# Disruption talk: an analysis of disruption-related communication, strategies, and outcomes in S&P 500 firms

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# DISRUPTION TALK:
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**Abstract:** Disruptive innovation has attracted significant scholarly and managerial interest. In the existing research, there is ongoing debate about the nature of disruptive innovation and who initiates it. The related question of how incumbents can deal with disruption, let alone initiate it, has not been extensively addressed. To bridge these gaps, we conceptualized disruptive innovation as "a market outcome in which new offerings successfully challenge established ones in a given market". This definition enables studying a wide range of disruptive strategies. We then analyzed communication about disruptive innovation in the press releases of 101 S&P 500 firms between 2005 and 2014, along with the subsequent outcomes of those disruptive intentions until the end of 2019. The infrequency of references to disruptive innovation in the press releases seems to suggest that disruption is a rather rare issue for these firms. Nevertheless, content analysis of press releases and secondary data suggests that large incumbent firms employ a number of distinct strategies to initiate disruption. While some of these strategies were not unexpected, others were more surprising and led in many cases to positive market outcomes. Our findings suggest that disruptive innovation is not necessarily a threat but may present many opportunities for established businesses.

## 1 Introduction

Although widely endorsed by practitioners, disruptive innovation (Christensen, 1997) is among the most widely debated management theories (Hopp et al., 2018). Despite advances in conceptualizing disruptive innovation and explaining its drivers and challenges (for review, see Yu and Hang, 2010), the term continues to have multiple usages. According to Christensen et al. (2015), "Many researchers, writers, and consultants use 'disruptive innovation' to describe *any* situation in which an industry is shaken up and previously successful incumbents stumble. But that's much too broad a usage." Others argue that Christensen's (1997) "low-end disruption" is relatively rare (King and Baatartogtokh, 2015), and the term has since been extended to encompass new phenomena such as "new market disruption" (Christensen et al., 2015; Govindarajan and Kopalle, 2006; Schmidt and Druehl, 2008) and disruption through business model innovation (Markides, 2006).

In the present study, we argue that while both the original definition of Christensen—as well as the recent extensions—are useful, they may unnecessarily restrict the range of disruption theory, especially if the aim is to understand disruption as an *outcome* rather than as a specific *process*. Another issue that has been typical for disruptive innovation field is the focus on market entrants and startups as initiators of disruption while large incumbent firms are seen as the ones being disrupted. However, amid increasing assertions and evidence that incumbents may also disrupt other market participants in various ways (Assink, 2006; Yu and Hang, 2010, 2011), it remains as an open question whether disruptive innovation should be more narrowly or broadly defined, and which types of innovations or innovating firms should be considered disruptive (Markides, 2006; Nagy et al., 2016).

This question is important since strategy scholars and practitioners should be able to explain how competitiveness can be sustained (Makadok et al., 2018), and which strategies work best, such as entering new markets quickly, exploring new windows of opportunity, as well as improving innovation capabilities (Park, 2018). By assuming that established businesses cannot respond effectively to disruption—let alone initiate it—theory can offer little constructive guidance to management researchers or practitioners (King and Baatartogtokh, 2015). The success of large technology firms (including the so-called "FANG" firms) suggests that at least some incumbents have the potential to move, shape, and indeed disrupt markets. Interestingly, there is evidence that disruption or dethronement of established firms has become less frequent after the millennium, while it was more prevalent in 1990s (Bessen et al., 2020). Therefore, a gap remains between the original framing of disruptive innovation theory as

entrant-oriented, low-end disruption, and the disruption recently witnessed in the markets. In proposing an extension to disruption theory, we argue that disruption should be conceptualized as a market outcome rather than as a process in which various actors play predetermined roles. This honors Christensen's (1997) original intention by explaining how new actors enter the market while existing firms fail (outcome), but relaxes any assumptions about the actors contributing to this dynamic (roles) or the ways in which they enter and disrupt markets (process).

Our study makes two main contributions. First, we develop an account of disruptive innovation that does not directly specify any scope conditions (e.g., low-end disruption, new market disruption). Rather than focusing on the source of disruption (technology or market type), our perspective is more open-ended, defining disruption as a *market outcome in which new offerings successfully challenge established ones in the given market*. Importantly, this definition does not rule out established, or any other types of firms or ecosystems who develop and deliver offerings, as disruptors. Second, this definition lends itself to our empirical investigation of whether and how established firms pursue disruptive innovation. Using a longitudinal approach, we analyze the press releases of 101 S&P 500 firms during the period 2005–2014 to explore how and to what extent large established businesses communicate about disruptive innovation. We also draw on relevant secondary sources to assess subsequent market outcomes up until 2019.

Our findings have important implications for the theory and practice of disruptive innovation. First, qualitative content analysis triangulated by publicly available sources reveals that established firms' communications make relatively few references to disruption, and when they do, the term is assigned differing meanings. Our analysis of ten years of press releases from 101 S&P 500 companies identified only 41 unique cases in which "disruption talk" clearly aligned with our theoretical definition while many of the other mentions could be considered "cheap talk." On closer inspection, the disruption-related press releases proved revealing; while many of the successful outcomes of disruption were based on incumbent firms' own technologies, only a few involved setting up a separate business unit to that end. We also found other evidence of how incumbents typically pursue disruptive innovation, including investment in or partnering with startups and innovative firms, as well as recruitment of disruption-oriented managers. Overall, the study addresses recent calls for clarification of incumbents' role in disruption and the question of whether disruption can be managed proactively by being anticipated ex ante (see Hopp et al., 2018). Our findings suggest that, by building on their strengths—for instance, through innovative expansion of core technologies

and capabilities—incumbent firms can initiate disruptive innovation to achieve positive market outcomes. To that extent, disruptive innovation may present an opportunity as well as a threat for established firms seeking to leverage growth and renewal through market expansion and diversification.

## 2 Disruptive innovation in theory and practice: a new outcome-based conceptualization

*Disruptive innovation* (Christensen, 1997) is perhaps the most widely appraised term in management theory outside academia. Given such widespread interest among practitioners, it is perhaps inevitable that many academics have questioned its applicability, boundaries, and generalizability (e.g., King and Baatartogtokh, 2015; Markides, 2006). Revisiting the case studies that grounded the original theory, King and Baatartogtokh (2015) found that the evidence was in fact quite limited. Indeed, since the concept was first introduced (Christensen, 1997; Christensen and Rosenbloom, 1995), there has been lively debate around what constitutes disruptive innovation (Christensen, 2006; Christensen et al., 2015; Hopp et al., 2018; Markides, 2006; Millar et al., 2018; Nagy et al. 2016) and whether the theory is applicable in real-word contexts (King and Baatartogtokh, 2015). For all that, it seems clear that the theory has a significant practical relevance, it remains important to assess its applicability and, as we will argue, its potential for refinement, as suggested by Christensen et al. (2015).

In line with the original definition, Christensen et al. (2015) defined disruption as a "process whereby a *smaller company with fewer resources* [emphasis added] is able to successfully challenge established incumbent businesses." Specifically, this view holds that disruption has its origins in low-end or new markets. In the first case, the disrupters target unserved low-end customers by offering an inferior technology, subsequently encroaching on incumbents' high-end customers when the technology has developed sufficiently to meet those customers' needs (Adner, 2002; Christensen, 2006; Christensen and Raynor, 2003; Danneels, 2004; Schmidt and Druehl, 2008). In the latter case, disrupters create a completely new market from which they can expand into the incumbents' market over time (Govindarajan and Kopalle, 2006; Schmidt and Druehl, 2008). In either case, it can be argued that disruption occurs primarily because incumbent firms are only good at sustaining innovation—that is, offering enhanced versions of existing technologies to existing customers—and so risk becoming "Sleeping Beauties" (Dabrowska et al., 2019). This "success syndrome" (O´Reilly and Tushman, 2016) causes incumbents to systematically delay their response to disruptive

threats (Christensen, 1997). By leveraging low-end customer or new market demand, entrants can ultimately address the needs of higher-end customers, by which time it is too late for incumbents to respond (Christensen, 1997; King and Baatartogtokh, 2015).

The core message of the original theory of disruptive innovation, is that competitiveness tends not to be sustained (Christensen, 1997). However, this is fundamentally problematic from a strategic management perspective, as there is a need to explain how firms can sustain their competitiveness (see e.g., Teece et al., 1997), as disruption affects corporate operations and strategy (Sainio and Puumalainen 2007), and can sometimes be deliberately initiated (Hang et al., 2015). Christensen (1997) was clearly aware of this contradiction and offered incumbents strategic guidance on dealing with the threat of disruption. For example, he argued that an autonomous and separate business unit must be established as a necessary condition for successful disruptive innovation, a feature that has been recognized later by many others (see Crockett et al., 2013; O´Reilly and Tushman, 2016).

Therefore, it is problematic to assert categorically that incumbent firms cannot engage in disruption, even if less inclined to do so; indeed, it has been argued that these assumptions may not always hold (King and Baatartogtokh, 2015). Additional critiques and related extensions contend that disruption takes different forms (such as business model or product innovation) and occurs in different ways (Markides, 2006), and that patterns of technological and market disruption also differ (Schmidt and Druehl, 2008). Recent research has also highlighted market and industry contexts that may be more susceptible to disruptive innovation (Keller and Hüsig, 2009; Klenner et al., 2013), the capabilities needed for disruption (Hang et al., 2015), and how existing markets interact with new disruptive entrants (Ansari et al., 2016). Nevertheless, it remains unclear how incumbent firms can develop the necessary capabilities and strategies to create disruption and innovation (Assink, 2006; Yu and Hang, 2010, 2011).

Rather than criticizing existing versions of disruption theory, we contend that the challenge is that these typically focus on low-end and new market disruption by small firms in unserved markets. Indeed, it has been argued that the original theory's predictions have not always been realized empirically when the conditions are strictly interpreted (King and Baatartogtokh, 2015). For the same reason, newer definitions of disruptive innovation—for example, as "an innovation with radical functionality, discontinuous technical standards, and/or new forms of ownership that redefine marketplace expectations" (Nagy et al., 2016)—are narrow as they limit the scope conditions under which incumbent firms are challenged by entrants.

We argue that disruptive innovation should be defined in terms of distinctive market outcomes, with no ex ante scope conditions; in other words, the definition should include the

core ideas of actors or entities that are disrupted, those that disrupt, and the "act" of disruption. In defining disruption as *a market outcome in which new offerings successfully challenge established ones in the given market*, disruption becomes the dependent construct, and the explanatory constructs define its scope conditions within a given research design. Here, offering refers to a non-exclusive list of new products, services, or business models (Markides, 2006). Importantly, this definition does not rule out Christensenian (i.e., low-end or new market) disruption but also accommodates alternative drivers or processes of disruption. Nor does this definition either exclude or insist upon the role of large incumbent firms as potential disrupters.

The benefit of this broader definition is that it allows us to analyze the phenomenon of disruptive innovation from different perspectives. For instance, one can extend the theory to explain how an established firm like Apple could disrupt the mobile phone market and challenge incumbents like Nokia by introducing iPhone/iOS. Similarly, in contrast to the pure Christensenian view (Christensen et al., 2015), our perspective allows for Uber being a disruptive innovator. In suggesting that any actor can disrupt and potentially dethrone established offerings, our definition invites us to ask how such firms succeed in doing so. However, as disruption need not entail full dethronement (see Christensen, 2015; Yu and Hang, 2010), the phrases "successfully challenge" and "in the given market" usefully narrow the scope of competition. For example, a disrupter might be dominant in another market, perhaps enabling it to intervene more effectively in the focal market of interest.

In light of our definition, answering the question "Why and how do firms fail?" (Christensen, 1997) will enhance our general understanding of how firms can sustain their competitiveness. However, disruptive innovation theory might reasonably challenge the assumption that dominant firms' competitiveness can be sustained indefinitely. For that reason, it seems important to explore how firms might maintain their advantage as "transient" or temporary (D'Aveni et al., 2010), along with related capabilities (Teece et al., 1997).

In the remainder of the study, we will empirically explore whether and how established businesses can respond to and/or pursue disruptive innovation. Focusing on large established S&P 500 businesses, our qualitative content analysis addresses a number of questions. Do the data support the widely held assumptions about incumbents' role in disruption? Do firms engage in "cheap talk," using the concept too loosely as suggested by Christensen et al. (2015)? Do incumbents pursue initiatives such as establishing separate business units or collaborating with disruptive players as suggested in the relevant literature (Crockett et al., 2013; Powell, 2010; Wan et al., 2015), and what eventual market outcomes do such initiatives achieve?

## 3 Methodology

We analyzed "disruption talk" in the press releases of S&P 500 firms, supplemented by secondary sources. Press releases are known to be a useful data source in innovation research (Antons et al., 2020) and more broadly in analyses of business communication (Henry, 2008). As S&P 500 -listed firms are among the most valuable firms globally, the press release data indicate how large incumbent firms in various industries talk about disruption and what subsequently happens. As these firms are also obliged to inform stakeholders about important changes related to their business, we expect to find information about responses to disruptive threats, as well as any intent to pursue disruptive innovation, given the likely monetary impact of any such developments (Christensen, 1997). On that basis, we confined our attention to press releases of firms that remained on the S&P 500 stock index throughout the 10-year period 2005–2014 whose press releases were readily available on their public website, and on the latter publicly available evidence of disruption outcomes until the end of year 2019. This yielded a sample of 101 firms, providing a broad dataset for longitudinal analysis, which was crucial in analyzing how disruption outcomes (if any) unfolded over time. To collect the data, several research assistants were deployed to scan corporate web pages and to collect all non-repeating content, excluding for example "About" or "Contact" items in each press release for the 10-year period. To mitigate errors in data collection, we programmatically removed exact duplicates or press releases whose content was found in its entirety in other releases (amounting to 2,835 items). After filtering, the final sample included 93,770 press releases issued by the selected firms within the given timeframe.

We then identified press releases in which the keyword "disrupt" was mentioned at least once, searching programmatically for those that included the substring "disrupt*" (that is, all press releases that used any variant such as *disruption*, *disruptive*, or *disruptive innovation*). In total, 1,203 press releases referred in some way to disruption. To further exclude irrelevant content, we read through all of the 1,203 press releases and eventually found that 50 referred to disruption which broadly aligns with our definition and with the previous literature. In other instances, the word was used more generally to refer for example to disruption in the supply chain, natural environment, technical operations, or in a very general fashion. Releases that discussed the same topic were treated as a single "case," leaving a final total of 41 unique cases. To content analyze these 41 cases, the three authors first read and analyzed the press releases individually before collectively identifying themes and patterns describing the sources and nature of disruptive innovation. This was an iterative process, involving multiple rounds

of coding, labeling, and relabeling the identified disruption strategies/activities (five different themes), and the market outcomes (if any) of these disruption intentions (four different categories of success).

As expected, we found that the press releases rarely related to market outcomes and, in some cases, said little about the sources and nature of disruption. Instead, these communications typically referred to actions such as acquisitions or recruitment. For that reason, we collected publicly available online material to triangulate the press release data. We sought to determine whether the desired market outcomes were realized or whether disruption was mentioned only to promote and justify strategic decisions to various stakeholders.

Because of the ambiguity of some press releases, the nature of disruption, and/or the limited secondary data, we could not always trace the latter outcomes. We finally categorized market outcomes as "failure" (where we found clear evidence of market failure); "intractable" (where we could not reliably determine the market outcome as failure or success); "potential success" (where we found some non-definitive evidence of market success); and "success" (where we found clear evidence of market success). We acknowledge that "success" does not necessarily imply existing offerings in the market were disrupted by the new offering, yet because the S&P 500 firms themselves communicated about to pursue or respond to disruption, and because disruption does not necessitate full dethronement, market success still likely represents a disruption outcome.[1] Also, in some cases, we were also better able to determine the success or failure of competing offerings in the given market, and our category scheme should therefore provide a meaningful sense of how disruption is perceived, how it unfolds, and whether it matters.

## 4 Results

First, it is worth noting that the number of disruption-related press releases (50 out of 93,770) was remarkably low, as S&P 500 managers should be very familiar with the term *disruption* as a ubiquitous business concept, with significant monetary implications for established businesses and their stakeholders. By way of comparison, 18,585 (19.8%) of the press releases mentioned the word "innovat*", indicating that these firms are at least somewhat innovative.

[1] Tracing the success of a focal offering, though difficult, is much easier than tracing disruption, as the latter also involves looking at the market success and failure of competing offerings. Without the press release data, however, we would be even less confident that the positive or negative market outcomes reflect "true" disruption. This may help to resolve the seeming disconnect between our big data-based analysis of the press releases to identify disruption "cases" and the subsequent content analysis (see also Tidhar and Eisenhardt, 2020).

The bare statistics suggest that established firms do not often perceive disruption as a significant threat, and/or that disruptive innovation is not seen as a highly common strategy.

When talking about disruption, most firms used the term quite generically. For example, CenturyLink described their products as "disruptively low price/cost" (e.g., June 20, 2005; July 31, 2006), and Verizon Communications went so far as to claim that "along with Fios, these networks are the most disruptive technologies the world has seen" (Sep. 9, 2009). Nevertheless, as a general theme, all 41 cases referred in some way to *how* to pursue disruptive innovation "internally" or how to deal with external disruption. Most related to the former, describing concrete actions for pursuing disruptive innovation rather than engaging in "cheap talk". In this regard, we identified six distinct strategic approaches: investment in disruptive firms; own offerings (products, services, or business models); partnering for disruption; platform strategies; recruitment; and setting up a separate technology unit. These are summarized in Table 1, along with frequencies and identified market outcomes (see end of Methodology section for an explanation how market outcomes were identified). The online appendix provides further details and illustrative evidence for each case.

**Table 1.** Disruption cases categorized thematically and by market outcome

| Market outcome/ Strategy | Failure | Intractable | Potential success | Success | TOTAL |
|---|---|---|---|---|---|
| ***Investment in disruptive firm*** | 2 | 5 | 1 | 4 | 12 |
| | 3M (1), GE (1) | Becton Dickinson (1), Comcast (1), JPMorgan Chase (1), Kimberly Clark (1), Microsoft (1) | 3M (1) | M&T Bank (1), 3M (2), CenturyLink (1) | |
| ***Own offering*** | 2 | | 5 | 3 | 10 |
| | Microsoft (1), Yahoo (1) | | 3M (1), Northrop Grumman (1), Raytheon (1), GE (1), Newell Rubbermaid (1) | Raytheon (1), Air Products (1), GE (1) | |
| ***Partnership aiming for disruption*** | | | 1 | 1 | 2 |
| | | | 3M (1) | Raytheon (1) | |
| ***Platform strategy*** | 1 | 2 | 2 | 4 | 9 |
| | Yahoo (1) | AT&T (1), Oracle (1) | Microsoft (1), Oracle (1) | Microsoft (1), Oracle (1), Amazon (1), Verizon Communications (1) | |
| ***Recruitment*** | 1 | 4 | | | 5 |
| | Time Warner (1) | Microsoft (2), Newell Rubbermaid (1), Northrop Grumman (1) | | | |
| ***Separate technology unit*** | | 3 | | | 3 |
| | | Microsoft (2), Oracle (1) | | | |
| **TOTAL** | 6 | 14 | 9 | 12 | 41 |

As shown in Table 1, all of the identified strategic approaches are mentioned more than once, and no single firm accounts for all mentions of any one approach, enhancing the generalizability of our findings. Many of the firms pursued more than one strategy; when market outcomes were tractable, these were mostly positive (nine potentially successful + 12 successful) rather than negative (six failures). While this might indicate a bias toward positive communication, market outcomes in most cases were found to be tractable only a few years after the original press release. On that basis, we can conclude that once a large established firm publicly pursues disruption (however rarely), this is likely to result in at least modest success. This is an intriguing finding, as the extant theory argues, to the contrary, that established firms struggle to deal with disruptive innovation, let alone initiating it.

More specifically, Table 1 shows that the firms in our sample commonly invested in external firms (12 cases, mostly startups) to pursue disruptive innovation. In this regard, 3M was especially active, announcing investments in Ecovative Design (May 24, 2011), Zephyr Technology (April 16, 2012), and Mersive (October 24, 2012). All of these were identified as successful or potentially successful investments (please see the online appendix for quotes from the press releases and specific evidence about market outcomes in each case). However, 3M's investment in Pixel Qi (September 9, 2011) was not successful, as that company later went into bankruptcy. Nevertheless, our finding that there were more successful investments than failures (although as many were intractable) suggests that investment in a disruptive firm is an effective way for an established firm to pursue disruption. This is clearly consistent with the Christensenian view that disruptive innovation is best pursued through an external firm or an independent business unit to avoid internal resistance. Partnerships were also utilized to exploit the benefits of external organizing, although only in two cases. For example, as announced on November 9, 2006, Raytheon partnered with Alliant Techsystems to develop a new missile system for the Israeli army in what can be viewed as a disruptive move, as the old system was apparently replaced in its entirety. In three cases, an external business unit was set up to pursue disruptive innovation; for example, Microsoft set up the Search Technology Center (announced in June 17, 2008) to "accelerate Microsoft's investments in Live Search and disrupt the search and advertising marketplace." However, in this and other simmilar cases, it proved difficult to track down specific performance outcomes.

Surprisingly, the second most common way of pursuing disruption was to introduce new internally developed disruptive products, services, or business models (i.e., own offerings). Of 10 such cases, only two resulted in failure while the rest were at least potentially successful. For example, on March 26, 2007, General Electrics announced that "Our success with compact ultrasound is a testament to GE's ability to invest in game-changing, disruptive technologies that continue to generate organic growth." Although this sounds sensationalist, GE is still among the leading players in today's general imaging ultrasound systems market (at 2020). These and other examples confirm that large established firms are capable of pursuing disruption internally, contradicting the prevailing view that internal resistance inhibits such pursuits. Certainly, the failures are an argument against internal development, and commercialization of disruptive innovations is challenging; for example, Yahoo launched their web browser Axis with the following words: "…consumer-facing search is ripe for innovative disruption… With Axis, we have re-defined and re-architected the search and browse

experience from the ground up" (May 24, 2012). This confidence proved unfounded, as the browser was discontinued a year after launch.

The third most frequent (and perhaps most contemporary) disruptive innovation strategy is the so-called "platform strategy"—setting up a platform to gain from disruptive innovations introduced by third-party complementors. Our findings suggest that this approach is very successful, with six (potential) successes and just one failure, with two intractable cases. In our sample, Amazon Web Services (AWS) and Redshift were among the clearest successes, as predicted by Kurt Brown, Director of Data Science and Engineering Platform at Netflix, in Amazon's press release (November 28, 2012): "We're very excited about the cost-disruptive and cloud-based model of Amazon Redshift. It's sure to shake up the data warehousing industry." AWS contributed to the success of Netflix, with indirect benefits for Amazon. In contrast, Yahoo's Search BOSS (Build your Own Search Service)—originally hyped as enabling "…developers and companies to build world-class custom search experiences and disrupt the search industry." (July 10, 2008) —was discontinued in 2016, confirming the well-known challenges of building a critical mass of users in the early platform life cycle to stimulate further growth.

Finally, although the resulting market outcomes were largely intractable, and one resulted in failure, recruitment of managers who are skilled in disruptive innovation also enables established firms to pursue disruption. Netflix managers seem highly regarded in this respect, as evidenced by a Bill Gates quote (March 26, 2007): "Reed's [Hastings, founder of Netflix] track record for delivering innovative and disruptive technologies to market is very impressive… With his rich consumer and technology background, he will be a tremendous addition to our board..." This approach may have contributed to Microsoft's status as one of the most valuable firms on the planet, but again, this is difficult to prove. Clearly, recruiting a "disruptive manager" does not in itself guarantee positive market outcomes; strategic actions must also be implemented, and at worst, a recruit's actions may harm the focal firm. For example, Time Warner recruited Maureen Govern, who was "…CTO at Convergys Corporation, where she was responsible for technology leadership, identifying out-front, disruptive technologies…" (September 28, 2005) and was blamed for a massive customer data leak that occurred shortly after she joined the firm, triggering her resignation.

In summary, the cross-case analysis shows how the established firms that pursued disruptive innovation utilized a number of distinct strategic approaches. In most cases, their efforts proved at least potential success. Perhaps the most utilized and effective approaches

were investment in external firms, developing and commercializing own offerings, and setting up and scaling platforms to benefit from disruption initiated by complementors.

## 5 Discussion and implications

Disruptive innovation (Christensen, 1997) is perhaps the most widely acknowledged management theory, and the most contested one (Hopp et al., 2018; King and Baatartogtokh, 2015; Markides, 2006; Nagy et al., 2016). Following Christensen's (1997) original insight, most of the literature characterizes disruption as something small market entrants do—disrupting large incumbents that fail to recognize new market opportunities. However, business practice and research suggests that disruptive innovation may also be initiated by large incumbent firms using a range of strategies (see for example Crockett et al., 2013; Powell, 2010; Yu and Hand, 2011), and recent evidence shows that the role of entrants and incumbents might have also shifted over time (Bessen et al., 2020).

The present study contributes to this debate by first refining the definition of disruptive innovation, as narrow scope conditions (Whetten, 1989; Suddaby, 2010) may unnecessarily limit understanding of disruption by a heterogeneous set of actors and sources (including incumbents and firms of all sizes). We began by extending the traditional framing of disruptive innovation in terms of low-end and new market disruptions (Christensen et al., 2015) or other specific criteria (e.g., Nagy et al., 2016). Instead, we defined disruption as *a market outcome in which new offerings successfully challenge established ones in the given market*. This approach facilitates more open exploration of all scope conditions (e.g., low-end/high-end, new market, business model disruption) of the dependent construct: the emergence of a new offering that at least partially replaces existing offerings. Second, in line with this refined definition, we conducted an empirical investigation of how large established firms perceive and manage disruption by content analyzing disruption-related press releases from S&P 500 firms during the period 2005–2014. As we analyzed available data until the end of 2019, we were also able to track the market outcomes of these offerings and decisions that firms perceived or communicated as "disruptive."

Our findings suggest that disruption may be less frequent than one might expect; when referred to in the press releases, it was typically used to justify strategic decisions related to investment, recruitment, and technology launches. We also found that the case firms used it to rationalize the success of recent technology or product launches. Surprisingly, although deemed unlikely in the literature (Christensen, 2006; Powell, 2010), many successful outcomes

were based on firms' own offerings (such as novel technologies or digital platforms). Separate business units—a commonly suggested device for incumbent-driven disruption (Christensen and Raynor, 2003; Crockett et al., 2013)—were deployed in only a few instances. Less surprisingly, we also found evidence of how incumbents typically pursue disruptive innovation, including investment in and partnering with startups and other innovative firms (Wan et al., 2015) and recruitment of disruption-oriented managers who might help to ensure the necessary "unlearning" or to counter internal resistance to disruption (Assink, 2006). However, evidence of successful market outcomes was more mixed and unclear in these latter cases. We also found evidence of a contemporary platform-based approach to disruption, where an established platform firm seeks to gain from complementors' disruptive innovation (Ozalp et al., 2018).

### *5.1 Research implications*

The conceptual and practical applicability challenges of disruptive innovation theory call for further addressing its boundary conditions related to 1) actors/entities that disrupt, 2) actors/entities that are disrupted, and 3) the process and outcomes of that disruption. We argue that exploring these issues in a more open and detailed way can broaden the theory's utility for researchers and practitioners. Thus, the Christensenian view of disruption (Christensen, 1997; Christensen et al., 2015), although useful in appropriate contexts, may be too specific (King and Baatartogtokh, 2015; Millar et al., 2018), making further examination and refinement difficult. Similarly, any singular view of disruption may make it difficult to formulate constructive advice for practicing managers in established firms by implying that it is almost impossible to sustain competitiveness (King and Baatartogtokh, 2015), despite recent evidence to the contrary in the successes of large-scale firms—for example, in the platform and cloud computing sectors (see Nieuwenhuis et al., 2018). In the interests of constructive theory development, we call for more inquiry into existing definitions, operationalizations, and empirical measurement of disruptive innovation. New literature streams on market susceptibility to disruption (Keller and Hüsig, 2009; Klenner et al., 2013) and how incumbents and new players interact during the process of disruption (Ansari et al., 2016; Zhang et al., 2019) are already making progress in this regard. Our results provide further backup for scholars to explore the potential and the boundaries of disruptive innovation.

As a main empirical contribution, the present study provides evidence of the link between disruption-related strategic decisions made by established firms and eventual market outcomes, following the proposed process-neutral definition of disruptive innovation. By

tracking instances of disruption initiatives such as product launches, investments, alliances, and recruitment, we were able to identify six kinds of strategy that firms deploy to disrupt markets. Our findings point to heterogeneous motives, as firms' disruption activities involve a number of strategic approaches that extend beyond the original Christensenian view of low-end disruption (Christensen, 1997) or new market disruption (Govindarajan and Kopalle, 2006; Schmidt and Druehl, 2008). While this suggests that some firms may be "misusing" the construct, we found that they nevertheless remained focused on a relevant and consequential disruptive aspiration (i.e., emergence of new offerings with the potential to replace existing ones).

Our results also shed light on incumbents' capability (or lack thereof) to translate disruption-related strategic intent into actual disruption, which can prove challenging for established firms because of behavioral and other barriers (Assink, 2006; Park, 2018). Our finding that the firms in our sample discussed disruption quite infrequently, and in some cases engaged in "cheap talk" instead, indicates that large established firms may not be very good at disruption, which aligns with the classic views. However, firms that really communicated and took action to make disruption happen clearly employed a range of distinct strategies. While many of these approaches draw on existing theory (e.g., setting up a separate business unit or partnership), we found that investing in and commercializing own offerings may also prove effective. This view extends the understanding of factors which can leverage a disruption potential (see Millar et al., 2018). Additionally, many of these firms successfully employed the relatively new platform strategy (e.g. Nieuwenhuis et al., 2018) to leverage third-party innovation. Despite the challenges of successful upscaling (e.g., Ozalp et al., 2018), this approach may suit incumbent firms with more resources, without having to overcome internal resistance.

### *5.2 Managerial implications*

Examining "disruption talk" in practice shows that labeling something as disruptive may be a good communication tool but does not ensure the success of a given technology. On the other hand, we also found some evidence that several of the identified strategies may prove valuable for established firms struggling for strategic renewal in their attempts to compete with nimble entrants with more flexible organizational structures.

Our study identified many practical examples of how incumbent firms can manage disruption, including partnering with and investing in disruptive start-ups, launching products with potentially disruptive features, or setting up technology platforms. However, it is difficult

to identify best practices because disruption often comes as a surprise, making it difficult for incumbents to prepare in advance. Managers should therefore adopt a context-aware approach, analyzing disruption in relation to the firm's business model and innovation project portfolio. Some innovation efforts might target sustaining current trajectories in existing markets; others might track potentially disruptive developments in other markets and segments. Neither should be overlooked in a world characterized by temporary competitive advantage and the increasing dynamism of markets and technologies.

### *5.3 Limitations and further research*

As our sample was confined to firms that remained on the S&P 500 index during the years 2005–2014, we could not achieve an unbiased estimate of the prevalence of disruption efforts and resulting market outcomes among larger firms in general. For example, some firms may have dropped out of the index as a consequence of disruption, in which case we would be overestimating the success of established firms' disruption efforts. Nevertheless, our qualitative examination provided interesting evidence demonstrating that established firms *can* successfully pursue disruptive innovation. This is a crucial insight, as the existing literature largely assumes that established firms cannot cope with disruption. In future research, it would useful to more systematically assess the success and failure rates of the identified strategic approaches among both incumbents and entrants. Also, building on our suggested definition of disruptive innovation, more research is needed to examine the range of strategies and processes leading to disruptive market outcomes.

Our approach to identifying cases of disruption also assumes that the firms openly and knowingly used the term "disruption" in their press releases. Conceivably, disruption might occur without being communicated and/or without using the term "disruption." As identifying market outcomes also proved challenging in some cases, future research should develop more objective measures of disruption and resulting market outcomes to assist quantitative analysis.

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**Appendix A** Disruption themes in the press releases of S&P500 firms in 2005-2014, sorted via disruption strategy category

| Strategy category | Firm | Date of press release | Market outcome | Representative quote from corporate communication (mention of disruption in bold) | Remarks |
|---|---|---|---|---|---|
| Investment in a disruptive firm | 3M | 2011-05-24 | Success | Ecovative Design, LLC, the world leader in mycelium-based materials science, today announced that a group including 3M (through its 3M New Ventures business), Rensselaer Polytechnic Institute, and DOEN Foundation has invested in the company... "Ecovative has the kind of **disruptive**, breakthrough technology that can be a game changer in various industries including automotive, construction and architecture," said Stefan Gabriel, President of 3M New Ventures. "We are pleased to be working with Ecovative on the development and deployment of this exciting technology that we believe will enhance 3M's footprint in sustainable polymer technologies. | 3Ms EcoCradle Product has received industry awards, Fortune 500 clients (e.g. IKEA/DELL have replaced packaging materials with EcoCradle products) (https://globalcorporateventuring.com/ecovative-design-packs-3m-funding/) |
| Investment in a disruptive firm | 3M | 2012-04-16 | Success | 3M New Ventures, the corporate venture organization of 3M, announced today that it has invested in Zephyr Technology, a developer of real-time physiological monitoring solutions for well-being applications in healthcare, first responder, sports, military, and industrial markets... 3M New Ventures, headquartered in Munich, Germany, identifies and invests in highly innovative companies and **disruptive** new technologies with strategic relevance for 3M. | Original investment by 3M in Zephyr has resulted in series of further acquisitions. Zephyr has received significant further funding ($2.4M, see http://www.mobihealthnews.com/22288/zephyr-raises-2-4m-for-wearable-health-fitness-monitors). Further, they are gaining significant attention in sporting equipment markets, for example through appearing in Major League Basketball (http://bigstory.ap.org/article/e37ae2fb27494b3dbd985e2da76f605f/ap-newsbreak-mlb-approves-wearable-technology). Covedien has bought Zephyr in 2014 (http://www.mobihealthnews.com/32797/exclusive-covidien-acquires-bioharness-maker-zephyr-technology). Zephyr has its own webstore (https://www.zephyranywhere.com/) |
| Investment in a disruptive firm | 3M | 2012-10-24 | Potential success | "Combining Mersive software with 3M's projection and display technology, will produce affordable, easy-to-install, high quality display systems that foster interaction, facilitate decision making and cultivate creativity," said Stefan Gabriel, president of 3M New Ventures. "As part of this agreement, 3M and Mersive will closely collaborate to develop projection and display systems that achieve higher levels of performance and ease of use than products currently on the market." 3M New Ventures, headquartered in Munich, Germany, identifies and invests in highly innovative companies and **disruptive** new technologies with strategic relevance for 3M. | Evidence of successful commercialization, and potentially of disruption. For example, "One thing Mersive CEO Rob Balgley thoroughly enjoys about his job is telling engineers that Boeing just ordered five licenses of their product, news that surely brings pause to their 10-12 daily hours of writing code." (http://www.builtincolorado.com/2015/02/16/mersive-has-breakout-year-2014-sells-3m-solstice) |

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| Investment in a disruptive firm | 3M | 2011-09-12 | Failure | Stefan Gabriel, president of 3M New Ventures said, “Pixel Qi’s technology enables displays of such lower power and high usability that the vision of ubiquitous displays comes much closer to realization. In combining Pixel Qi’s **disruptive** display technology with our technology platforms, we can create new business opportunities in the consumer and commercial markets for 3M.” | The investment in Pixel Qi turned out as failure, as it has gone out of business (e.g., http://goodereader.com/blog/electronic-readers/pixel-qi-is-officially-out-of-business). |
| Investment in a disruptive firm | Becton Dickinson | 2014-05-20 | Intractable | There is an incredible market opportunity for startups looking to **disrupt** the healthcare and medical industry by combining medical and information technologies, said Albert Lauritano, Director of Business Development, BD Technologies, who is responsible for BD’s strategic technology partnerships. Working with entrepreneurs to bring new products and services to the market provides a great opportunity to support the next generation of world-class companies and help them accelerate their business with BD’s global industry expertise. BD has been looking at opportunities for technology partnerships in Israel in particular in order to take advantage of the innovation ecosystem of entrepreneurs, technology and technical capability, infrastructure and government support. This cooperation provides BD with a proven partner in Microsoft to meet our corporate purpose of "Helping all people live healthy lives". | Evidence of latter success not available (no particular start-ups named) |
| Investment in a disruptive firm | CenturyLink | 2005-03-07 | Success | SAVVIS continues to expand the scope of its product offerings to include a broad range of advanced managed network and hosting services which uniquely address the mission critical requirements of financial customers. In addition, SAVVIS delivers application services delivered via its global IT infrastructure that address specific workflow issues in the financial services industry. These solutions enable electronic trading, deliver direct data feeds from leading exchanges such as Nasdaq, and provide normalized, raw data feeds using a unique utility model and multicast technology. Most recently, SAVVIS introduced virtualized utility services from which financial companies, large and small, can select a unique mix of server, storage, and network capacity that enables on-demand scalability and improved availability at a **disruptively** low cost. | Savvis was a portfolio company of CenturyLink and before being fully acquired for $2.5 billion in 2011, Savvis' revenue was almost US$1 billion. |
| Investment in a disruptive firm | CenturyLink | 2005-06-20 | Success | DDU by SAVVIS is a high-performance cost-effective utility service that seamlessly integrates technology from HyperFeed Technologies (OTCBB: HYPR.OB) with SAVVIS’ global network offering, creating an ultra low-latency solution that accesses real-time direct data sources and answers the call of financial services firms that have traditionally relied on maintaining expensive ticker plants and slower consolidated feeds. Direct feeds offer firms high performance at a high cost, while consolidated feeds offer very low performance at an average cost. DDU provides firms with the best of both worlds – high performance, ultra low- latency access at a **disruptively** low price point. | Savvis was a portfolio company of CenturyLink and before being fully acquired for $2.5 billion in 2011, Savvis' revenue was almost US$1 billion. |

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| Investment in a disruptive firm | CenturyLink | 2005-08-22 | Success | SAVVIS delivers application services delivered via its global IT infrastructure that address specific workflow issues in the financial services industry. These solutions enable electronic trading, deliver direct data feeds from leading exchanges such as Nasdaq, and provide normalized, raw data feeds using a unique utility model and multicast technology. Most recently, SAVVIS introduced virtualized utility services from which financial companies, large and small, can select a unique mix of server, storage, and network capacity that enables on-demand scalability and improved availability at a **disruptively** low cost. | Savvis was a portfolio company of CenturyLink and before being fully acquired for $2.5 billion in 2011, Savvis' revenue was almost US$1 billion. |
| Investment in a disruptive firm | CenturyLink | 2006-07-31 | Success | SAVVIS continues to expand the scope of its product offerings for the financial services industry. These offerings include a broad range of advanced managed network and hosting solutions tightly integrated with market data feeds, thousands of financial institutions, and leading financial application services providers. SAVVIS financial services solutions enable electronic trading and straight through processing, deliver direct data feeds from leading exchanges such as Nasdaq, and provide normalized, raw data feeds using a unique utility model and multicast technology. In addition, SAVVIS is a leader in delivering virtualized IT utility services from which financial companies, large and small, can select a unique mix of server, storage, and network capacity that enables on-demand scalability and improved availability at a **disruptively** low cost. | Savvis was a portfolio company of CenturyLink and before being fully acquired for $2.5 billion in 2011, Savvis' revenue was almost US$1 billion. |
| Investment in a disruptive firm | CenturyLink | 2013-10-08 | Success | Savvis' introduction of business solutions comes as market demand continues to rise for utility-driven IT products and services that are aligned to meet elevated business objectives. "Sourcing practices risk losing their value unless they closely link to business strategy," writes Forrester Research Inc. principal analyst Liz Herbert in the May 2013 report "Sourcing Digital **Disruption**." | Savvis was a portfolio company of CenturyLink and before being fully acquired for $2.5 billion in 2011, Savvis' revenue was almost US$1 billion. |
| Investment in a disruptive firm | Comcast | 2010-10-21 | Intractable | Kleiner Perkins Caufield & Byers (KPCB) today announced the sFund, a new $250 million initiative to invest in entrepreneurs inventing social applications and services. Amazon.com, Facebook, and Zynga, the leading companies defining today's social and online environment; entertainment and media leaders Comcast and Liberty Media, and Allen & Company LLC, have committed to invest in the sFund and serve as strategic partners. The sFund will provide financing, counsel, and relationship capital for a new generation of entrepreneurs to deliver on the promise of the social web... Mark Zuckerberg, CEO of Facebook, said, "The Web is being rebuilt around people, and we're at a point where any app, website, or device can be designed to be social from the ground up. We're focused on enabling entrepreneurs to build companies that can **disrupt** their industries." ...Brian Roberts, chairman and CEO of Comcast Corporation, said, "Social businesses play an increasingly important role in our entertainment and communications products. We're very pleased to be a part of the sFund and look forward to seeing the great innovations that are generated from its investments." | Leveraging growth through investing in startups, (no latter evidence of success available) |

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| Investment in a disruptive firm | GE | 2011-08-30 | Failure | "At Khosla Ventures we invest in technologies with the potential to **disrupt** their industries," said founder Vinod Khosla. "The latest round of orders Danotek has received for its permanent magnet generators is just the beginning. We look forward to Danotek's continued growth by means of company innovation, partnerships, and customers across the globe. Danotek's products improve the efficiency and reliability of the drive-train, which is critical for its customers. We've been impressed by its proven commercial traction and increased our investment so Danotek can continue to grow its customer base and extend its product line," said Rachel Sheinbein, partner at CMEA Capital. "We believe that the company is well-positioned to become a leading force in the wind energy industry." | The investment in Danotek turned out as failure, as it has gone bankrupt (e.g. https://www.sec.gov/Archives/edgar/data/1537435/000153743513000016/tgns1-ex1011danotek5300apa.htm) |
| Investment in a disruptive firm | JP Morgan Chase | 2012-10-09 | Intractable | Larry Feinsmith, who focuses on technology strategy and innovation for JPMorgan Chase, makes regular visits to Silicon Valley to ensure the bank stays connected to the latest startups. Feinsmith noted "The partnership with the venture and entrepreneurial community is critical to our success. We have partnered with hundreds of venture backed companies over the past few years and we feel now, more than ever, there is a tremendous amount of exciting and **disruptive** technology being created in the Valley." | Exploring for potentially disruptive innovations, and investing in technology startups (no latter evidence of success available) |
| Investment in a disruptive firm | Kimberly Clark | 2014-12-04 | Intractable | The Kimberly-Clark Digital Innovation Lab (D'Lab) is bringing open-source innovation to the consumer package goods category with the second annual KChallenge startup competition at the 2015 Consumer Electronics Show (CES) in Las Vegas, Nevada. The winning startup will receive the opportunity to pilot a project with one of Kimberly-Clark's global brands such as Kleenex, Huggies, Depend, Scott or Kotex... "Our focus is to be the orchestrators and facilitators of innovation by tapping into the outside world," said Sirkin. "We want the world to be our laboratory, and through events such as the KChallenge and CES, we want to tap into all the **disruptive** ideas that will connect us to the future first." | Exploring for potentially disruptive innovations through facilitating an innovation contest for startups (no latter evidence of success available) |
| Investment in a disruptive firm | M&T Bank | 2010-04-27 | Success | Hundreds packed Storer Auditorium at Onondaga Community College to hear five finalists make the ultimate pitch in NY's Creative Core's $200,000 Emerging Business Competition. The live presentations before a panel of distinguished judges, including nationally recognized financial experts, venture capitalists, and investors is the last competition challenge before one finalist wins a $200,000 investment. "Our judges bring a wealth of experience in investing and business development, and have the ability to recognize promising companies," said Allen J. Naples, regional president, Syracuse Division of M&T Bank and title sponsor... GeneWeave Biosciences, LLC, Ithaca: GeneWeave Biosciences is commercializing a **disruptive** bacterial detection technology developed at Cornell University. The diagnostic testing technology will rapidly determine drug resistance and toxicity of bacteria with results accurate to the genetic level, while requiring no laboratory or expensive equipment, at one tenth the production costs of competitors. www.geneweavebio.com | Exploring for potentially disruptive innovations through facilitating an innovation contest for startups. Resulted in major success and buyout by Roche on a contestant labelled as "disruptive": (https://www.fiercebiotech.com/financials/roche-bags-antibiotics-diagnostics-tech-425m-geneweave-buyout) |

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| Investment in a disruptive firm | Microsoft | 2008-05-28 | Intractable | The Microsoft HealthVault Be Well Fund has been designed to stimulate not-for-profit research and development across a broad range of health disciplines that have the potential to significantly improve health and outcomes for patients. The Be Well Fund will help seed innovative avenues of research and explore the potential for **disruptive** improvements to health management enabled by reuse and sharing of data between people, families, caregivers, doctors and facilities. The HealthVault Be Well Fund was announced at the Healthcare Information and Management Systems Society (HIMSS) 2008 Annual Conference & Exhibition in February 2008. | HealthVault contest: Funding external innovation to explore disruptive ideas (no latter evidence of success available) |
| Investment in a disruptive firm | Microsoft | 2008-06-10 | Intractable | The Microsoft HealthVault Be Well Fund request for proposal (RFP) recipients were named today at the second annual Microsoft HealthVault Solutions Conference. The 15 recipients represent a wide range of inventive online solutions designed to address significant health issues, such as childhood obesity, medication reconciliation, gathering and dissemination of mobile health information, diabetes management, and ways to help people manage their health more effectively... The Be Well Fund is designed to stimulate not-for-profit research and development across a broad range of health disciplines that have the potential to significantly improve health and wellness outcomes. The Be Well Fund helps seed innovative avenues of research and explore the potential for **disruptive** improvements to health management enabled by reuse and sharing of data among people, families, caregivers, doctors and facilities. | HealthVault contest: Funding external innovation to explore disruptive ideas (no latter evidence of success available) |
| Own offering | 3M | 2013-04-30 | Potential success | 3M, the market leader in professionally applied protection films, is **disrupting** the traditional notions of vehicle paint protection. The new 3M™ Paint Defender System harnesses the power of 3M technology by spraying on as a liquid before transforming into a clear, durable film. The addition of Paint Defender to 3M's current line of professionally applied films provides consumers with a variety of price and performance options to select from. The added barrier serves as a lasting line of defense against everyday hazards on the road, such as road chips, that threaten vehicle appearance. | A product that has been involved in creating a new product category. 3M has put significant effort to commercializing the product, which is available in major stores like Amazon.com (Best seller rank #29 in protective shields category). (e.g. http://www.thecarconnection.com/news/1084925_3m-paint-defender-tested-does-diy-paint-protection-work). |
| Own offering | Air Products | 2012-04-25 | Success | For the third consecutive year, Air Products (NYSE:APD) is a Maplecroft Climate Innovation Indexes (CIIs) Leader... Launched in January 2010, The Maplecroft CIIs are calculated by Bloomberg and based on evaluations by global analysis firm, Maplecroft. For this year's ranking, approximately 1,300 U.S. publicly traded companies with a free-float market capitalization of more than US $1 billion was narrowed to an eligible pool of benchmark organizations engaged in public climate-related programs. From this subset, Maplecroft selected 100 CII Leaders by evaluating over 100 performance criteria across five major climate innovation categories: management systems, mitigation of emissions, emissions reductions, adaptation and innovation. The innovation category, with a focus on **disruptive** technologies and initiatives to capitalize on climate-related opportunities, accounted for 50 percent of the companies' final scores. | External recognition of disruptiveness, the company has been successful later on. |

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| Own offering | GE | 2007-03-26 | Success | GE culminated its performance in 2006 with worldwide compact ultrasound revenue for the fourth quarter of $67.8 million. GE's fourth quarter revenue was significantly higher than competitors in this compact ultrasound arena. "Our success with compact ultrasound is a testament to GE's ability to invest in game-changing, **disruptive** technologies that continue to generate organic growth," said GE Chairman and CEO Jeffrey R. Immelt. "Our engineering research across ultrasound product lines can continue to bring rapid innovation. I am proud of GE's commitment to investing in technologies that help change the way healthcare is delivered to patients." | "In 2016 GE Healthcare manufactured its 17,000th LOGIQ E9, a general imaging ultrasound system that has become the most installed general imaging ultrasound system in history." (10/12/2016, bizjournals) |
| Own offering | GE | 2012-08-31 | Potential success | "We are at work for a healthier India. The Lullaby LED Phototherapy System is a great demonstration of our commitment towards lowering costs, improving access and improving clinical quality. Such **disruptive** technologies can help address a larger vision of meeting India's millennium development goals (MDG4) to reduce infant mortality", said Munesh Makhija, Chief Technology Officer, GE Healthcare South Asia. | Lullaby: Entering new markets (developing countries) with a potentially low-cost disruptive technology. The product is heavily marketed by GE. |
| Own offering | Microsoft | 2013-09-16 | Failure | As Sibos 2013 gets underway, SunGard, Thomson Reuters, Temenos and FreedomPay are announcing new apps for Windows 8 and Windows Phone 8 that will help financial services companies across the world grow their businesses with mobile experiences for employees and customers. According to Gartner, “CIOs see these technologies as **disrupting** business fundamentally over the next 10 years. When asked which digital technologies would be most **disruptive**, 70 percent of CIOs cited mobile technologies, followed by big data/analytics at 55 percent, social media at 54 percent and public cloud at 51 percent.” | Microsoft eventually lost the mobile ecosystem competition to iOS and Android |
| Own offering | Newell Rubbermaid | 2008-02-05 | Potential success | "Graco Sweetpeace is a revolutionary new product that exemplifies how we are using consumer insights, innovation and marketing to build Brands That Matter(TM) to consumers," said Mark Ketchum, Newell Rubbermaid's president and chief executive officer. "The Sweetpeace Soothing Center is a great example of **disruptive** innovation. Once parents see and understand the soothing center concept, a conventional infant swing will no longer be good enough." | Sweetpeace Soothing Center: the product was among the best selling products (e.g., on Amazon) in the category that it created, but it was discontinued later. |
| Own offering | Northrop Grumman | 2014-09-10 | Potential success | The DARPA Microsystems Technology Office awarded Northrop Grumman an $11.9 million contract for phase one of the Arrays on Commercial Timescales (ACT) program... Key subcontractors on the Northrop Grumman ACT team are Semtech and Systems & Technology Research. "Our **disruptive** ultrahigh speed analog-to-digital and digital-to-analog converter technology will help revolutionize phased array technology," said Craig Hornbuckle, Semtech's chief systems architect. | The technology continues to be developed under DARPA's control, Northrop Grumman being a contractor. (see e.g., http://www.array2016.org/) |

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| Own offering | Raytheon | 2013-06-04 | Success | The TekTonic Award honors the most innovative and **disruptive** technologies introduced for use in human resources-related training. The award, launched in 2010, is bestowed based on input from users and industry peers. HRO Today magazine focuses on HR operations and outsourcing... "One of the top challenges facing global training program managers is overcoming language and cultural barriers without sacrificing the core goals of the training," said Dave Letts, vice president, Raytheon Professional Services. "Too much standardization can ignore language nuances and local culture, while too much customization can affect training messages and cost. We've achieved that much-sought-after balance with Catapult and we're pleased that HRO Today is recognizing the efforts of our talented team to address these issues effectively." | Raytheon Catapult is an award winning training & development service (https://www.raytheon.com/ourcompany/rps/content-design-development) |
| Own offering | Raytheon | 2009-03-04 | Potential success | ...taking the fight to the frost with a new system using radio frequency technology. Raytheon's Tempwave™ radiant heating system offers a more efficient way to warm crops and avoid the adverse effects of frost on the growing season. “Our expertise in radio frequency has enabled a **disruptive** product that frees growers from the limits and variations inherent in existing frost protection methods," said Lee Silvestre, vice president Mission Innovation for Raytheon's Integrated Defense Systems. "Tempwave autonomously and precisely delivers energy directly where it's needed to prevent freezing." | Raytheon’s Tempwave technology has been successfully tested (http://istep.ifmefector.com/2013/04/09/radar-technology-stops-fruit-frost/) and used also in different applications (https://www.popularmechanics.com/technology/infrastructure/a21030/solid-state-microwaves/) |
| Own offering | Yahoo | 2012-05-24 | Failure | "Our search strategy is predicated on two core beliefs: one, that people want answers, not links and two, that consumer-facing search is ripe for innovative **disruption**," said Shashi Seth, senior vice president, Connections, Yahoo! Inc. "With Axis, we have re-defined and re-architected the search and browse experience from the ground up." | Axis web browser was discontinued in 2013, only a year after its debut (https://en.wikipedia.org/wiki/Yahoo!_Axis) |
| Partnership aiming for disruption | 3M | 2011-12-12 | Potential success | 3M and Shale-Inland today announced they have entered into a five year commercialization agreement that builds on the strengths of both organizations to offer new-to-the-world product solutions for advancing the development of protective and decorative films in the global primary metal and metal fabrication markets. 3M's expertise in material science technology platforms combines to drive **disruptive** innovation in the market place, while Shale-Inland brings comprehensive expertise in steel and aluminum distribution, stainless steel polishing, stamping and fabrication. | Product (protective laser tape), based on a partnership between 3M and Shale-Inland, is available in the markets. |
| Partnership aiming for disruption | 3M | 2012-02-06 | Potential success | “Our technology partnership with 3M will quickly bring **disruptive** products to the metal production and distribution marketplace,” said Craig Bouchard, CEO and Chairman of Shale-Inland. “Our subsidiary, Main Steel, has been the leading distributor of laser tape in North America since the inception of the product. The new 3M laser tape is the finest protective tape product we have ever seen. I expect several more exciting announcements in the coming months.” | Product (protective laser tape), based on a partnership between 3M and Shale-Inland, is available in the markets. |

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| Partnership aiming for disruption | Raytheon | 2006-11-09 | Success | ...has selected Alliant Techsystems Inc. (ATK) to develop the booster motor for the flexible, affordable and lethal Stunner Interceptor, an element of the Short Range Missile Defense (SRMD) program. "ATK Tactical Systems' composite booster motor solution for the Stunner Interceptor supports our strategy of **disruptive** innovation in the terminal missile defense mission area," said Michael Booen, Raytheon vice president of Advanced Missile Defense and Directed Energy Weapons programs. | A missile system developed for Israeli army by Raytheon (http://www.army-technology.com/projects/stunner-terminal-missile-defence-interceptor-israel/) |
| Platform strategy | AT&T | 2013-09-18 | Intractable | “There are only a few times when you get to participate in a technology **disruption** as big as the one we’re currently experiencing,” said Geisse. “Whether it’s equipping flight attendants with tablets to take orders, embedding technology in cars to connect people to information, or delivering store promotions on mobile devices when a shopper walks into a store, our world-renowned network and expertise is playing a huge role in changing how people live and how companies, government, and institutions like schools and hospitals operate.” | AT&T has demonstrably benefitted from disruptive innovation, such as the emergence of mobile computing devices, due to the increasing need for mobile data infrastructure. However, specific market outcome cannot be distinguished. |
| Platform strategy | Amazon | 2010-12-09 | Success | Amazon Web Services LLC (AWS), an Amazon.com company (NASDAQ: AMZN), today announced M-Dot Network as the winner of the fourth annual AWS Start-Up Challenge. "This year's Start-Up Challenge included finalists from North America, Europe and Asia Pacific, and the record number of applications we received illustrated the global innovation of start-ups running on AWS," said Adam Selipsky, Vice President, Amazon Web Services. "AWS gives businesses access to highly scalable, on-demand technology infrastructure with no upfront investment. The seven finalists are great examples of how businesses today are using AWS to get to market quickly with innovative and **disruptive** ideas, without having to expend significant upfront capital." | AWS is clearly a commercial success, enabling third-party disruptive innovation. |
| Platform strategy | Amazon | 2010-08-18 | Success | "Winning the AWS Start-Up Challenge was a watershed for GoodData," said Roman Stanek, CEO and Founder of GoodData. "It helped validate the cloud as a technically feasible and economically **disruptive** way to deliver Business Intelligence; and exposed us to the rich and diverse community of AWS start-ups and developers. We were born in the cloud - similar to a lot of other cloud companies, we couldn't have built our business without AWS." | AWS is clearly a commercial success, enabling third-party disruptive innovation. |
| Platform strategy | Amazon | 2012-11-28 | Success | "At Netflix, we deliver personalized recommendations for our millions of subscribers by analyzing large volumes of data, and are always looking for ways to improve our service," said Kurt Brown, Director, Data Science & Engineering Platform at Netflix. "We're very excited about the cost-**disruptive** and cloud-based model of Amazon Redshift. It's sure to shake up the data warehousing industry." | AWS (Redshift) is clearly a commercial success, enabling third-party disruptive innovation. |

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| Platform strategy | Microsoft | 2009-11-19 | Success | As further evidence of customers' desire for choice in deployment, Saugatuck Technology Inc., a Westport, Conn.-based research firm focused on emerging and **disruptive** technologies, revealed that software as a service (SaaS)-based solutions are being increasingly linked with on-premise data, applications and processes through Web services-based integration APIs, such as those contained in Microsoft Dynamics ERP, and that although most SaaS vendors with on-premise and cloud-based offerings will not have interoperating versions, or seamless data compatibility through 2011, Microsoft Dynamics ERP will be among the handful of first-wave "hybrid" exceptions. | Microsoft Azure allows for third-party disruptive innovation by enabling them to innovate on focal firm platform (Azure is among global leaders in cloud technology) |
| Platform strategy | Microsoft | 2014-02-11 | Potential success | "We are making BoardConnect available on Windows 8 to give passengers even more choices to use the platform," said Norbert Müller, senior vice president of BoardConnect at Lufthansa Systems. "This makes it easy for airlines to give their passengers a superior in-flight entertainment experience that allows them to watch a wide range of movies, look at flight information and shop, all from their seat." The mobile era is causing a fundamental **disruption** in the aviation industry. With the cloud making technology more accessible than ever, businesses in the aviation industry have to shift and increase their technology investments in areas where they haven't historically focused. Now, technology can be a route to cost savings, growing revenue and staying ahead of the competition. | BoardConnect in-flight app helped expanding into a new unserved market with an existing product (https://newsroom.lufthansagroup.com/english/aviation-services/all/boardconnect-by-lufthansa-systems/s/76b888ec-4dd0-4487-87ea-d8d82f1b43c6) |
| Platform strategy | Oracle | 2013-01-28 | Success | "It is very encouraging to see the delivery of positive results from the fast implementation of Oracle Fusion Middleware and Oracle Exalogic which took less than ten months to complete. The pre-configured and pre-integrated solutions will help Globe improve business agility and become more adaptive to the dynamic changes in the telecommunications industry," said Ying Loong Chin, Vice President, Oracle Fusion Middleware, Oracle ASEAN. "With the breadth and depth of our industry expertise and technology excellence, we are ready to provide telecommunications service providers with more innovative solutions to address multiple challenges and opportunities brought by emerging and **disruptive** technologies such as social, mobile and cloud in years ahead." | Oracle Fusion Middleware is a leading cloud platform. |
| Platform strategy | Oracle | 2014-06-27 | Potential success | Business processes are at the core of what makes or breaks a business in today's digital age. Organizations with highly optimized, adaptive, repeatable, and measurable processes are more competitive in the marketplace. In addition, organizations that are able to capitalize on **disruptive** technologies such as mobile, social, big data, cloud, and the Internet of Things to transform their business and drive innovation will further differentiate themselves from their competition. The new release of Oracle Business Process Management Suite (Oracle BPM Suite) 12c not only helps businesses optimize and automate their business processes, but it enables them to establish deeper connections that will drive ongoing engagement. | Oracle BPM Suite 12c: One of the Oracle's platform products, still on the market. |

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| Platform strategy | Oracle | 2012-10-01 | Intractable | ..launched the Oracle Network Applications Platform, its first industry-specific engineered system, designed to meet the extreme network workload requirements for the development and deployment of mission-critical communications services and applications. The communications industry is experiencing rapid mobile broadband network growth, a proliferation of smart connected devices and intensifying competition. To compete with **disruptive** competitors – such as Over-the-Top providers – network equipment providers (NEPs) and communications service providers (CSPs) must innovate faster and at a lower cost. | Oracle Network Applications Platform: One of the Oracle's past platform products, no clear evidence of latter success in the markets. (http://www.oracle.com/us/industries/communications/communications-network-platform-ds-1852613.pdf) |
| Platform strategy | Verizon Communications | 2009-10-21 | Success | "Verizon has consistently raised the bar on broadband speeds and network reliability, forcing both competitors and peers to explore new technologies and increase their own capabilities in an attempt to keep pace with the **disruption** triggered by FiOS," Davis added. In the five years since the FiOS network was first deployed, Verizon has introduced the only national fiber-to-the-home TV service and has been an industry leader in high-definition TV; pioneered blistering broadband speeds of 50 Mbps (megabits per second) downstream and 20 Mbps upstream; and blurred the lines between cable TV and Internet with, among other tools, an interactive media guide that merges content from broadcast TV, the Internet and a customer's private photo, video and music files. | Verizon is heavily marketing Fios, and it is a commercially successful platform, enabling new third-party disruptive applications that require heavy data transfer over Internet. |
| Platform strategy | Verizon Communications | 2009-09-29 | Success | "Along with FiOS, these networks are the most **disruptive** technologies the world has seen. All of this incredible technology will work together to make our country competitive in the global economy and deliver on the big social issues that America faces - things like education, health care and energy conservation," he said. Lynch explained that Verizon's FiOS service - which is the only service from a company Verizon's size delivered over an all-fiber network, straight to homes - incorporates a dynamic in-home network that connects entertainment and Internet devices and services, enabling a rich, converged experience for customers. Leveraging the hardware and software in the home is revolutionizing the customer experience, allowing media sharing, on-screen widgets that blend the Web and the TV together, and making possible new network-supported services such as energy management and security. | Verizon is heavily marketing Fios, and it is a commercially successful platform, enabling new third-party disruptive applications that require heavy data transfer over Internet. |
| Platform strategy | Yahoo | 2008-07-10 | Failure | Yahoo! Inc. (Nasdaq:YHOO) today introduced a new open Web services platform, Yahoo! Search BOSS(TM) (Build Your Own Search Service), which gives third parties an unprecedented level of access to Yahoo! Search Technology, including the ability to re-rank and control the presentation of Web search results. Yahoo! Search BOSS, available today as an API in beta, enables developers and companies to build world-class custom search experiences and **disrupt** the search industry. | Yahoo Search BOSS (Build your Own Search Service) was discontinued in 2016 (https://en.wikipedia.org/wiki/Yahoo!_Search_BOSS) |

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| Recruitment | Microsoft | 2007-03-26 | Intractable | “Reed’s track record for delivering innovative and disruptive technologies to market is very impressive,” said Microsoft chairman Bill Gates. “With his rich consumer and technology background, he will be a tremendous addition to our board... There are very few companies that rival Microsoft’s impact on the way millions of people live, work and play around the world,” Hastings said. “I look forward to working with Microsoft’s esteemed group of board members to help shape the direction of the company as it continues to tackle the biggest industry challenges and opportunities.” Hastings founded Netflix in 1997, and the company ended 2006 with 6.3 million subscribers, having more than doubled in size over the last two years. | Recruiting managers that have demonstrably enabled disruption outside the firm (no clear evidence of latter success available) |
| Recruitment | Microsoft | 2013-01-10 | Intractable | Krikorian most recently founded R2 Studios. Before that he served as the co-founder, chairman and CEO of Sling Media Inc., inventors of the Emmy® award-winning Slingbox®, which is now owned by EchoStar Corp. Krikorian served on the board of Amazon.com Inc. and also co-founded the Philips Mobile Computing Group where he co-led the team that created the award-winning Velo 1 handheld PC running Windows CE. He has received numerous lifetime achievement awards including the Lifetime Technology Leadership Award from Broadcasting & Cable, as well as the TechFellow Award for **Disruptive** Innovation from TechCrunch, Founders Fund and NEA. | Recruiting managers that have demonstrably enabled disruption outside the firm (no clear evidence of latter success available) |
| Recruitment | Newell Rubbermaid | 2012-10-26 | Intractable | Newell Rubbermaid will reorganize the company around the first two pillars of its Growth Game Plan--Brand and Category Development (Making our Brands Really Matter) and Best in Class Execution and Delivery (Building an Execution Powerhouse). The new Development Organization will be accountable for building big brand ideas, high-impact **disruptive** innovation and a true point of difference through superior design and product experience. All of the company's marketing, insight, design, research and development, and corporate development talent will be part of the new Development organization. | Recruiting managers that have demonstrably enabled disruption outside the firm (no clear evidence of latter success available) |
| Recruitment | Northrop Grumman | 2013-02-08 | Intractable | Burton is named chief technology officer for Northrop Grumman Aerospace Systems. In this position, he will lead the newly established Research and Technology organization. This group is responsible for research that incorporates a technical and cost trade process early in the invention cycle; applied technology including accelerating the technology readiness levels for program application and cost reduction; **disruptive** technologies focused on solving the nation's hardest problems; and involvement in professional associations, including national labs, boards and universities. | Recruiting managers that have demonstrably enabled disruption outside the firm (no clear evidence of latter success available) |
| Recruitment | Time Warner | 2005-09-28 | Failure | Prior to coming to AOL, Govern was CTO at Convergys Corporation, where she was responsible for technology leadership, identifying out-front, **disruptive** technologies for Convergys' Customer and Information Management Groups. In addition, she served as corporate spokesperson for Convergys on technology issues. | Recruitment ended up in failure due to a privacy data leak that took place in the company under the era when the manager was responsible (e.g. https://www.forbes.com/2006/08/22/aol-technology-govern-cx_po_0822autofacescan01.html) |

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| Separate technology unit | Microsoft | 2006-01-25 | Intractable | Live Labs will investigate a broad and comprehensive set of research topics such as multimedia search, machine learning, distributed computing and data mining, and will engage in rapid prototyping and the incubation of **disruptive** technologies. Unlike basic research, which is geared toward visionary discoveries that may or may not end up in actual products, and product development, which is feature-focused and geared toward solving tactical engineering problems, Live Labs' applied research will study the relationship and applicability of theories or principles to the solution of a problem or an actual product or service. | Microsoft Live Labs established as s new unit. Some continued products remain, but no clear evidence of disruption (https://en.wikipedia.org/wiki/Microsoft_Live_Labs) |
| Separate technology unit | Microsoft | 2008-06-17 | Intractable | At the Cannes Lions International Advertising Festival, Microsoft Corp. today announced plans to open a Search Technology Center (STC) in Europe in its fiscal year 2009. The new center will be designed to help accelerate Microsoft's investments in Live Search and **disrupt** the search and advertising marketplace to the benefit of both the consumer and the advertiser, in line with Microsoft's recent announcement in the U.S. of Live Search cashback. | Setting up a new business unit to develop disruptive innovations (no latter evidence of success available) |
| Separate technology unit | Oracle | 2014-12-08 | Intractable | Today, Oracle announced expansion in Toronto, Canada with the unveiling of a new cloud software development center in the city's downtown core. The center will drive innovation for Oracle Marketing Cloud, part of the Oracle Customer Experience Cloud. Oracle expanded its footprint in Canada to leverage Toronto's burgeoning community of digital **disruptors**. To support this growth, the company plans to increase its Toronto cloud software development team by 30 percent. | Establishing a new cloud-development facility in Toronto (no evidence of success tractable) |