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## **EXPLAINING ORGANIZATIONAL RESPONSES TO DISRUPTIVE INNOVATIONS: A Study of Digitization in the Dutch Music Industry**

**Amber Geurts**  
University of Groningen  
Innovation Management & Strategy / Faculty of Economics & Bus  
a.geurts@rug.nl

**Thijs Broekhuizen**  
University of Groningen  
Innovation management & Strategy  
t.l.j.broekhuizen@rug.nl

**Wilfred Dolfsma**  
Loughborough University London  
Glendonbrook Institute for Enterprise Development  
w.a.dolfsma@lboro.ac.uk

### **Abstract**

Contrasting views exist on organizational survival during disruptiveness. Although a large body of research has indicated inertial forces that drive the relative difficulty of incumbents to respond to disruptive innovations, numerous anomalies to the standard model of entrant-incumbent dynamics during disruptiveness have noted learning dynamics that foster the adaptability of firms during disruptiveness. This contradiction may be resolved by including motivation- and capability-to-respond as moderators of the relation between the impact of the disruption and the organizational response to it. Our exploratory analysis of 118 responses to the same disruptions in the music industry indicates two kind of responses: defensive and offensive. The results show that offensive responses are mainly motivation driven, whereas defensive responses are driven by the interplay of impact, motivation- and capability to respond. The results support the proposed three-way interaction. A final model is tested which explains the occurrence of the alternative responses and their success.

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**\*\*\*\*Working Paper, please do not cite\*\*\*\***

### **Abstract**

Contrasting views exist on organizational survival during disruptiveness. Although a large body of research has indicated inertial forces that drive the relative difficulty of incumbents to respond to disruptive innovations, numerous anomalies to the standard model of entrant-incumbent dynamics during disruptiveness have noted learning dynamics that foster the adaptability of firms during disruptiveness. This contradiction may be resolved by including motivation- and capability-to-respond as moderators of the relation between the impact of the disruption and the organizational response to it. Our exploratory analysis of 118 responses to the same disruptions in the music industry indicates two kind of responses: defensive and offensive. The results show that offensive responses are mainly motivation driven, whereas defensive responses are driven by the interplay of impact, motivation- and capability to respond. The results support the proposed three-way interaction. A final model is tested which explains the occurrence of the alternative responses and their success.

**Keywords:** disruptive innovation, organizational responses, Awareness-Motivation-Capability perspective, digitization, music industry

## **Introduction**

The introduction of MP3 technology which enabled the compression of sound data (1993) and increasingly reliable bandwidth internet, developers started to build software that enabled the (peer-to-peer) distribution of digitized music files over the net. Around 2000, increasingly more net start-ups, such as Napster (1999), LimeWire (2000), Kazaa (2001) and iTunes (2003) appeared that introduced bold new ways of distributing, promoting and selling music (Leyshon et al., 2001; Moreau, 2013). These external technological developments directly challenged large incumbents in the music industry: traditional competencies were disrupted, worldwide revenues declined tremendously and new market opportunities were created (Business Week 2000; New Yorker, 2014). The case of digitization in the music industry is not unique. Many industries are confronted with extra-industry disruptions from relative unknowns that disturbed the strategic positions of competitors within that industry and opened up windows of opportunities for newcomers (Christensen, 1997).

A large body of research indicates the shared interest of researchers and practitioners in understanding the drivers of organizational survival during disruptiveness. Much research has focused on the inertial forces and firm characteristics as key ex post predictors of firm's inability to recognize or adapt to the challenges posed by a disruption (Christensen & Roosenbloom, 1995; Cohen & Levinthal, 1990; Gilbert, 2005; Henderson & Clark, 1990; Leonard-Barton, 1992). However, contrasting cases in the research literature have noted the resilience of firms during disruptiveness, whereby dynamic capabilities and cognitive frames seem to enable firms to surpass their initial position to grasp the opportunities of the disruption (Eggers & Kaplan, 2008; Kaplan & Tripsas, 2008; Teece, 1997; Tripsas, 1997; Tripsas & Gavetti, 2000).

A dilemma results, whereby a disruption provides a firm a window of opportunity which can be embraced, but inertial forces constrain the firm to grasp it and force the firm to

ignore the disruption and focus on traditional business instead (Ansari & Krop, 2012; Charitou & Markides, 2003). The resulting divergence in organizational responses to disruptiveness illustrate the difficulty within extant research to indicate how firms respond to a disruption and why firms respond that way. To date, it has therefore not been possible to indicate which strategic path of responding to disruptive innovations is most successful (Danneels, 2004; Tripsas, 2009).

In this study, we provide a theoretical framework based on the awareness-motivation-capability perspective previously applied in competitive dynamics research (Chen, 1996) that may resolve how firms deal with the dilemma of embracing disruptiveness. More specifically, we develop the argument that the firm's awareness of the disruption and the pervasiveness of the phenomenon, i.e. the impact of the disruption (Bode et al., 2011; Chen, 1996; Dewald et al., 2010) urge firms to respond, but the type of response depends on the motivation and capability to do so (Chen, 1996; Chen, Su & Tsai, 2007; He, Mahony & Wang, 2009). An important implication of this argument is that firms confronted with a disruptive innovation within their industry can engage in strategic action (Ozcan & Eisenhardt, 2009; Santos & Eisenhardt, 2009): disruptive innovations create a field of tensions between established and new competitive advantages (Chen, Su, Tsai, 2007), wherein firms can maneuver themselves and be inventive and reflective in their actions towards the disruptive innovations, if sufficiently motivated and capable (Chen, 1996).

To the extent that research on disruptive innovation has acknowledged awareness, motivation and/or capability as predictors of responses to disruptions, they have been assumed to be endogenous to firms responses (e.g. Charitou & Markides, 2003; Christensen & Overdorf, 2003; Macher & Richman, 2004), (implicitly) addressed in qualitative case studies (i.e. Bergek et al., 2013; Gilbert, 2005; Tripsas, 2009; Tripsas & Gavetti, 2000) or treated as independent predictor(s) (i.e. Eggers & Kaplan, 2008; Tripsas, 1997). In contrast, we aim to

shed light on the interactions of these predictors and argue that there is an interplay between the type of response and these three behavioral drivers. Studying the different responses and their relations to these drivers simultaneously may reveal important similarities and differences that could resolve the dilemma of disruptiveness.

To empirically explore the hypothesized interactions, we conducted a survey study among publishers and record companies in the Dutch music industry (Snow & Thomas, 1994). The survey addressed the responses of these firms to the rise of digital technology in that industry over a time period from 2000 to 2015 (Moreau, 2013). Relying on a sample of 118 responses to these same disruptions we illustrate the drivers of the different responses, thereby partly confirming the hypothesized three-way interactions. Relying on self-reported performance, we further make a first attempt to indicate which response is considered the most successful. These findings contribute to a richer theoretical understanding of how firms respond to disruptiveness (successfully) and illuminate the key drivers that determine the strategic path of responding to disruptiveness.

### **Theoretical background**

Disruptive innovations can create (1) a discontinuous break, destroying a firm's existing (technical) competences, skills and knowledge base (Tushman & Anderson, 1986, 1990), or (2) disrupt market-based competencies, affecting a firm's existing value network and business models (Bergek et al., 2013; Christensen, 1997; Christensen & Raynor, 2003). Such competence-destroying discontinuities fundamentally challenge and even render obsolete the required skills, abilities and knowledge applied in the old technological paradigm (Tushman & Anderson, 1986, 1990). As incumbents often perceive these technologies as initially unimportant and financially unattractive as well, they are often ignored. Nevertheless, these disruptive technologies also introduce a novel feature that is initially liked by a niche

segment, but ultimately convinces mainstream customers due to technological advancements and improvements to the disruptive technology (Bergek et al., 2013; Christensen, 1997).

Responding to such disruptions is therefore important. A continuously growing body of research has addressed the strategic organizational responses incumbent firms could employ in response to the disruption which range from ignoring the innovation and focusing on traditional business (Charitou & Markides, 2003), to establishing a separate organizational unit or spin-off organization (Christensen & Overdorf, 2003; Corley & Gioia, 2004) or accessing knowledge and resources through collaborative efforts or joint ventures (Bode et al., 2011; Christensen & Overdorf, 2003; Gnyawali & Park, 2009; Madhavan et al., 1998; Rothaermel, 2001; Rothaermel & Boeker, 2008).

Underlying these studies on organizational responses is a large body of research focusing on the so-called standard model of incumbent-challenger dynamics during disruptiveness (Ansari & Krop, 2012), which focus on the firm attributes that inhibit the firm's capability to respond to a disruption (i.e. Hannan & Freeman, 1977; Nelson & Winter, 1982; Cohen & Levinthal, 1990; Kamine & Schwartz, 1982). These studies have demonstrated that the disadvantage of incumbent firms stems from the inability of incumbents to change strategies due to their incumbency which includes investments in existing value networks and profit models (Christensen & Roosenbloom, 1995; Gilbert, 2005; Leonard-Barton, 1992).

Numerous exceptions of surviving incumbents (Bergek et al., 2013; Gulati & Puranam, 2009; Hill & Rothaermel, 2003; Rothaermel, 2001; Tripsas, 1997) and struggling new entrants (Golder & Tellis, 1993; Ozcan & Eisenhardt, 2009; Suarez & Lanzolla, 2005) question these assumptions. This has led to a recently growing body of research which address the motivational aspect of responding to disruptiveness that enhance the resilience of firms during disruptiveness; dynamic capabilities and cognitive frames seem to enable firms

to surpass their initial position to grasp the opportunities of the disruption (Eggers & Kaplan, 2008; Kaplan & Tripsas, 2008; Mol et al., 2012; Teece, 1997; Tripsas, 1997; Tripsas & Gavetti, 2000).

A dilemma results about when and how to respond: a disruption provides a firm a window of opportunity which can be embraced, but inertial forces constrain the firm to grasp it and force the firm to ignore the disruption and focus on traditional business instead (Ansari & Krop, 2012; Charitou & Markides, 2003). The resulting divergence in organizational responses indicates how extent literature is limited in that it has not yet explicitly examined the strategic path of firms after they perceive the impact of a disruptive innovation, or discussed the interplay between drivers of firm responses, the chosen organizational responses and their respective success over time. This is the aim of this study. Table 1 clarifies the positioning of this study.

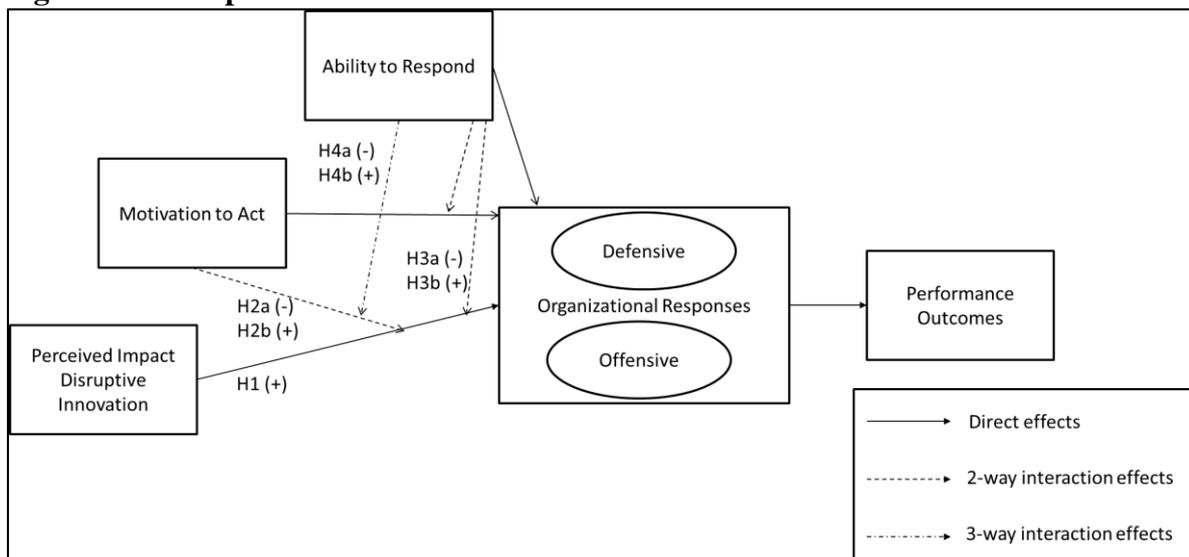
**Table 1: Literature on explaining origin of successful organizational responses to disruptive innovations**

<b>Reference</b>	<b>Organizational Responses</b>	<b>Capability component</b>	<b>Motivational component</b>	<b>Performance Outcome</b>
Christensen & Overdorf, 2003; Gnyawali & Park, 2009; Macher & Richman, 2004; Madhavan et al., 1998; Rothaermel, 2001	V			
Hannan & Freeman, 1977; Nelson & Winter, 1982; Cohen & Levinthal, 1990; Kamine & Schwartz, 1982		V		
Bode et al., 2011; Dewald et al., 2010; Eggers & Kaplan, 2008; Kaplan & Tripsas, 2008; Tripsas, 1997; Tripsas & Gavetti, 2000			V	
Charitou & Markides, 2003	V	V (conceptual)	V (conceptual)	
This study	V	V	V	V

## Hypothesis development

We provide a theoretical framework based on the awareness-motivation-capability perspective previously applied in competitive dynamics research (Chen, 1996) that may resolve how firms deal with the dilemma of embracing disruptiveness. More specifically, we develop the argument that the firms' awareness of the disruption and the pervasiveness of the phenomenon, i.e. the impact of the disruption (Bode et al., 2011; Chen, 1996; Dewald et al., 2010) urge firms to respond, but the type of response depends on the motivation and capability to do so (Chen, 1996; Chen, Su & Tsai, 2007; He, Mahony & Wang, 2009). Following competitive dynamics research we argue that the motivation to act and the capability to act are two fundamental drivers, whereby the type of response depends not only on their independent but also on their interactive effects (Chen, Su Tsai, 2007). To understand how firms respond to a high-impact disruption it is therefore important to simultaneously investigate a firm's capability to respond and their motivation to do so. Figure 1 summarizes the hypothesized relations and presents the theoretical model of this study which will be discussed next. For simplicity reasons we discern two types of not mutually exclusive responses – defensive and offensive- and assume that firms differ in their tendency to use these responses.

**Figure 1: Conceptual Model**



### Awareness: Impact of the disruption

Competitive dynamics research often considers awareness as related to a firm's informational capacity (He, Mahony & Wang, 2009). Firms consider the impact of a disruptive innovation as a fundamental and critical piece of information to assess the pervasiveness of the phenomenon and for guiding strategic responses (Bode et al., 2011; Chen, Su, Tsai, 2007). If the perceived impact of a given disruptive innovation on a firm's performance objectives is noticed and exceptional- i.e. it exceeds acceptable levels (Bode et al., 2011)- firms are urged to respond. For incumbents this means that when they are confronted with a disruption that is not only different, but also in conflict with their existing ways of doing business. Due to this lack of knowledge and control concerning the disruptive innovation, firms are urged to question existing behavior, strategies and competitive advantages. For new entrants such a disruption may mean an opportunity to enter the industry and exploit the disruption through new ways of doing business (Bergek et al., 2013; Charitou & Markides, 2003). As such, considering only the impact of the disruptive innovation, it can be expected that the greater the impact of the disruption, the greater the pursuit of an organizational response, regardless of which one:

Hypothesis 1: The greater the perceived impact of a disruptive innovation on a firm, the greater its pursuit of organizational responses, regardless of which type of response

### Moderating impact: motivation to respond and capability to respond

Awareness of the disruption is a necessary, but not sufficient argument for why a firm choose to respond in a certain way. A firm not only has to be aware of the disruption, a firm also has to be motivated and capable to respond (Charitou & Markides, 2003; Chen, Su, Tsai, 2007).

Motivation to respond can be linked to the incentive to engage in (competitive) action (Chen, 1996; Chen, Su & Tsai, 2007). If the firm notices the event and interprets it as important with respect to its goals (Bode et al., 2011; Charitou & Markides, 2003; Chen, 1996), feelings of risk and urgency to respond are increased (Dewald et al., 2010; He, Mahony & Wang, 2009). If the disruptive technology also reveals its added value and opportunities of growth (Christensen, 2003; He, Mahony & Wang, 2009), firms are more motivated to respond by embracing the disruptive technologies and innovations. Hence, the following two hypotheses can be developed:

Hypothesis 2a: The positive association between the impact of the disruption and the degree to which a firm responds defensively is strengthened when the firm is not motivated to respond

Hypothesis 2b: The positive association between the impact of the disruption and the degree to which a firm responds offensively is strengthened when the firm is motivated to respond

Capability to respond focuses on firm resources and capabilities that play a role in (competitive) response implementation (Chen, 1996; He, Mahony & Wang, 2009; Porter, 1996). In other words, prior investments and dependency on certain resources and skills (Christensen & Roosenbloom, 1995; Gilbert, 2005; Leonard-Barton, 1992) and on existing value networks (Christensen & Raynor, 2003) as well as established organizational processes (Christensen & Overdorf, 2003; Hannan & Freeman, 1977; Nelson & Winter, 1982) may constrain firms too much to embrace the disruption. If the resources required for adopting the disruptive innovation are not readily accessible by the firm, the capability of firms to cope with the disruptive innovation decreases (He, Mahony & Wang, 2009). Hence, the following two hypotheses can be developed:

Hypothesis 3a: The positive association between the impact of the disruption and the degree to which a firm responds defensively is strengthened when the firm is not capable to respond

Hypothesis 3b: The positive association between the impact of the disruption and the degree to which a firm responds offensively is strengthened when the firm is capable to respond

Interaction between impact of the disruption, motivation to respond and capability to respond

Competitive dynamics research usually consider the motivation to act and the capability to act as two fundamental drivers, whereby the type of response depends not only on their independent but also on their interactive effects (Chen, Su Tsai, 2007; He, Mahony & Wang, 2009). This study extends on this line of reasoning by arguing that to understand how firms respond to a high-impact disruption it is important to investigate not only the moderating effects of either motivation to respond or capability to respond, but also to consider their joint interactive effects. After all, without the requisite resource endowments, firms that are aware of the disruption and highly motivated to respond will still be unable to implement their chosen response. Consequently, the following two hypotheses can be developed:

Hypothesis 4a: There is a three-way interaction between the impact of the disruption, the firm's motivation to respond and the firm's capability to respond; defensive responses are highest when the impact is high but the motivation and capability to respond are low

Hypothesis 4b: There is a three-way interaction between the impact of the disruption, the firm's motivation to respond and the firm's capability to respond; offensive responses are highest when all three dimensions are high

## **Empirical analysis**

### Methodology

Data about the origin of successful organizational responses to disruptive innovations over time were collected by means of an online survey, administered among firms working in the Dutch music industry. The aim was to collect data in one industry, that faced the same disruption in a recent timeframe. Such a design kept constant a number of external factors that could have influenced the organizational responses to disruptiveness (see e.g. Charitou & Markides, 2003).

### Research context

The data were collected in the Dutch music industry. Recent technological advancements have affected the (Dutch) music industry from 2000 onwards (IFPI, 2006; NVPI, 2010-2014), when seemingly underperforming new technologies (cf. Christensen, 1997) like the MP3, set into motion a process of digitization of music (Einhorn, 2003). Music in a digital format enabled producers to instantly store, transmit and distribute music online to customers without much, if any, costs for those consumers. These online distribution services, which became of increasingly good quality, affected the traditional business model of the industry directly, and core-competences in production, distribution and promotion lost their traditional value (Christensen, 1997; Leyshon et al., 2005; Moreau, 2013). Using the digitization of music as disruptive innovation therefore provides a unique and unprecedented opportunity to investigate the effects of and responses to the same disruption within the same industry.

Given that our aim was to examine firm drivers of actual responses to the disruption the survey targeted managers and CEOs of Dutch music companies, as they play an important role in devising the strategic approach of the firm based on an overarching view on their

firms' activities, abilities, motivations and performance. To exclude one-man companies, do-it-yourself artists and music companies where music is not the primary source of income (cf. Mol et al., 2005), only companies listed by the NVPI, the industry association of the Dutch entertainment industry, and by Entertainment & Business, a Dutch news publisher for the entertainment industry, were approached. This resulted in a contact list of around 200 companies, active in the Dutch music industry in 2015.

### Data collection

In March 2015, the questionnaire was distributed via e-mail and LinkedIn. First, firms were informed via an introductory email about the aim of the study and the type of questions to be expected. If the firms agreed to fill in the survey, an invitation email with a link to the survey was sent to a personal e-mail address. After one month, non-respondents were contacted via telephone (3 attempts) to encourage them to fill in the survey (Snow et al., 1994).

Respondents were encouraged to complete the survey by offering the participating firms a so-called benchmark that would provide the firm more insights into their own strategic response to the disruption. In exchange for participation, respondents were also offered a report on the results of the larger research project. Of the 200 contacted firms, 141 firms agreed to fill in the survey and 86 of those firms provided complete responses, resulting in an effective response rate of 38%. Depending on the age and survival of the firm, these 86 firms either filled in 1 or 2 time periods, resulting in 118 total observations. About 90% of the respondents were the founder or CEO of the companies. The companies represent all musical genres. Firms were, on average, 15 years of age ( $SD = 14$ ) and consisted of mainly small to medium sized companies. The majority of the respondents (80%) have been working long enough in the music industry to have experienced prior technological changes in the industry.

## Survey design

The lack of established constructs to measure the drivers of responses and the lack of agreed-upon scales for organizational responses to disruptive innovations meant constructs had to be developed and tested for validity via a pilot study. In the design and administration of the survey we used multistage scale development measures to mitigate possible measurement errors. First, the questionnaire was designed only after extensive pre-survey fieldwork to identify constructs measurements. Individual one-hour, face-to-face interviews with experts in the field (N=9) as well as with individual record companies (N=15) were used to help develop survey questions (Fowler, 2013). Second, the findings from the interviews were complemented with constructs from main literature on the topic of organizational responses to disruptive innovations. Third, a-prior construct validation was used to assess whether (un-)informed respondents would be able to identify for each item in the survey the constructs to be measured (Cronbach & Meehl, 1955). Finally, a field pretest study has been conducted among several industry experts and firms to identify to what extent respondents could answer the questions as well (Fowler, 2013). Appendix A presents the items for each construct.

The survey was specifically constructed to collect data across two time periods, identified in the expert and company interviews: The Downloading period (2006-2010) and The Streaming period (2010-2015). Respondents were asked to base their answers on a specific time period and explanations and examples were given to guide respondents in their recall (Doty & Glick, 1998; Fowler, 2013). The ability of respondents to recall the disruption is limited (recency effect), especially when going back in time for more than a few years (Snow et al., 1994). Nevertheless, the interviews with industry experts and record companies confirmed that most respondents would be able to recall the general sentiment of the two time periods and could clearly distinguish the two time periods. In addition, questions regarding

the first time period were only asked when one would actively recall having taken action in that period.

Considerable attention has been given to the design of the survey, making sure the survey was easy to use and straightforward (Bode et al., 2011). To assess the reliability of the responses, several measures have been taken. First, to assess response bias, we compared early responders from late responders (Armstrong & Overton, 1997) and found no statistically significant mean differences except for the item age ( $t= 2.295^{**}$ ), suggesting that early responders were slightly older. Despite the careful design of the survey, limits to the ability of the respondents to recall the disruption over time was still a potential threat to the validity of the findings (Bode et al., 2011). The questionnaire therefore included a specific question regarding the year of entry into the industry. Using these dates, we split the data set into 3 equally sized groups (early, mid and late) and performed a MANOVA test using all items to inspect the mean differences among these groups. No significant differences were found, suggesting that there was no recency effect.

#### Measures and research instrument

Exploratory factor analysis was used as there was no knowledge beforehand which items belong together (Fabrigar et al., 1999). The analysis guided the identification of dimensions related to the impact of the disruption (independent variable), the organizational responses (dependent variables) and the drivers of the responses, motivation to respond and capability to respond (moderators). As the measures of sampling adequacy were very good (Hair et al., 2009), confirmatory factor analysis using Partial Least Square (PLS) were used to further identify the measures and to test the research instrument (Hair et al., 2014), especially because our model contains reflective constructs and we have a relatively small sample size (Liang et al., 2007).

Table 2 shows the constructs and their items. Disruption impact captures the extent to which a firm perceived a disruption has a negative effect on the firm (cf. Bode et al., 2011). To capture the multifaceted nature of disruptiveness in the music industry, we constructed a 4-item scale that relates to both the impact of the disruption on core activities of music companies, namely production, distribution, promotion (Moreau, 2013), and the impact of the disruption on financial performance (sales revenues). Defensive response is measured using eight items related to the continued exploitation of the traditional business model. Offensive response is measured using nine items related to the extent to which firms adapt their firm and business model to new, digital business. The proposed moderator motivation to respond is measured using four items related to the increasing role of the disruption, which motivates firms to embrace the disruption. Capability to respond is measured using seven measures that relate to the required skills, competences and resources needed to embrace the disruption.

We included firm age, firm size, genre, prior experience, time to respond, constraints and stage as control variables in the analyses. Firm age, measured as the difference between the founding year and the current year (Bergek et al., 2013; Bode et al., 2011), firm size, measured as the number of fulltime employees in a firm (Bergek et al., 2013; Bode et al., 2011) and prior experience, measured as the earlier experience of the firm with technological change (Bode et al., 2011), may affect organizational actions and inertial responses (Bergek et al., 2013). Time to respond, the amount of time a firms takes to respond to a disruption when becoming aware of it, was included because it might affect the type of responses as market uncertainty is reduced over time (Gavetti & Rivkin, 2007). Constraints were included as environmental contingencies cannot be changed by firms but influence the process of responding (Christensen, 1997; Hannan & Freeman, 1977). Finally stage was added to control of the time period in which the firm responded, the downloading period or the streaming period. Table 3 provides a descriptive table.

**Table 2: Confirmatory Factor Analysis (PLS)**

Constructs	Items	SL	T-Value	AVE/CR	$\alpha$
Impact of the Disruption (Number on a scale of 1 (low) - 10 (high))	Impact on Production	.772	4.535	.64/.86	.85
	Impact on Distribution	.832	5.553		
	Impact on Promotion	.731	3.731		
	Impact on sales	.779	4.582		
Defensive Response	Sustain old value network	.763	16.810	.48/.87	.84
	Only informed about new possibilities	.751	18.113		
	Contact multiple potential partners to reduce risk	.440	4.461		
	Protect against digital exploitation	.626	8.272		
	Reduce overhead costs	.623	9.157		
	Exploit alternative sources of income (phys.)	.634	9.906		
	Improve quality physical product	.755	14.893		
	Sustain focus on old business	.826	27.820		
Offensive Response	Invest resource to make digital core-business	.837	36.713	.55/.91	.89
	Invest in joint projects on new business	.798	22.364		
	Invest in collaborations on new business	.802	20.459		
	Invest in establishing new value network	.638	9.026		
	Search for knowledgeable potential partners	.543	6.960		
	Reallocate resources to embrace digital	.727	11.215		
	Initiate new activities independently	.849	33.921		
	Allocate resources for new skills in-house	.805	26.328		
Motivation to respond	Reorganization of the firm	.583	8.180	.65/.88	.81
	Disruption will improve value of product	.843	28.073		
	Disruption is increasingly fast	.861	25.827		
	Disruption can increase market share	.575	5.226		
Capability to respond	Disruption creates potential for growth	.888	42.328	.50/.87	.82
	My company is alert	.678	9.623		
	My company has the required skills (r)	.741	13.866		
	My company has the required knowledge (r)	.761	15.490		
	My company is aware of the disruption	.754	13.818		
	My company sees profit opportunities (r)	.756	15.287		
	My company experiences a positive influence of the disruption (r)	.441	4.640		
There are no organizational boundaries (r)	.732	12.114			
Performance	Performance relative to competitors	.713	5.011	.46/.81	.82
	No. of awards relative to competitors	.597	2.951		
	No. of hits relative to competitors	.641	3.478		
	Subjective performance	.580	2.081		
	Subjective financial targets	.581	2.146		
	Subjective profits	.584	2.064		
	Subjective succes	.735	5.745		

Notes:

- a. All items, unless otherwise noted, use a five-point Likert scale, anchoring at 1 = totally disagree - 5 = totally agree  
b. SL = maximum likelihood standardized loadings with t-values, AVE = average variance extracted, CR = composite reliability, derived from bootstrapping with 5000 replications  
c. (r) = reverse scored item  
d. Number of cases = 118  
e. Exploratory factor analysis has been run before confirmatory factor analysis using PLS.

## Construct validity and reliability

SmartPLS 3.0 has been used to assess the validity and reliability of the latent constructs (Hair et al., 2014). Table 2 presents all items and their standardized loadings (SL), together with each scale's average variance extracted (AVE), composite reliability (CR) and Cronbach's alpha ( $\alpha$ ). All constructs demonstrate convergent validity as the standardized loadings (SL) are in an acceptable range and the t-values indicate that they are significant. In addition, The average variance extracted (AVE) for each constructs is satisfactory for all items, indicating that the constructs can account for at least 50 percent of the variance in the items (Fornell & Lacker, 1981). If the square root of the AVE is higher than each of the inter-construct correlations, it is evidence of sufficient discriminant validity (Fornell & Lacker, 1981). The results in table 3 suggest that the measurement model demonstrates sufficient discriminant validity. Finally, we find evidence for sufficient construct reliability because the composite reliabilities as well as the Cronbach alpha's are well above .80 (Bagozzi, Yi & Philips, 1991).

**Table 3: Means, Standard Deviations, Correlations and Discriminant Validity**

Variables	MEAN	SD	1	2	3	4	5	6	7	8	9	10	11
Control													
1) Age	15.63	14.79	n/a										
2) Size	1.56	1.00	.345 ***	n/a									
3) Prior experience	2.64	0.75	.082	.045	n/a								
4) Time to respond	3.57	3.99	.018	.120	-.024	n/a							
5) Given value network constraints	2.45	0.87	.083	.172 *	-.058	.173 *	.828						
6) Stage	0.56	0.49	-.129	-.034	-.058	.051	-.133	n/a					
Independent													
7) Impact of disruption	5.14	2.87	.- .101	-.034	.002	.136	.022	-.060	.817				
Moderator													
8) Motivation	3.31	0.97	-.100	-.054	.200 *	-.237 **	-.516 ***	.079	.102	.804			
9) Capability	2.72	0.72	-.080	-.053	.117	-.147 $\psi$	-.631 ***	.151 $\psi$	-.135	-.544 ***	.705		
Dependent													
10) Defensive	2.72	0.85	-.088	.104	-.070	.301 ***	.556 ***	-.025	.060	-.327 ***	-.475 ***	.689	
11) Offensive	2.99	0.96	.022	.043	.331 ***	-.137	-.333 ***	-.021	.117	.722 ***	.536 ***	-.140	.741

$\Psi = p < .10$ , \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$

□ square root of each latent construct's AVE, derived from bootstrapping with 5000 replications, n/a = not applicable

## Common Method Bias

Finally, although it has been shown that interaction effects are robust against common method variance (Evans, 1985), several remedies for controlling common method variance were incorporated (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Accordingly, respondents were given only general information about the objectives of the study and no clues were given about the actual relationships under investigation. Respondents were ensured anonymity and confidentiality to reduce socially desirable responses and to encourage firms to provide potentially sensitive firm information (Fowler, 2013). The questionnaire consisted of different scales, some of which were reversed to diminish the risk of biases (Lindell & Whitney, 2001). As a final step, objective secondary data has been gathered for all cases in the survey for the items “firm age” and “firm size”. For both “firm age” ( $r = .997^{***}$ ) and “firm size” ( $r = .944^{***}$ ) there were high correlations with their counterparts in the primary dataset, which suggests that the primary data were reflective of reality (Podsakoff, MacKenzie, Lee & Podsakoff, 2003).

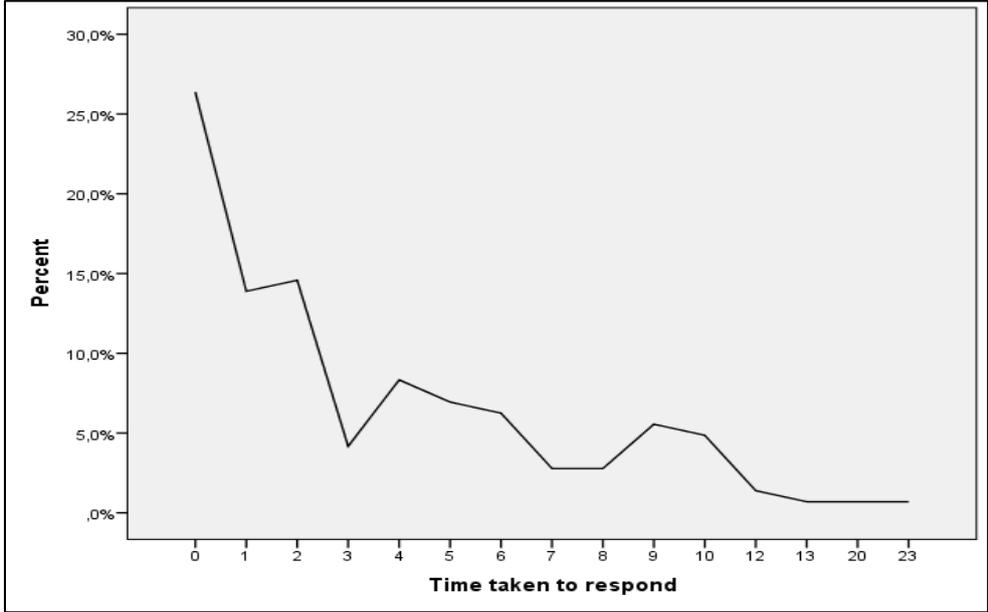
## Results

### Descriptives

On average, firms became aware of the disruption in the year 2002 ( $SD = 6.71$ ). At that time, the initial impact of the disruption, which affected sales the most -followed by the impact on their distribution, production and, finally, promotion- averaged around negative 5. Over time, the average impact of the disruption on the firm increases in the downloading period ( $MEAN = -5.73$ ,  $SD = 4.24$ ) and in the streaming period ( $MEAN = -6.26$ ,  $SD = 6.05$ ). With the increasing impact, the likelihood of actually responding to the disruption increases as well, whereby the average moment when firms actually respond to the disruption lies around the

start of the downloading period, namely around 2006 (SD=6,48). Subtracting the year of response to the year of awareness, we can see that on average firms respond within 4 years after awareness (SD = 3.99), whereby around 25% takes more than 6 years to respond. Figure 2 indicates the percentage of firms to the number of years taken to respond.

**Figure 2: Time taken to respond**



**Responding to disruptive innovations**

Based on the factor analysis this study took two types of responses, namely defensive and offensive as dependent variables. A firms awareness of the disruption and a firms motivation and capability to respond are the independent variables in the estimation of firms self-reported responses to disruptiveness within their industry. After basic assumptions had been checked (Hair et al., 2009), we used process models – Model 2 and Model 3- to investigate the proposed hypotheses (Hayes, 2012). In model 1 we include the control variables alongside the first-order associations. Model 2 adds all second-order associations and model 3 includes the proposed three-way interactions. Table 5 presents the results.

**Table 5: Results of process analysis for defensive and offensive responses**

Process	Model 1: Basic model		Model 2: Two-way interactions		Model 3: Three-way interactions	
	Defensive Response	Offensive Response	Defensive Response	Offensive Response	Defensive Response	Offensive Response
Constant (B)	2.282***	-1.567**	3.544***	-1.422	9.476***	0.255
Firm age	-.168*	.056	-.009*	.004	-.007	.004
Firm size	.022	.048	.031	.049	.032	.049
Prior experience	-.008	.162**	-.004	.204**	-.054	.190*
Time to Respond	.243**	.015	.049*	.003	.049**	.003
Given constraints	.443***	.217*	.099**	.060*	.098**	.060*
Stage	-.006	-.038	-.030	-.077	-.022	-.074
Independent						
Impact of disruption	.002	.085	-.160	.021	-.969**	-.197
Moderators						
Motivation to respond	.097	.629***	.209	.703***	-1.760*	.144
Capability to respond	-.223*	.331***	-.789*	.295	-2.918***	-.306
Interactions						
Impact * Motivation (int. 1)	-	-	-.021	-.017	.247*	.056
Impact * Capability (int. 2)	-	-	.078 $\psi$	.022	.368**	.099
Motivation * Capability (int. 3)	-	-	-	-	.685**	.194
Impact * Motivation * Capability (int. 4)	-	-	-	-	-.092*	-.025
R <sup>2</sup>	.36	.59	.43	.62	.47	.63
R <sup>2</sup> Change int. 1	-	-	.001	.001	-	-
R <sup>2</sup> Change int. 2	-	-	.016 $\psi$	.001	-	-
R <sup>2</sup> Change int. 4	-	-	-	-	.028*	.002
N	118	118	118	118	118	118

$\psi$  =  $p < .10$ , \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ , n.s. =  $p > .10$

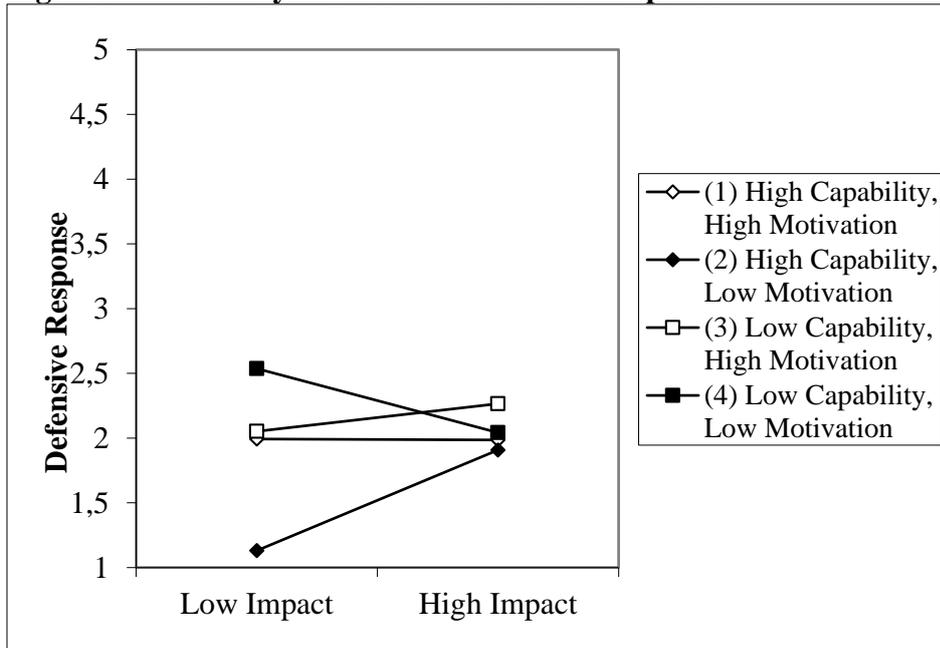
The basic model in table 5 indicates a wait-and-see-approach: a firm is more likely to take more time to respond if one responds defensively. The table further indicates that if a firm has more experience with technological change, the firm is more likely to respond offensively. This might explain why older firms, contrary to the standard model of entrant-incumbent dynamics (Ansari & Krop, 2009), are less likely to respond defensively. After all, they have been active in the same industry for quite a while. Environmental constraining contingencies influence the firms response significantly, but their positive association indicate a response unavailability.

With regard to what drives the responses, some striking differences between offensive and defensive responses become immediately clear. Offensive responses are strongly driven by the motivation to respond ( $b = .629, p < .001$ ) and to a lesser extent by capability to respond ( $b = .331, p < .001$ ). The direct effects already contribute to 59% of the explained variance. The addition of the two-way and three-way interactions do not add to the explained variance. As a consequence, the proposed hypotheses 1, 2a, 3a and 4a have to be rejected.

Defensive responses on the other hand are highly driven by the interaction of all-three behavioral drivers, supporting hypothesis 4b (rejecting hypothesis 1, 2a and 3a). The basic model indicates a direct, negative influence of capability to respond ( $b = -.223, p < .05$ ), but this direct effect only contributes to 36% of the explained variance. The addition of the two-way interaction only adds slightly to the understanding of the model, but it's the addition of the three-way interaction that seems to drive the defensive response. The explained variance increases from .36 in model 1 to .47 in model 3, which is equivalent to an increase of 11 percent.

Hypothesis 4 predicts a three-way interaction of the type of response, the impact of the disruption, the motivation to respond and the capability to respond. This would require a statistically significant increase in variance explained in model 3 as well as findings consistent with the hypothesis. Model 3 in Table 5 shows that the addition of the three-way interaction increases the overall variance explained for defensive responses by .03 ( $p < .05$ ), which suggests that this contributes to the understanding of the nature of this relationship. The negative effects of motivation to respond and capability to respond are attenuated by the impact of the disruption. If the impact of the disruption increases, the choice of firms whether to respond very defensively decreases (more homogeneous). We further plotted the high and low levels of each variable (Aiken & West, 1991). Figure three further illustrates the three-way interaction.

**Figure 3: Three-way interaction Defensive Response**



Finally, a final model is tested which reports the relation between the responses and subsequent (self-reported) firm success. These results indicate that whereas firms that respond offensively judge their performance worse ( $b = -.287, p < .05$ ), they do predict themselves to be doing better than others in their direct environment ( $b = .352, p < .05$ ). No significant differences were found in the relation between responding defensively and performance. The model explains around 27% of variance.

**Table 6: OLS Regression Responses to Performance**

Process	Model 1: Basic model	
	Subjective Performance	Relative Performance
Constant (B)	5.035*	6.672***
Firm age	-.012	-.023
Firm size	.214*	.209*
Prior experience	.046	-.143
Time to Respond	.065	-.084
Given constraints	-.148	-.186
Stage	-.107	-.136
Motivation to respond	.122	-.036
Capability to respond	.507***	.062
Independent		
Offensive Response	-.287*	.352*
Defensive Response	.164	-.067
R <sup>2</sup>	.27	.27
N	118	118

<sup>ψ</sup> =  $p < .10$ , \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ , n.s. =  $p > .10$

## **Discussion and Conclusion**

Research on disruptiveness has highlighted a fundamental dilemma: disruptions provide firms a window of opportunity which can be embraced, but inertial forces constrain the firm to grasp it and force the firm to ignore the disruption and focus on traditional business instead (Ansari & Krop, 2012; Charitou & Markides, 2003). The resulting divergence in existing literature on organizational responses to disruptiveness illustrates the difficulty within extant research to indicate how firms respond to a disruption and why firms respond that way. To date, it has therefore not been possible to indicate which strategic path of responding to disruptive innovations is most successful (Danneels, 2004; Tripsas, 2009).

In this study we address this difficulty by applying the awareness-motivation-capability perspective previously applied in competitor dynamics research. Our basic argument is that the firms' awareness of the disruption and the pervasiveness of the phenomenon, i.e. the impact of the disruption urge firms to respond, but the type of response depends on the motivation and capability to do so, whereby the type of response depends not only on their independent but also on their interactive effects (Chen, Su Tsai, 2007; He, Mahony & Wang, 2009).

The main finding of our study is that there are different drivers for the types of responses to disruptiveness. In the case of offensive responding, this is mainly motivation driven: regardless of the impact of the disruption, a firm has to be motivated to respond offensively to the disruption. Being capable to adapt the firm to the disruption helps to embrace the disruption, and is a secondary direct driver that makes firms more likely to respond offensively. Those firms that do respond more offensively, are more likely to consider themselves to be doing significantly better than their direct competitors. Nevertheless, those who respond offensively do not necessarily have to perform better in general.

In the case of defensive responses, the drivers of organizational action are more complex. The results indicate that the negative effects of motivation to respond and capability to respond are attenuated by the impact of the disruption. In addition, if the impact of the disruption increases, the choice of firms whether to respond more defensively decreases and the response choice becomes more homogeneous. This finding confirms our hypothesis.

To the extent that research on disruptive innovation has acknowledged awareness, motivation and/or capability as predictors of responses to disruptions, they have been assumed to be endogenous to firms responses, (implicitly) addressed in qualitative case studies or treated as independent predictor. By addressing the question of how and why firms respond differently to disruptiveness through survey method, this study has tried to extend the line of reasoning, within the limitations of self-reported experiences of a reasonable number of cases.

The contribution of this study is the way it has brought together the different literature streams within disruptive innovation research on 1) organizational responses, 2) capability to respond and 3) motivation to respond and explored their independent and interactive effects through an online survey administered to firms experiencing similar disruptions in a recent timeframe. The inclusion of different types of responses made it possible to investigate important similarities and differences in the predictors of responding to disruptiveness. Finally, his study also provides a stepping stone to providing an insight into the effect of responding to the disruption on firm performance. By showing that firms respond differently depending on the role of the impact, motivation and capability to respond, we have taken steps toward resolving the challenge of disruptiveness. It would be valuable if future research would continue this line of work and tested the moderating effects of impact, motivation and ability on an increasing number of responses, across industries experiencing different levels of disruptiveness, and across firms with different levels of constraints and flexibility.

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## Appendix A: Multi-item Measurement Scales

Measure and Items	Source
<p>Disruption impact (before and per time period) How did the disruption negatively affect (directly or indirectly) your firm on the following dimensions? (1, “not at all”; 10, “to a very large extent”).</p> <p>IMP 1 Production IMP 2 Distribution IMP 3 Promotion IMP 4 Sales</p>	<p>Bode et al., 2011: Disruption impact</p> <p>Einhorn, 2003: production, distribution, promotion</p>
<p>Buffering (per time period) Since the disruption, to what extent has your business unit pursued the following activities? (1, “not at all”; 5, “to a very large extent”).</p> <p>BUF 1 ...made arrangements to protect the firm against the digital exploitation of the product BUF 2 ... tried to reduce costs to create slack BUF 3 ...searched for alternative sources of income to efficiently keep on exploiting the product physically BUF 4 ...tried to meet consumer needs via incremental improvements of the physical product BUF 5 ...focused even more on the physical exploitation of the product as my firm was not yet convinced of the value of the new technologies and innovations</p>	<p>Bode et al., 2011: Buffering</p> <p>Charitou &amp; Markides, 2003: ignore the innovation; focus on own business</p>
<p>Bridging (per time period) Since the disruption, to what extent has your business unit pursued the following activities? (1, “not at all”; 5, “to a very large extent”)</p> <p>BRI 1 ...searched for potential partners with knowledge about the new technologies and innovations to spread risks BRI 2 ...tightened established relationships with stakeholders because the physical exploitation of the product is still very important for my company BRI 3 ...only informed itself about new possibilities because my firms was not yet convinced of the value of the new technologies and innovations BRI 4 ...initiated contacts with multiple potential partners to reduce the risk of betting on the wrong horse</p>	<p>Bode et al., 2011: Bridging</p>
<p>Bundling (per time period) Since the disruption, to what extent has your business unit pursued the following activities? (1, “not at all”; 5, “to a very large extent”)</p> <p>BUN 1 ...allocated resources differently to embrace digital exploitation of the product BUN 2 ... independently set up new activities to start exploiting the product digitally BUN 3 ... allocated resources to develop skills in-house BUN 4 ... reorganized to be better capable to embrace new technologies and innovations</p>	<p>Charitou &amp; Markides: adopt and keep internal</p> <p>Gulati &amp; Puranam, 2009: reorganization</p> <p>Mol et al., 2005: value chain</p>

<p>Breaching(per time period)  Since the disruption, to what extent has your business unit pursued the following activities? (1, “not at all”; 5, “to a very large extent”)  BRE 1 ...allocated resources extensively to make the digital exploitation of the product the core business of the firm  BRE 2 ...invested in joint projects that favor the digital exploitation of products  BRE 3 ... invested less resources in the physical exploitation of the product because my company was convinced of the value of the new technologies and innovations  BRE 4 ...allocated resources to co-operate more intensively with partners with knowledge about the digital exploitation of the product</p>	<p>Bode et al., 2011/  Christensen &amp; Overdorf, 2003/  Gnyawali &amp; Park, 2009/ Madhavan et al., 1998/ Ozcan &amp; Esienhardt, 2009/Rothaermel, 2001: partnering</p>
<p>Capability to respond  Thinking about time period X, to what extent do you agree with the following statements? (1, “not at all”; 5, “to a very large extent”)  ABI 1 My company was aware of the new digital technologies and innovations at an early stage  ABI 2 My company did not have enough resources to invest in the digital exploitation of products    ABI 3 My company did not have the necessary skills to effectively focus on digital exploitation of products  ABI 4 The external stakeholders of my company gave the company no other choice than to focus on the traditional physical exploitation of products  ABI 5 The employees of the company had no knowledge of the new digital technologies and innovations  ABI 6The routines of the company constrained the company in embracing the digital exploitation of products    ABI 7 The allocation of resources within the company was difficult to change    ABI 8The old technologies were still working relatively good to attain the goals of the company</p>	<p>Garrison, 2009: sensing capability  Christensen, 1997/Charitou &amp; Markides, 2003/Tripsas, 1997: resources &amp; resource dependency  Charitou &amp; Markides, 2003/Tripsas, 1997: skills/capabilities  Christensen &amp; Raynor, 2003: conflict with value network  Charitou &amp; Markides, 2003: internal conflict  Hannan &amp; Freeman, 1977 : organizational routines  Christensen &amp; Raynor, 2003: resource dependency  Charitou &amp; Markides, 2003: conflict with technology</p>
<p>Motivation to respond:  Thinking about time period X, to what extent do you agree with the following statements? (1, “not at all”; 5, “to a very large extent”)</p>	<p>Jockel et al., 2010/Kaplan &amp;</p>

<p>MOT1 My company was convinced that the new, digital technologies and innovations would improve the value of my products</p> <p>MOT 2 My company was not yet convinced that these new digital technologies and innovations would be profitable</p> <p>MOT 3 New digital technologies and innovations follow each other up more and more frequently, that's why my company wanted to embrace them as soon as possible</p> <p>MOT 4 My company experienced a negative influence of these new, digital technologies and innovations, that's why there was a higher need to respond</p> <p>MOT 5 My company wasn't prepared to embrace the new digital technologies and innovations as my company believed that there were still too many barriers</p> <p>MOT 6 My company didn't want to run the risk to lose market share quickly and that's why my company wanted to embrace digital exploitation as soon as possible</p>	<p>Tripsas, 2008: added value/cognition</p> <p>Dewald et al., 2010: perceived urgency</p> <p>Charitou &amp; Markides, 2003: goal alignment</p> <p>Gilting &amp; Nooteboom, 2006: willingness to change</p> <p>Dewald et al., 2010: perceived risk</p>
<p>Performance</p> <p>Change measures</p> <p>PER 1 Change measure for number of fte's</p> <p>PER 2 Change measure for net turnover</p> <p>PER 3 Change measure for distribution online/offline sales</p> <p>How do you evaluate the performance of your company during period X? Please indicate to what extent do you agree with the following statements? (1, "not at all"; 5, "to a very large extent"</p> <p>PER 4 In general, my firm was successful</p> <p>PER 5 My company was satisfied with the obtained revenue</p> <p>PER6 My company was satisfied over de development of profits</p> <p>PER 7 My company obtained the financial goals</p> <p>PER 8 In comparison with my direct competitors, my company has generally been performing better</p> <p>PER 9 In comparison with my direct competitors, my company produced more top-40 hits</p> <p>PER 10 In comparison to my direct competitors, my company has won more awards and other prizes</p>	<p>Ozcan &amp; Eisenhardt, 2009: performance</p> <p>Bode et al., 2011: competitive intensity</p> <p>Ozcan &amp; Eisenhardt, 2009: performance</p>