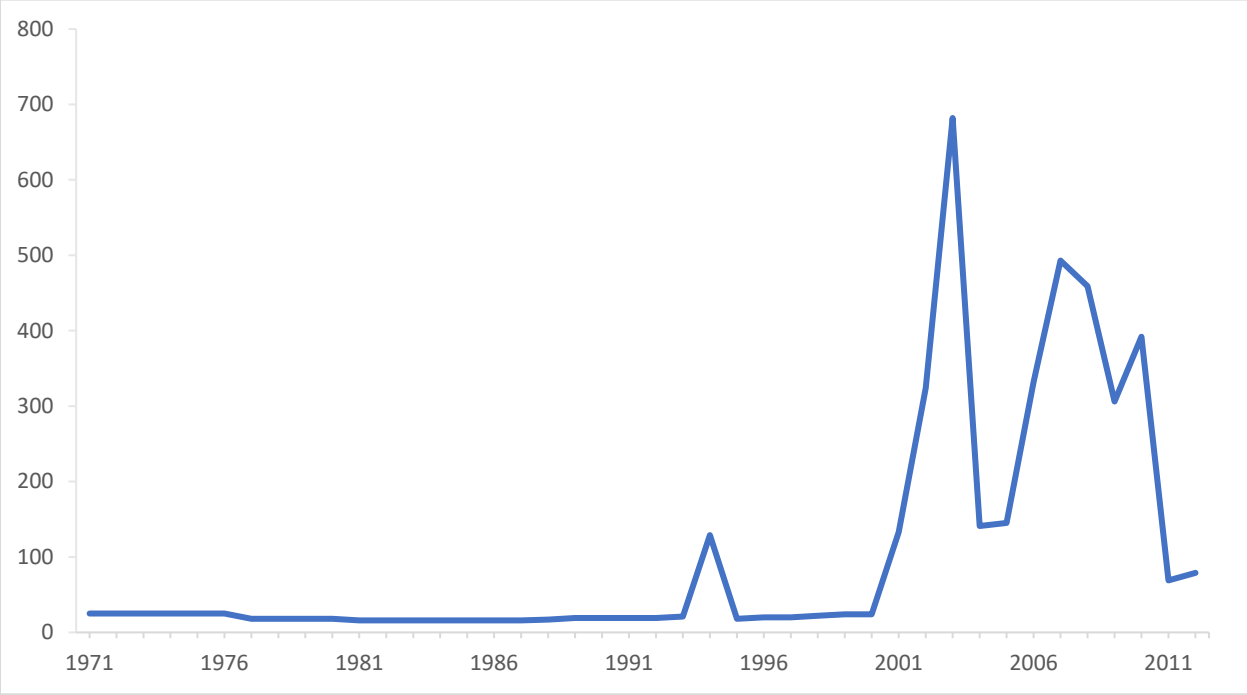


Figure 5: Digital photography developments

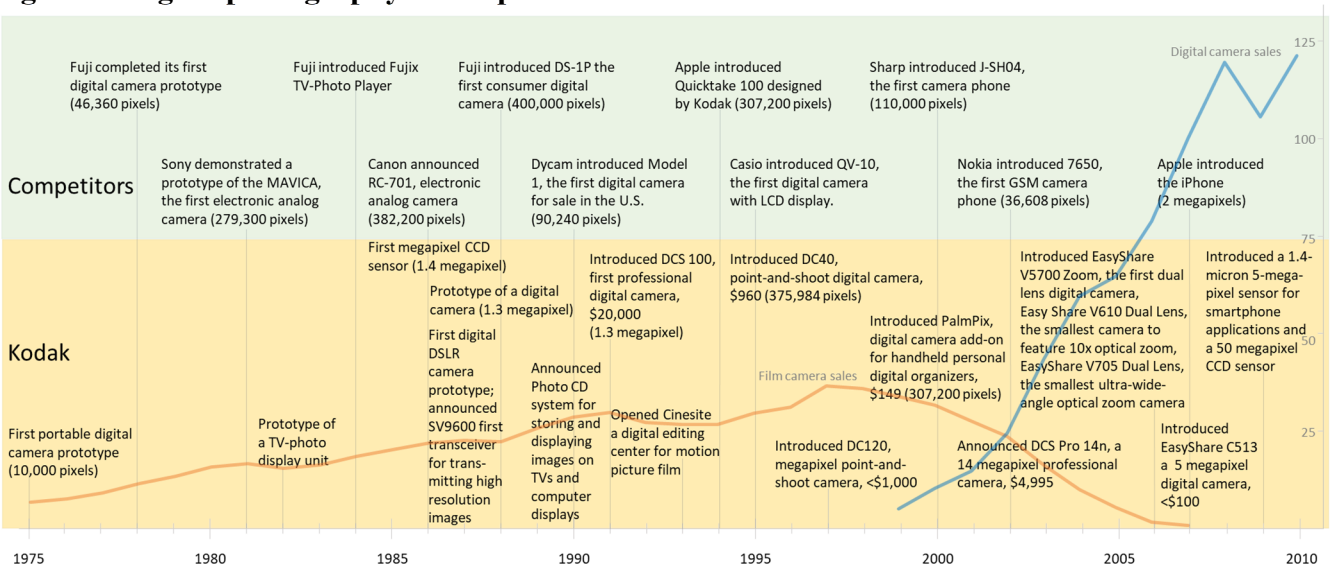


Table 1: Interviewees' last three positions at Kodak

Interviewee	Positions
Laura Quatela	President (2012-2014); General Counsel (2011-2012); Chief Intellectual Property Officer (2008-2010)
Ann McCorvey	CFO (2010-2012); Director of Investor Relations (2010-2007); Vice President, Corporate Financial Planning and Analysis (2004-2007)
Tim Lynch	Chief Intellectual Property Officer (2011-2014); Deputy General Counsel (2010-2014); Managing Director, Intellectual Property Transactions (2008-2010)

Willy Shih	President, Digital and Applied Imaging (1997-2003); President, Display and Components Group (2003-2005)
Jesse Greene	Vice President of Finance (1998-1999), Acting CFO (1999-2000), Senior Vice President for Strategy and Information Technology (2000)
Carl Gustin	Chief Marketing Officer (1995-2007); General Manager, Digital and Applied Imaging (1994-1995)
George Fisher	CEO (1993-2000)
Myron Kassaraba	Director, Corporate Strategic Alliances & Developer Relations, Corporate Marketing (1996-1998); Director, Sales & Marketing, Color Management Systems Group (1993-1996), Director of Marketing, Advanced Technology & Components, Kodak Electronic Printing Systems (KEPS) (1991-1993)
Michael Martino	Director and VP of Strategy and Business Planning, Chief Operating Office (2007-2009); Director of Strategy and Business Planning, Graphics Communication Group (2003-2007); Director of Corporate Strategy and Financial Planning (2001-2003)
Majid Rabbani	Distinguished Kodak Fellow and Head of Intelligent Systems Department (2011-2016); Kodak Fellow and Head of Intelligent Systems Department (2007-2011); Kodak Fellow (2000-2007)
Ken Parulski	Research Fellow and Chief Scientist, Digital Cameras and Devices (2010-2012); Research Fellow and Director, IP & Standards, Consumer Digital Group (2001-2009); Chief Architect, Kodak Digital Cameras (1995-2001)
Glenn Kennel	Program Manager, Digital Cinema (2000-2003); Category Manager, Cineon Conversion Products (1994-1998); Director of Technology, Cinesite, a Kodak Company (1998-1999)
Brad Hunt	Director of Operations, Digital Motion Imaging Division (1995-1996); European Region Sales and Business Development Manager, Digital Motion Imaging Division (1991-1995); Director of Advanced Technologies Strategic Planning, Motion Picture & Television Imaging Division (1989-1991)
Steven Sasson	Project Manager, Patent Litigation, Corporate Commercial Affairs (2004-2009); Research and Development Manager, Retail Photofinishing Platform (2001-2004); Development Manager of Output Systems, Professional Products (1996-2001)
Tone Kelly	Senior Consultant, Corporate Strategy Office (2002-2007); Associate Technical Intelligence Advisor, Strategic Planning (1998-2002); Technical Intelligence Advisor, Strategic Planning (1985-1998)
Donald Strickland	General Manager, Electronic Imaging Platform Center (1992-1993); General Manager, Mass Memory Division (1991-1993); Sloane Fellow (1990-1991)
Bob LaPerle	General Manager, kodak.com (2000-2005); Director of Digitization Strategy (1998 to 2000); General Manager, Digital Products & Services (1995-1998)
Barry Brenner	Director, Corporate Strategy (2001-2007); Director, Strategic Initiatives (1998-2001); General Manager, Kodak's Consumer Imaging Japan (1997-1998)
Carl Kohrt	Chief Technological Officer (1998-2001); Executive Vice President and Assistant Chief Operating Officer (1995-1997); General Manager, Health Sciences (1991-1995)
Scott Brownstein	Advanced Development Manager, CD Imaging (1987-1993); Team Leader, Thermal Printing Systems (1983-1987); Senior Research Physicist (1971-1983)
Jim Patton	Chief Technical Officer, Consumer Imaging (1997-2001); Worldwide Product Line Manager, Capture Products, Consumer Imaging (1994-1996); Regional Business General Manager for the US & Canada, Professional Imaging (1990-1993)
Joerg Agin	President, Entertainment Imaging (1995-2001); General Manager, Motion Picture and Audio Visual Division (1988-1992); General Manager, Verbatim Division (1985-1988)

Ed Giorgianni	Senior Research Fellow (1996-2005), Research Fellow (1982-1996), Senior Research Engineer (1976-1982)
Larry Matteson	Corporate Vice President and General Manager, Imaging Information Systems Group (1991-1992); Group Vice President of Imaging and Information Systems (1989-1990); Group Vice President of Commercial Information Systems (1985-1989)
Terry Faulkner	Director and Vice President of Strategic Initiatives (1993-1998); Director Technology Planning (1992-1993); Technical Assistant to the Director of Research (1986-1992)
Earnest Deavenport	CEO Eastman Chemical Company (1994-2012); President, Eastman Chemical Company (1989-1993); Assistant General Manager, Eastman Chemical Company (1985-1989)
Brad Paxton	Director, Electronic Imaging Research Laboratories (1991-1992); General Manager, Printer Products Division (1989-1991); General Manager, Electronic Photography Division (1986-1989)

Table 2: Eastman Kodak Company milestones

Year	Event
1879	George Eastman filed for his first patent in photography.
1888	Eastman introduced Kodak—a $25 film-based camera which represented a technological shift from glass-plate to film photography, making cameras portable and shortening the per image exposure time from 30 minutes to seconds. Each Kodak came with a roll of film to capture 100 snapshots. For $10, the company would develop and print the images and reload the camera with another roll of film.
1892	George Eastman changed the name of his company from Eastman Dry Plate and Film Company to Eastman Kodak Company to reflect the success of film cameras.
1895	Kodak introduced a $5 pocket camera.
1896	Kodak introduced X-ray and motion picture film, establishing a dominant position in both markets, while manufacturing 400 miles of photographic film a month.
1901	Kodak introduced a $1 Brownie camera.
1905	Kodak became a public company, listing on NYSE.
1912	George Eastman established Kodak Research Laboratories, funding the work of 20 people with an annual budget of $53,797 (about $1.25 million in 2012 dollars).
1930	Kodak joined the Dow Jones Industrial Average in July of 1930.
1930s	Kodak Research Laboratories developed Kodachrome—one of the first commercially successful color films which remained in production until 2009.
1950s	Kodak researchers invented the E-1 Camera system for the government SAMOS satellite program. The camera developed the film in space and scanned in the images in analog form for subsequent transmission to Earth using radio signal.

Table 3: Canon, Sony and Kodak, still video product pricing

Product	Canon	Sony	Kodak
Camera	$2,595	$4,000	Prototype $3,000
Player/Recorder	$2,695	$3,400	$1,900-$3,900
Color Printer	$19,900	$11,000	$4,800
Transceiver	$6,950	$15,000	$12,600
Video transfer stand		$9,850	$2,200

Table 4: Value proposition of Photo CD vis-à-vis other photographic image storage options

	High-end digital camera	Low-end digital camera	Photo CD	Film camera
Hardware price	$10,000	$900	$350-500	<$50
Resolution	1.3 megapixel	0.3 megapixel	18 megapixel	2-20 megapixel
Storage medium	Digital unit storage (bundled with a camera)	$3 for 2-inch floppy disc containing up to 50 images	$20 per CD containing up to 100 images	<$10 for 24 exposures

Table 5: Evidence of inertia in Kodak's decisions

Inertia antecedents	Existent literature	Evidence of inertial behavior	Evidence of non-inertial behavior
Economic	Cannibalization concerns lead to underinvestment (e.g., Arrow, 1962; Henderson, 1993)		Despite concerns about the possibility of digital photography displacing film Kodak continued investing in digital technology research and development of digital products.
Organizational	Core competencies turn into core rigidities (e.g., Leonard-Barton, 1982); incumbents fail to reconfigure their capabilities to accommodate technological change (e.g., Lavie, 2006) Resource rigidity—underinvestment into promising new technologies (e.g., Gilbert, 2005) Commitment to existing customers (e.g., Christensen, 1997); financial analysts (e.g., Benner, 2010; Noda and Bower, 1996); performance metrics (e.g., Christensen, Kaufman and Shih, 2008)		Starting in the 1980s Kodak successfully developed new digital capabilities in R&D, hiring more electrical engineers, commercializing products based on digital technology starting with the digitally enabled copiers in the 1970s, professional cameras and related equipment from 1980s onwards, consumer cameras from 1990s onwards, and inkjet printers between 1980s and 2000s.
Cognitive	New products developed by the incumbents hew too closely to their existing products (e.g., Benner and Tripsas, 2012) Products that do not match the incumbent's business model will be developed, but not commercialized (e.g., Tripsas and Gavetti, 2000)	In the mid- to late-1970s Kodak did not aggressively pursue the copier business due to a mismatch between amateur photography business model which entailed selling low-cost hardware and copier business model which	In the late 1980s and early 1990s Kodak developed both cameras that were seen as computer accessories, e.g., Apple Quicktake 100 and 150, and cameras with optical roots, e.g., the DCS professional series.

		entailed the lease expensive equipment and charge by the copy.	

Table 6: Evidence of strategic renewal in Kodak's decisions

Mechanism	Existing literature	Evidence from the Kodak case
R&D/New Product Development	Firms facing increased competition can regain their competitive advantage by investing in R&D and enhancing their R&D capabilities (e.g., Knott and Posen, 2009). Investment in hybrid products can help incumbents learn about the new technology (e.g., Cohen and Tripsas, 2018; Furr and Snow, 2015)	Starting in the early 1980s, Kodak invested 1/3rd of its R&D budget into digital technology. The investment translated into launches of multiple new digital products including professional and consumer digital cameras. In the 1990s, Kodak commercialized four hybrid products that combined digital and film technology, three targeted amateur photographers (Photo CD, Advanced Photo System, and imaging kiosks) and one targeting motion-picture professionals (Cineon).
Organizational Ambidexterity	Standalone organizational units dedicated to the novel technology can help organizations maintain a balance between exploration and exploitation efforts (e.g., O'Reilly and Tushman, 2014). Reorganization can provide a firm with the benefits of ambidexterity by changing the patterns of interaction between organization members (e.g., Gulati and Puranam, 2009; King and Tucci, 2002)	From 1984 onwards, Kodak had standalone business units focused on commercializing digital technologies. The business units had profit and loss responsibility as well as dedicated marketing and sales forces. Kodak managers undertook several major reorganizations, decentralizing the organization to 17 business units in 1984 and recentralizing to 3 divisions in 1989.
Diversification	Acquisitions can help firms broaden a firm's knowledge base (Vermeulen and Barkema, 2001) and fill gaps in their capabilities (e.g., Capron and Mitchell, 2009). Incumbents in declining industries can use diversification to leverage their capabilities in alternative markets (e.g., Anand and Singh, 1997).	In 1972, Kodak created Eastman Technologies, a division focused on acquisitions of smaller companies with promising new imaging technologies. In 1984, the division introduced a start-up incubation program with the majority of the funded start-ups focusing on digital technology. In 1988, Kodak bought Sterling Drug, in a major push to diversify into pharmaceuticals by translating the chemicals it developed in photography into pharmaceuticals.
Leadership changes	In dynamically changing environments, the CEO's views can quickly become obsolete (e.g., Henderson, Miller and Hambrick, 2006) and changes in CEO can help facilitate organizational adaptation.	Between 1990 and 2012, Kodak had four different CEOs with their tenures ranging from three (Whitmore) to seven years (Fisher and Perez).

	Hiring outsider CEOs whose expertise matches the industry conditions can enhance firm performance (Chen and Hambrick, 2012). CEO succession in combination with other leadership team changes can help incumbents navigate technological transitions (e.g., Tushman and Rosenkopf, 1996).	In 1993, Kodak hired George Fisher, an external CEO with experience running a digital technology company. In 2000, he was succeeded by Dan Carp, an internal hire. In 2005, Kodak hired Antonio Perez, a CEO with expertise in running an inkjet printer company, matching Kodak's strategic direction of focusing on inkjet printing. Both external CEOs hired multiple senior managers from outside Kodak bringing new skills into the company.

Selected References:

Agarwal, R., & Helfat, C.E. (2009). Strategic renewal of organizations. *Organization Science*, *20*(2), 281–293.

Atkinson, T. (1987). Still video—after all these years. *Los Angeles Times*, Jul., 17, p. E23.

Benner, M. J. (2008). Financial market reactions following technological discontinuities: a non-event study in two industries. *Industrial and Corporate Change*, *17*(1), 109–154.

Callahan, S., & Goldberg, N. (1986). The future arrives. *Popular Photography*, Jul., pp. 63–64.

Chandler, C. H. (1986). Eastman Kodak opens windows of opportunity. *Journal of Business Strategy*, 7(1): 5–9.

Collins, D. (1990). *The story of Kodak*. Harry N. Abrams, Inc.

Danneels, E. (2010). Trying to become a different type of company: Dynamic capability at Smith Corona. *Strategic Management Journal*, *32*(1), 1–31.

Deutsch, C. H. (1997). Kodak earnings retreated 16.4% in second quarter. *New York Times*, Jul. 17, D2.

Dougherty, D. (1992a). Interpretive barriers to successful product innovation in large firms. *Organization Science*, *3*(2), 179–202.

Drukker, L. (1981) Sony's revolutionary video still camera. *Popular Photography*, Oct., p. 234.

Durniak, J. (1986). Tape tells the story in Canon's new system. *New York Times*, Jul. 20, p. 43.

Eggers, J. P., & Kaplan, S. (2009). Cognition and renewal: Comparing CEO and organizational effects on incumbent adaptation to technical change. *Organization Science*, *20*(2), 461–477.

Free, J. (1986). Video photography—the electronic revolution continues. *Popular Science*, Oct., pp. 74, 75, 98.

Gilbert, C. G. (2005). Unbundling the structure of inertia: Resource versus routine rigidity. *Academy of Management Journal, 48*(5), 741–763.

Goldberg, N. (1984). Shoptalk. *Popular Photography*, Oct., pp. 35–36.

Govatos, T., & Callagy, R. (1998). Eastman Kodak. Donaldson, Lufkin, Jenrette. Jan. 20.

Grundberg, A. (1990). Kodak announces tantalizing bits from its world of new technologies. *New York Times*, Sep. 23, p. 67

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N)ever-changing world. *Strategic Management Journal*, *32*(11), 1243–1250.

Hunt, C. B. (1994). Digital film workstations: Evolution in the video compositing suite. Presentation at International Broadcasting Convention, Amsterdam, Sept. 17.

Kiss, A. N., & Barr, P. S. (2015). New venture strategic adaptation: The interplay of belief structures and industry context. *Strategic Management Journal*, *36*(8), 1245–1263.

Kodakery. (1994). Thomas discusses recent imaging changes. Apr. 18, pp. 1, 8.
Lee, S. Y. (2004). *Eastman Kodak: Lost in transition?* Credit Suisse First Boston, Jul. 8.
Maremont, M. (1992). Smile, you're on compact disk. *Business Week*, Aug. 10, p. 26.
Martin, H. (1987). Kodak's new still video system. *Print*, Sept. 1, pp. 122–123.
Munir, K. A. (2005). The social construction of events: A study of institutional change in the photographic field. *Organization Studies*, *26*(1), 93–112.
Perez, A. (2008). *Eastman Kodak Company FQ4 2007 Earnings Call*, January 30.
PR Newswire. (1994). Kodak announces new digital imaging organization. Mar. 28.
Rosenbloom, R. S. (1997). Polaroid Corporation: Digital imaging technology in 1997. Harvard Business School Case #9-798-013
Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal*, *21*(10–11), 1147–1161.
West, N. M. (2000). *Kodak and the lens of nostalgia*. University of Virginia Press.