Switch on the green bulb for a more sustainable future

The dynamics in the institutional field and their impact on the diffusion of sustainable lighting

Masterthesis
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1. Introduction

1.1 Sustainable innovation in the context of institutional theory

Sustainable innovation is a powerful force for change in business and society. Sustainable innovation reverses existing products, technologies, and markets, and adjusts the relationship between business and environment (Larson, 2000). Hence existing institutions, “the rules of the game in a society” (North, 1990:3) are being replaced by new institutions necessary to realize change. These rules may be imposed by governmental regulations and policies or be imbedded within society as norms and the common way things are done (DiMaggio & Powell, 1983). In opposite to the assumption that institutional pressures lead to isomorphism (DiMaggio & Powell, 1983), the adoption of new innovation which contains a change in norms and beliefs could prove that institutional pressures also stimulate institutional change. Several institutional actors are involved in the process of institutional change and can be both, source or recipient of institutional pressures (Campbell, 2007; Doh & Teegen, 2002; Scott, 1995; Zucker, 1987). According to DiMaggio and Powell (1983), institutional actors exert coercive, mimetic, and normative pressures on companies in the institutional field. Oliver (1991) argues that companies deal with these pressures depending on their interest, willingness, and ability. Another approach assumes companies do not only deal with institutional pressures but transform and shape institutions in new ways to better serve their organization’s interests (DiMaggio, 1988; Pacheco et al., 2010; Woolthuis et al., 2012). Especially with regard to the significant power of policies and legislation on business activities, organizations expand their attempts to influence public policy decisions (Hillman & Hitt, 1999; Oliver & Holzinger, 2008; Weidenbaum, 1980).

1.2 The sustainable lighting market in Germany

The global lighting market is shifting from traditional lighting to more energy efficient technologies. The transition is brought forward by climate summits and reports that urge action ("Pressespiegel: Klimabericht rüttelt wach", 2007) and disasters such as Fukushima in 2011, subsequent to which several governments started to deliberate or even decide upon alternative energy generation. More stringent regulations concerning electricity consumption in general, such as the ban of the traditional light bulb, have contributed to a change in the lighting market (McKinsey, 2012).
Germany has adopted a pioneering role in the European Union and taken tremendous steps in their energy policy towards a nuclear-power free energy production until 2022. By incrementally shutting down nuclear power plants, the electricity generation from renewable energy sources is planned to be increased about 35% by 2020 (bundestag.de). However, the shutdowns will result in energy shortfalls since almost 20% of all electricity supply was derived from nuclear power, as of 2011. While this gap in energy supply stimulates the penetration of renewable energy generation, it also leads to a reconsideration of energy efficiency in order to secure a sufficient energy supply. Electricity for lighting accounts for approximately 20% of the total energy generation. Thus alternative energy efficient solutions such as LED light, can contribute to a total decrease of energy demand and the resulting cost savings can become a vital source of profit for companies (McKinsey, 2011).

Regarding the development of energy efficient lighting in Germany over the last decades, the contribution of renewable energy to the overall energy consumption increased from 3% in 1990 to 20% in 2011 (destatis.de). Statistical data reveal, that the proportion of what private households in Germany spend per year for lighting reflects 10% of the overall energy costs per household. Thereby this proportion stays very steady from 1995 until 2007, but expenditures for electricity in private households increased between 1996 and 2011 of about 77% (BMWi, 2013).

The European lighting market is controlled by a few big market players, Philips, Osram, General Electric, Megaman, and Panasonic (Frost & Sullivan, 2010). On the German market, Philips and Osram are the dominant lighting companies (Tauber, 2012) which proved to have the power to eminently influence policies.

Given this context of increasing energy prices, policies towards renewable energies, and existing energy efficient technologies, there certainly are prerequisites for a transition from traditional lighting towards more sustainable lighting.

1.3 Research aim and objective

The thesis aims at testing existing institutional theory and the broadly operationalized framework of companies’ strategic responses to institutional pressures. Within our research group, based on theoretical concepts, a coding scheme is developed that enables us to assess the extent and effects of institutional pressures on the diffusion of sustainable innovation. More specifically, the objective is to find out whether and when companies and consumers are going to adopt sustainable lighting and if this happens in response to institutional pressures.
The case of sustainable lighting in Germany, as one of the case studies selected within the research group, is investigated based on this framework and by means of coding and analysis of newspaper articles. Hence the following research question is to be answered:

*What are the dynamics between companies and their institutional field? To what extent does this stimulate the diffusion of sustainable innovation?*

By breaking down the research question into two parts, the first question deals with the outcomes analyzed based on institutional theory literature and results from the data analysis. The second part of the question addresses the effect of the dynamics in the institutional field on the replacement of existing technologies by sustainable solutions. Ultimately, institutional change may be realized (figure 1).

![Figure 1 Conceptual model](image)

### 1.4 Scientific and societal relevance of the topic

Investigating the interaction of institutional pressures in the field of sustainable lighting shall enhance the understanding of the applicability of institutional theory. Oliver (1991) established a framework about the different strategies companies apply in response to those pressures, and other scholars such as Pacheco et al. (2010) introduced a more entrepreneurial, anticipatory approach companies adopt towards institutional pressures. However, neither Oliver nor Pacheco et al. include the different types of pressures into their research. Thus linking two broadly operationalized theoretical frameworks, DiMaggio and Powell’s approach of institutional theory and Oliver’s framework of strategic responses, including the entrepreneurial approach (Woolthuis et al., 2013; Pacheco et al., 2010) will enhance the understanding of institutional change. In addition to that, with regard to the selected industry, a special focus is put on strategies aiming at influencing policy making and legislation.
As to the diffusion of sustainable innovation, especially in the field of institutional pressures towards more sustainability and the necessity to reduce the ecological footprint, this research seems of particular interest. Following news and media, it seems like many companies usually try to avoid everything that goes beyond complying with the minimum environmental standards, while others actually pursue risk management strategies or even long-term sustainable development strategies for enduring organizational profitability e.g. Coca Cola and Unilever (Senge, 2010:46-48). Hence alternative standards developed by the individual organization in anticipation to institutional pressures might go beyond the strategic responses as argued by Oliver (1991) and embody a positive impact on environment and society. Thus finding out what favors the adoption of energy efficient lighting among companies as well as consumers, can give implications on necessary incentives for the penetration of comparable sustainable innovations.

1.5 General outline of the thesis

The first chapter starts with a literature review that addresses the theoretical framework of the thesis, sustainable innovation, institutional theory and pressures, and companies’ strategic behavior.

Subsequent to this, the next chapter informs about the methodological choice and explains in detail the selected research design, the data collection, analysis and coding, and additionally gives information about the case study of sustainable lighting in Germany.

The third chapter consists of the analysis of the coded pressures and responses, whereby the event history is broken down in three phases. Each phase consists of a description and a findings section.

In the fourth chapter, the results of the data collection will be interpreted and analyzed with regard to the theoretical framework and the evidence found throughout the case study. Besides, the research question will be answered.

Eventually, the last chapter presents a discussion of the results of this study and elaborates on the limitations and possibilities for future research.
2. Literature review

2.1 Corporate sustainability and sustainable innovation

The World Commission on Economic development defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987: 43). Motives why companies engage in sustainable development and adopt a more sustainable approach have been researched from different angles. Bansal and Roth (2000) have researched companies’ motives for ecological responsiveness and found out that competitiveness, legitimation as well as social responsibility are motivators for firms to become more environmentally responsive. Although the motivation depends on other contextual factors, they found out that legitimation is firms’ main concern when turning towards a more sustainable approach. While these pressures are to be led back to institutional theory, they also build up on the resource-based view (Barney, 1991) or Hart’s (1995) extension, the natural resource-based view. In order to obtain a sustained competitive advantage, Barney (1991) claims that firms have to develop resources that are valuable, rare, imperfectly imitable, and non-substitutable. But as Hart (1995) states, the resource-based view in this form disregards the constraints imposed by the natural environment. Given the increasing number of environmental jolts and ecological issues firms are confronted with, resources and capabilities that facilitate a more sustainable economic activity will eventually lead to enduring economic profitability (Hart, 1995). Elkington (1997) argues that sustainable businesses live up to the ‘triple bottom line’ of economic success (profit), environmental values (planet), and social fairness (people). According to Bansal (2005), organizations must integrate these three principles into their processes and practices to achieve corporate sustainable development. First environmental integrity as to Bansal (2005) is achieved through corporate environmental management, i.e. by decreasing an organization’s ecological footprint. The author refers to the strategic approaches as established by Hart (1995) whereby the solutions to environmental issues vary from more reactive tactics to a (pro)active dedication of a firm to become a first mover in a greener industry field. In his research, Hart (1995) differentiates between mere pollution control as end-of-pipe solution, to pollution prevention through improved processes until product stewardship which includes a whole reconsideration of the life cycle of a company’s product. Secondly, corporate social responsibility implies an integration of all stakeholders of an organization, through transparency, commitment to represent all stakeholders’ interests, and a
fair value distribution among all relevant stakeholders. Thus, thirdly, value creation and capturing, in the end also leads to economic prosperity (Bansal, 2005).

Sustainable innovations can be considered as the realization of sustainable development (Bos-Brouwers, 2010). Sustainable innovations are described as renewals or improvements of products that combine all the three aspects of sustainability and have an impact on improving the sustainability in the whole sector. During the transition towards more sustainability, entrepreneurs play an important role since those are the people that are willing to take the risk and create something new. Nevertheless, also entrepreneurial oriented organizations are restricted by the institutional environment they act in. Hence regulations, norms, and other pressures have an influence on the diffusion and acceptance of their innovative products (Klein Woolthuis, 2010).

2.2 Institutional theory and institutional pressures

2.2.1 Institutional theory

“Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction” (North, 1990:3). Early approaches of institutional theory by Selznick (1949) or Berger and Luckmann (1966) focus on institutionalized rules, values and beliefs and how organizations absorb them to create value and social meaning. More recent approaches, the neoinstitutional theorists, have elaborated on the diversity of these processes and on the different influences they exert on organizations and the structure of organizational fields (DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Scott, 1995; Zucker, 1977). The focus of this thesis is on the neoinstitutional approach and the different kind of institutional pressures exerted on organizations.

Meyer and Rowan (1977) argue that organizations aim at gaining legitimacy to secure organizational survival. Therefore they incorporate “practices and procedures defined by prevailing rationalized concepts of organizational work and institutionalized in society” (Meyer & Rowan, 1977:340). Formal structures arise in line with institutionalized myths but not necessarily in accord with the most efficient method of operation. In order to maintain official conformity but also achieve high efficiency, organizational structures become loosely coupled and formal structures become separated from the actual work activity. The myths creating formal structures are “rationalized” and “impersonal prescriptions” and at the same time “institutionalized” and thus represent taken-for-granted rules and norms that need to be followed to gain legitimacy and resources. This leads to an institutional isomorphism whereby
organizations are matched with, or even incorporate, the institutional environment (Meyer & Rowan, 1977). DiMaggio and Powell (1983) claim that organizations become prisoners in “the iron cage” of institutional isomorphism. They argue that when organizational fields become more established, there is an increasing homogenization among the organizations. Thus change in the organizational fields appears to be less driven by competition and efficiency, but the result of actions that lead to an increasing homogenization among the organizations. DiMaggio and Powell (1983) describe three different processes: coercive, mimetic, and normative pressures that lead to institutional isomorphism. Later on, Scott (1995) builds up on the institutional theory approaches by emphasizing three pillars of institutions. First, regulative aspects of institutions, which involve “the capacity to establish rules, inspect or review others’ conformity to them, and as necessary, manipulate sanctions, rewards or punishments in an attempt to influence future behavior” (Scott, 1995:35). This goes back to DiMaggio and Powell’s (1983) mechanism of coercion. Secondly, Scott (1995) introduces the normative pillar. The normative pillar implies norms and values, which impose objectives and constraints on social behavior, in line with the definition of normative pressures by DiMaggio and Powell (1983). Thirdly, Scott presents the cognitive aspects as one of the aspects of institutions, “the rules that constitute the nature of reality and the frames through which meaning is made” (Scott, 1995:40). This includes dimensions such as “symbolic aspects”, “belief systems”, “cultural frames”, or “frameworks of meaning” (Scott, 1995). Scott (1995) hereby refers to the mimetic mechanism of DiMaggio and Powell’s (1983) that indicates mimetic processes, i.e. organizations that imitate other, superior, organizations in case of uncertainty, which contributes to the emergence of isomorphism.

Research states that the approach of DiMaggio and Powell (1983), who built up on Meyer and Rowan (1977) is “the most strongly stated and most influential statement on neoinstitutional theory” (Kraatz & Zajac, 1996:813). Researchers that used institutional theory to operationalize their own concepts mainly used the neoinstitutional approach of DiMaggio and Powell (1983). For that reason, the thesis will mainly build up on this approach.

2.2.2 Institutional pressures

Institutional pressures are caused by various institutional actors. Zucker (1987) and Scott (1995) reveal the state and the professions as two types of institutional agents that have power to put pressure on organizations. Governments use their authority to exercise regulations, impose taxes, and privilege obeying organizations with key resources such as financial
resources or monopoly status, while penalizing disobeying organizations by e.g. fiscal and monitoring measures. Moreover governments have the control over the definition and enforcement of property rights which eventually determine the ownership, access to resources, and ultimately competitiveness of organizations (Scott, 1995). Besides governments, professions can also take on the role of institutional agents. By functioning as “definers, interpreters, and appliers” they can put forth a strong influence on institutions, based on their control of knowledge (Scott, 2008).

Other organizations or entire industry sectors are also considered institutional agents, being able to instigate in particular mimetic pressure on an organization, e.g. through action taken by industry associations or self-regulation among industry members (Campbell, 2007; Delmas & Toffel, 2004; Scott, 2005).

In addition to that, public and collectives have an influence on institutional thinking. Doh and Teegen (2002) found that NGOs become increasingly integrated in the institutional environment by developing ties and partnerships and consequently become serious sources of pressure for companies. In particular in the context of international business and the development of investment rules and trade agreements, NGOs prove to be quite influential (Doh & Teegen 2002). Other scholars researched the influence of particular activist groups on institutions (e.g. Den Hond & De Bakker, 2007) and the impact communities can exert on organizational change (e.g. Ramanath, 2009).

Institutional agents, as they are mentioned above, influence institutional change on different levels. The following division into the mechanisms (coercive, mimetic, and normative) as established by DiMaggio and Powell (1983) will further elaborate on the type of pressure put on organizations through actions by those different agents.

2.2.2.1 Coercive pressures

Coercive pressures arise from political influence and the aspiration of legitimacy, and are defined as enforcing demands through legal or financial sanctions (DiMaggio & Powell, 1983). Institutional isomorphic change may result from coercive pressures in terms of government supremacy. New law proposals, law passages, policies and other requirements such as reporting standards force organizations to adapt to the new rules in order to secure organizational survival (e.g. Amran & Siti-Nabiha, 2009; Bansal & Roth, 2000; Delmas & Toffel, 2004; Frumkin & Galaskiewicz, 2004; Sharfman et al., 1997). Governments can exert power with direct financial impact on organizations, e.g. by determining fiscal measures, by passing new subsidy regulations, or by imposing penalties for non-compliance (e.g.
A common legal system, national - or international wide, has an impact on many aspects of organizational behavior and structure. Political decisions apply across all kind of organizations which consequently makes them less flexible and adaptable to the individual organization’s needs (DiMaggio and Powell, 1983).

Coercive pressures also occur outside governmental areas. Within industries, pressures are created through companies’ actions and affect other companies, as for example contractors or suppliers can cause pressure for a company through a boycott due to a violation of environmental standards. However, powerful companies can also create pressure for governments by filing lawsuits (e.g. Henriques & Sadorsky, 1996).

Besides, the general public, for example in their role as consumers, can push companies towards changing their rules and principles in order to avoid financial damage. Den Hond and De Bakker (2007) argue that stakeholder groups, in particular activist groups, aim at changing existing norms and beliefs by engaging in political consumerism and by using the market to show their anger about certain affairs. This involves collectively increasing buying or boycotting products, through which these stakeholder groups express their preferences and attempt to steer political or corporate action.

Furthermore, activist groups carry out actions such as occupying company buildings which disrupt the usual business activity and lead to a direct financial consequences (Den Hond & De Bakker, 2007; Sharfman et al., 1997; Stolle et al., 2005). Shareholder activism is another type of pressure whereby groups try to acquire shares in order to increase their influence on company decisions (Den Hond & De Bakker, 2007).

2.2.2.2 Mimetic pressures

The origin of isomorphism does not only result from coercive pressures. Uncertainty in organizational fields causes companies to imitate and orientate along other companies (DiMaggio & Powell, 1983). Environmental constraints as well as strong network ties force companies to become similar (Meyer & Rowan, 1977; Zucker, 1987). Hence mimetic pressures are defined as enforcing expectations through active comparison to peers’ behavior.

Several scholars have done research on how those mimetic pressures can be measured. On the level of mimetic pressures leading back to companies, Burns and Wholly (1993) and Haunschild and Miner (1997) reveal the degree of industry adoption as one measurement. Hereby, Haunschild and Miner (1997) distinguish between three forms of inter-organizational imitation. First, imitation as result of the frequency of adoption by other firms, i.e. the number of firms that adopt a certain practice which becomes legitimate and taken for granted and
eventually used by other firms (Haunschild & Miner, 1997; Haveman, 1993). Secondly, imitation due to firm traits such as size, profitability, prestige that occurs when small firms copy bigger and more prestigious firms, since they are looking for gaining legitimacy (Burns & Wholly, 1993; DiMaggio & Powell, 1983; Haunschild & Miner, 1997; Haveman, 1993). And thirdly, firms that imitate other firms not because of the number or the characteristic of the practice, but due to the successful outcomes of applied practices and processes in the past (Haunschild and Miner, 1997). Other scholars such as Galaskiewicz and Burt (1991) measure mimetic pressures by the degree of industry interconnectedness, showing evidence about the impact of social networks between industry participants on the emergence of isomorphism. Palmer et al. (2003) as well as Rao et al. (2000) argue that also the ties board level members of different organizations have with one another (referred to as board interlocks) influence the degree of adaption in a field.

Mimetic pressures may also be caused by professionals. Scott (2008) reveals rankings and benchmarking (e.g. for The Sustainable Top 50) external bodies use to indicate firm performance on certain issues. DiMaggio (2008) argues that through consultancy firms training staff and shaping organizations by providing general management models, approaches become standardized within industry fields (see also Rao and Sivakumar, 1999).

2.2.2.3 Normative pressures

Normative pressures as expressing wishes through knowledge sharing and social actions on the basis of professional insights, education and information can result from governments, companies, professionals, and public and collectives that, through their actions or statements, put pressure on organizations.

Most literature on institutional theory has connected pressures through governments only to coercive pressures, based on their role as rule maker, controller or financial stimulator. Thus only a few scholars have researched the normative impact of governments on organizations (Vasudeva, 2013). Yet there is research based on the approach of the normative power of governments which identifies different measures for normative pressures. Baggott (1986) and Delmas and Toffel (2004) in their research mention voluntary agreements. Hence e.g. codes of practices governments and companies sign voluntary as incentives to precede regulative requirements can cause normative pressure. Furthermore Vasudeva (2013) introduces certification and normalization. This involves shaping the preferences of firms through the diffusion of norms. Certificates such as BIO, NEN, etc., enhance the attractiveness for firms to incorporate certain norms, in particular when these norms are in the
public attention (Vasudeva, 2013). Public procurement, i.e. governments and public institutions taking over the role as a lead consumer, demonstrates the financial rewards for adopting more environmental friendly practices and hence generates support for taking action (Bulkeley & Kern, 2006; Vasudeva, 2013). Besides that, Bulkeley and Kern (2006) and Johnstone (2005) argue how promotional activities such as awareness campaigns, projects and best practice case studies implemented by governments have an influence on the adoption of new technologies.

Normative pressures exercised by the industry have been introduced in existing literature in various ways. Henriques & Sadorsky (1995) mention advocacy, whereby pressure originates from the attempt to influence decisions taken by the government. In addition to that, Campbell (2007) claims that companies not only try to influence government regulations, but actively create and shape them. By establishing their own regulations, companies take advantage of controlling the regulative process themselves instead of dealing with enforced standards over which they have little control. Self-regulation varies from a pure interest in maintaining certain standards e.g. towards corporate responsible behavior, to more sincere concerns of industries wanting more protection against themselves, e.g. in the nuclear power industry (Campbell, 2007). Industry association membership-action as well as the formation of industry coalitions represent tools to stimulate knowledge development and the adoption of new technologies, as well as strong networks to promote and fight the status quo (Campbell, 2007; Delmas & Toffel, 2004; Garud & Karnoe, 2003).

According to DiMaggio & Powell (1983), normative pressures result primarily from professionalization. Thus professionals such as policy experts, scientists, or consultants can cause normative pressures for organizations, in form of introducing new norms and standards or expressing their expert opinion and thus push organizations to better environmental practices (Bansal, 2005; Matten & Moon, 2008; Radaelli, 2000; Sharfman et al., 1997). Professionals intend to influence the behavior of others by introducing standards (Scott, 2008), amongst others in form of reports and publications in recognized business journals (Campbell, 2007). Standards are also set by uniform MBA programs which includes business models that are consistently taught and applied in study programs (Campbell, 2007; Matten & Moon, 2008). Furthermore sharing of knowledge within a professional network, among experts, on conferences, or within industry group meetings is another measure of normative pressures resulting from professionals (Van Everdingen & Waarts, 2003).

Institutional theory relating to normative pressures also deals with the influence of public opinion on organizations (Meyer & Rowan, 1977; Oliver, 1991). Greening and Gray (1994)
reveal that firms adapt their organizational structures to their social and political environment. Thereby public opinion, expressed in newspaper, press or social media, has an impact on a company’s legitimacy. Interest groups are widely recognized as sources of pressures for companies. By contributing to public opinion development, organizing public demonstration and using the media, they may influence the image of an organization (Greening & Gray, 1994). Overlapping interests and common ideologies make people participate in interest groups that collectively aim at setting examples for companies how things can be done in a better way (De Bakker & Den Hond, 2003). Interest groups often are considered to be institutionalized in regulative processes, through their engagement in lobbying activities (Doh & Guay, 2006; Ramanath, 2008). They, just as NGOs, make use of media campaigns in order to bring a certain topic or concern about an organization to public awareness (Campbell, 2007). Tactics such as revealing information, public disclosure, or civil disobedience have an impact on norms and organizations. NGO cooperations, both with companies and with the government, add normative pressure on organizations (De Bakker & Den Hond, 2003; Ramanath, 2008).

### 2.3 Companies strategic behavior

Institutional theory fails to address the various strategies firms could choose to deal with pressures (e.g. Goodrick & Salancik, 1996). Meyer and Rowan (1977) talk about how companies can find solutions to deal with institutional requirements, but Oliver (1991) was among the first researchers that pointed out a variety of strategic responses and tactics depending on the degree of organizations’ willingness and ability to conform to these pressures. Often institutional requirements are difficult to combine with firms’ goals for maximum productivity, consequently the aspiration for legitimacy conflicts with the goals of economic efficiency. Depending on particular technical activities, organizations also face difficulties in linking the general and standardized institutional demands to their potentially very specific situations (Meyer & Rowan, 1977). Goodrick and Salancik (1996) suggest that uncertain institutional standards enable organizations to choose alternative strategies without losing legitimacy. Institutional expectations might be unclear, because beliefs and goals can be conflicting in themselves, or even if they are clear and universal, the means to achieve them can be unspecified or controversial within society (Goodrick and Salancik, 1996). In opposite to Goodrick & Salancik’s (1996) point of view, Oliver (1991) argues that organizations will react strategically to pressures, independent of the institutional standards,
but according to their interests. Firms’ strategies, from an institution’s point of view, vary in their degree of resistance, from mere, passive compliance to influential, active manipulation (Oliver, 1991). An increasing number of researchers (e.g. Clemens et al., 2008; Goodstein, 1994) have used Oliver’s (1991) theoretical framework to test and extent the knowledge about strategic choices to institutional pressures.

2.3.1 Companies strategic responses

Based on the assumption of potential variation in the way how organizations react to pressures, Oliver (1991) proposes five types of strategic responses: acquiescence, compromise, avoidance, defiance, and manipulation.

1) Acquiescence: When companies choose to acquiesce, they use a rather passive strategy that overall is meant to lead to enhanced legitimacy and social support. Oliver (1991) distinguishes between habit, imitation, and compliance. Habit refers to companies unconsciously adhering to taken-for-granted norms and rules, the approach most followed by the organization in the past (Clemens & Douglas, 2005; Oliver, 1991). Concerning imitation, Oliver refers to the mimetic isomorphism as stated by DiMaggio and Powell (1983). Companies mimic other, successful companies whom they trust, in particular when being confronted with uncertainty. Finally, compliance is a conscious conformity to requirements set by institutional actors such as government, public, or industry participants. Compliance is the more active tactic among the acquiescence tactics and organizations obey to those requirements in anticipation of certain self-serving advantages (Oliver, 1991).

2) Compromise: a compromising strategy may result from conflicting institutional requirements or standards and rules which are difficult to combine with firm internal norms and objectives (Meyer & Rowan, 1977; Oliver, 1991). Balancing, pacifying, and bargaining are tactics firms use whereby they move between conformity and resistance towards institutional demands. A balancing tactic aims at aligning inconsistent demands among or between various stakeholders with the organizational interests (Oliver, 1991). Goodstein (1994) e.g. referred to organizations that sought for a balance between work and family demands, by largely complying with institutional expectations but embedding some alternative choices that better match the organization’s internal interest. Pacifying tactics also tend to conform to at least the minimum requirements but the main focus is on calming and conciliating the origins of institutional pressure. The bargaining tactic implies a more active behavior whereby organizations try to interact with the external source of pressure to win courtesy in their requirements (Oliver, 1991).
3) Avoidance: Oliver (1991:154) defines avoidance “as the organizational attempt to preclude the necessity of conformity”. One tactic Meyer and Rowan (1977) and also Oliver (1991) refer to, is companies appearing to acquiesce to pressures but actually concealing certain aspects of non-conformity behavior from the source of pressure. Besides the concealing tactic, Oliver (1991) introduces the buffering tactic, which implies decoupling internal activities from formal structures and external actions, in order to stay legitimate (see also Meyer and Rowan, 1977). The buffering tactic is only beneficial for an organization, when the internal production or other internal activities do not depend on public approval. If not, the organization will become subject of suspicion and lose legitimacy. A more resistant form of avoidance is the escape tactic. Organizations may change their activity and goals entirely or move their production facilities to a different location in order to evade the pressure for conformity (Oliver, 1991).

4) Defiance: a defiance strategy implies a distinct rejection of institutional demands. Organizations would decide for such a strategy e.g. in case their internal interests drastically differ from the external requirements, or when the organization has little to lose by not complying or even is convinced of being able to demonstrate the rightness of their own behavior and the incorrectness of the inflicted norms. The tactics, dismissal, challenge, and attack represent an increasing resistance to institutional requirements. A dismissing or ignoring tactic could be implemented in case the perceived pressure of the imposed norms is low (Oliver, 1991). Organizations carry on doing business as usual and try to avoid any confrontation with the source of pressure (Clemens & Douglas, 2005). When an organization exercises a challenging tactic, they adopt a more offensive position and openly argue why their conviction and beliefs are more appropriate and reasonable than the widely spread opinion. Attack is a more aggressive tactic chosen by an organization in order to “assault, belittle, or vehemently denounce institutionalized values and the external constituents” behind those (Oliver, 1991:157). Organizations may attack institutions and the imposed norms when these norms are too tailored for their specific organization and when they feel their organizational values, rights, and autonomy are seriously endangered (Oliver, 1991).

5) Manipulation: a manipulation strategy is the most resistant strategy to react to institutional pressures. Organizations actively intent to change, recreate, and contain institutional forces. Co-opting tactics may imply to import influential constituents into the organization and neutralize institutional power, e.g. by hiring an institutional actor on the advisory board or form an alliance with a regulator. Also the use of organizational ties increases a firm’s ability to demonstrate its power and support in its organizational field.
Influence tactics, such as lobbying, aim at shaping public opinion and beliefs and manipulating government regulations. Organizations may also choose manipulating tactics, i.e. efforts targeting at gaining a dominant and controlling position towards institutional constituents. Taking on a control tactic is more likely when the organization is confronted with a comparable small advocacy group instead of a big powerful organization that puts pressure in the organization over a longer period of time (Oliver, 1991).

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<tr>
<th>Strategy</th>
<th>Tactic</th>
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<td>Acquiesce</td>
<td>Habit</td>
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<td></td>
<td>Imitate</td>
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<td>Comply</td>
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<td></td>
<td>Influence</td>
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<td>Control</td>
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</table>

Figure 2 Companies' response strategies and tactics (Oliver, 1991)

**Antecedents of strategic responses**

Whether companies conform or resist to institutional pressures depends on the organization’s willingness and ability to conform to those institutional requirements. According to Oliver (1991), organizations adopt certain response strategies and tactics, depending on “why these pressures are being exerted, who is exerting them, what these pressures are, how or by what means they are exerted, and where they occur” (Oliver, 1991:159).

The first predictive factor Oliver (1991) introduces is the cause of the pressure, which in accordance to former literature can either be social or economic fitness. Thus organizations will react to pressures in line with their estimation of the perceived economic gain and the expected legitimacy. Whether the organization agrees with the requirements and expectations imposed, influences the choice between mere acquiescence or more adverse strategies.

The second antecedent to strategic responses is the constituent (state, professionals, public etc.) that causes the pressure. Organizations often face multiple divergent pressures, whereby the satisfaction of the demand of one constituent means the rejection of the other’s. In conclusion, when the diversity of demands is high, more resistant strategies such as compromise, avoidance, or manipulation are more likely to occur and vice versa. Besides the multiplicity, dependence of the constituent that exerts the pressure also is a boundary of
possible strategic responses. With the degree of dependence decreasing, the likelihood of opting for a more resistant strategy increases.

As a third antecedent, Oliver (1991) introduces the content of the pressure exerted. Thereby the discrepancy of institutional pressures and the organizational goals influence the willingness of the organization to conform. Thus low consistency of pressure and organizational goals probably leads to more resistant strategic responses. Moreover also a loss of organizational autonomy entailed with conforming to the pressures has an impact on the organization’s willingness to acquiesce. Organizations’ aspirations to maintain control limits the likelihood of conforming. However, discretionary limitations have to be looked at in relation to the other predictive factors such as the cause, constituents, and control in order to conclude on the organization’s resistance.

The forth predictive factor is control, the means by which pressures are inflicted on organizations. In case of high legal coercion, implying severe punishments for non-conformity, the likelihood of organizations to conform is high and organizations would choose for an acquiescence strategy. Besides coercion, conformity to institutional expectations is also influenced by the diffusion of norms. When values and practices have already been diffused in organizational fields, other organizations are more likely to conform to the demands (Oliver, 1991). This is based on DiMaggio and Powell’s (1983) mimetic view on organizational behavior.

The environmental context as the fifth predictive factor has an influence on organization’s conformity or resistance to pressures as well. Organizations in an uncertain and unpredictable environment are more likely to put effort into establishing control and creating stability, thus would rather opt for less resistant strategies (Oliver, 1991). That is consistent with DiMaggio and Powell’s (1983) approach exposing that firms imitate each other in particular in uncertain environments. With the uncertainty diminishing, organizations become more confident to apply more resistant strategies to achieve organizational goals. Moreover, environments where organizations are highly interconnected facilitate the diffusion and adoption of norms and values. Hence organizations are more conforming to institutional pressures (Oliver, 1991).

2.3.2 Companies’ (political) strategic actions

Besides the framework of Oliver (1991) within which organizations adopt a rather reactive role, DiMaggio (1988) introduces the institutional and self-interested entrepreneur, who “mobilizes resources to transform or create institutions that favor his or her interests”
(DiMaggio & Powell, 1988 cited by Pacheco et al. 2010). Institutional entrepreneurship differs from the institutional approach of isomorphism and taken-for-granted nature of institutionalized norms and rules (Pacheco et al. 2010; Woolthuis et al., 2012). Hillman and Hitt (1999) argue companies attempt to affect policies due to their great impact on the competitive environment of firms. According to Oliver and Holzinger (2008), firms that pursue strategic political management consider the political environment as a set of opportunities, rather than a constraint. Weidenbaum (1980) distinguishes three different approaches how companies can deal with public policies, from a mere passive reaction, to positive anticipation, up to actively shaping policies. The latter tactic entails a proactive behavior of firms in order to reach particular political objectives and strengthen the company’s competitive advantage (Hillman & Hitt, 1999). Favorable subsidies, greater legitimacy, better market conditions and the like are outcomes of successful management of the political environment (Oliver & Holzinger, 2008). The approach of political strategic management includes several specific strategies and tactics which are combined in this thesis with the research and findings of institutional entrepreneurship theory.

Based on Pacheco et al.’s (2010) research and the operationalization through Woolthuis et al. (2012), the following tactics used by entrepreneurs to influence institutions and change status quo will be added to the analysis of companies’ strategic (re)actions to institutional pressures:

1) Framing and theorizing: framing tactics are used by organizations to build legitimacy and gain support for their aspired new norms and practices. They actively try to convince institutional fields of new ways to do things, by using commonly accepted narratives. Theorizing tactics, aiming at the same, use “chains of cause and effect” (Greenwood et al., 2002:60) to reason for certain practices (Pacheco et al., 2010).

2) Collaboration: institutional entrepreneurs stimulate cooperation and collective action. They bring together different actors that share the same interest and create joint meanings and identities (Fligstein, 1997). These entrepreneurs work together with other actors and take over the role as arbitrageurs to find solutions for common problems and exert influence on macrolevel institutions (Pacheco et al., 2010; Zucker, 1988).

3) Lobbying: utilizing political tactics aim at advancing collective interests of a group or individual interests of the institutional entrepreneur (Pacheco et al., 2010:990). The exertion of political tactics such as advocacy and lobbying can occur on the individual firm level or as collective action in terms of company cooperation or industry association action (Hillman & Hitt, 1999).
4) New contracts / negotiating property rights: According to Woolthuis et al. (2012), establishing new contracts and negotiating property rights is regarded as another tactic employed by institutional entrepreneurs. Woolthuis et al. (2012:4) claim that “vested interests and taken for granted ownership agreements” lead to rigidity in the organizational field. Entrepreneurs engage in negotiations between governments, companies, etc. in order to establish and institutionalize new agreements (Klein Woolthuis, 2010).

Figure 3 summarizes the strategic tactics firms choose in anticipation of change.

<table>
<thead>
<tr>
<th>Strategic action</th>
<th>Tactic</th>
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<td></td>
<td>Framing / Theorizing</td>
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<td></td>
<td>Collaboration</td>
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<tr>
<td></td>
<td>Lobbying</td>
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<td>New contracts /</td>
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<td>Negotiating IP</td>
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<td>rights</td>
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Figure 3 Companies’ (political) strategic actions
3. Methodology

3.1 Research design

The goal of this research study is to gain new insights into institutional theory, the characteristics of institutional pressures and their implications on organizations’ strategic behavior. The selected research approach is a qualitative approach, aiming at expanding existing theory from collecting and analyzing empirical material (Flick, 2008:12). Following an interpretivist philosophy, the emphasize is put on the research of the behavior of ‘social actors’, or in this case institutional actors, with a focus on exploring context, meaning and actions within the institutional environment (Saunders et al., 2009:116). Developing an understanding of the research context and seeking answers to ‘how’ and ‘why’ things happen, conclude in an inductive research approach (Saunders et al., 2009:126). Therefore using an exploratory case study is an appropriate research strategy (Yin, 1981). Since this research aspires to understand a phenomenon focusing on the past and changing over time, the case study entails archival research (Saunders et al., 2009: 150). This eventually leads to a historical description of the development of the diffusion of sustainable lighting in Germany, within the context of changes in the institutional environment. However, the research study includes characteristics of a mixed method approach (Teddlie & Tashakkori, 2009) since findings of other research studies are integrated and their results are tested by the collected event data. The collected data is then coded based on existing theory and analyzed by using narratives and graphical representation. A multilevel approach is applied for this and data is collected on the field level, i.e. the development of pressures in the institutional field, but also on the actor level by analyzing companies’ strategic actions. The focus of the study is the development and change process over a period of 15 years, thus a longitudinal time horizon is beneficial, leading to a more differentiated description of change (Poole et al., 2000:11).

3.2 Data validation

When collecting newspaper data, the validity of information obtained from these newspapers is questionable. In order to ensure validity, i.e. ensure that the indicator measures what is supposed to be measured (Lincoln and Guba, 1985), some problems when using newspaper events must be taken into account. Franzosi (1987) refers to concerns that question the validity of newspapers such as about the level of systematic bias when it comes to reporting, how accurate events are reported and whether certain happenings are more likely to
be covered than others. Overall, journalists even though being objective reporters might influence the notion of the event and besides they might be restricted by “commercial imperatives, time and space constraints, and limitations imposed by the organizational structure of the newsroom” (Franzosi, 1987: 6). Nevertheless, newspapers in this field of research are the only source of available, historical data. As Franzosi (1987) argues, no data source is without error, and by using media as a source, researchers risk to collect rather insufficient information than wrong information. In order to reduce sample selection bias, events shall be coded from different, independent sources (Franzosi, 1987). Therefore one decided to search event data in three widely diffused newspapers, whereby two constitute actual newspapers and the other one of an online news source. In addition to that, in order to find government related data, data from the government archive (bundestag.de) was gathered as well.

Besides errors due to problems with validity, there are also sources of random errors that have an impact on the reliability of the study. On the one hand, this might occur in case the coder interprets the obtained information by mistake and on the other hand when the information is entered wrongly into the coding scheme (Franzosi, 1987). The first source of error refers to inter-coder reliability issues and is avoided by doing inter-coder reliability tests and measuring the Cohen’s Kappa coefficient (Landis & Koch, 1977). Having completed three inter-coder reliability tests with two other students doing research in the same field, attained scores between 0.6 and 0.8 signify a sufficient level of agreement and homogeneity concerning the coding (appendix B). Furthermore the objectivity and non-interpreting of the coder is ensured by the preparation of the coding scheme. Franzosi (1987) argues that coding schemes should incorporate categories that are linked to the hypothesis of interests, and that are clear and mutually exclusive. By founding the coding scheme on a broad selection of existing theory about institutional theory, we could establish a sufficient number of categories and codes in order to be able to classify events clearly into the right categories. Besides, a reference and definition list has been established to make clear how certain events have to be coded. By additionally pre-testing and discussing the coding and the events found in peer groups, reliability of the data coding could be ensured. Secondly, data-entry errors are largely avoided by copy-pasting the newspaper quote in the original language into the coding scheme and only summarizing the main message into English.
3.3 The case study

Subject of this research study is the lighting market in Germany. The transition from traditional lighting to more energy efficient lighting was in particular influenced by the ban of the traditional light bulb passed by the European Union in 2007. Hence private households were forced to seek for alternatives to the popular traditional light bulb at the latest until the end of 2012, when the last light bulbs disappeared entirely in all retail stores. The law has caused much anger among consumers concerning the quality of the energy saving lights or the price of LED light, but also agitated skepticism among environmentalists about health and environmental pollution issues. Moreover experts question the overall effect of more efficient lighting on the total energy saving in households since other appliances are claimed to consume much more energy. A widespread opinion blames the industry for having pushed the governments to pass this law to their own favor. Alternative lighting, such as Fluorescent lights and LED lights, have been improved and advertized already years before the ban was passed. Proactive behavior from the lighting industry as well as political interests to promote energy-saving initiatives is assumed to have influenced the change in the lighting market in Germany. The case of lighting in Germany shall demonstrate the influence of different institutional forces and pressures on the diffusion of sustainable innovations.

3.4 Data collection

The study is part of a larger research project among master students in cooperation with TNO. The main topic of the research project is institutional theory and the influence on the diffusion of sustainable innovation. The research project consists of a group of 10 people, whereby three different sustainable innovations (lighting, electro car, solar panels) were analyzed each in a different country. Within the research group, a common framework based on institutional theory literature has been established in order to be able to compare the different innovations in the different countries in the end. Aim of this longitudinal analysis is to find out, when and why these innovations diffuse and what role different institutional pressures play in supporting or undermining the adoption of the innovation. Furthermore, institutional theory literature assumes a reaction by companies to these pressures which again might have an influence on the diffusion of the innovation. Thus by comparing the development of diffusion data with the timeline of institutional pressures and company actions, the data collection tries to find explanations for these questions.
3.4.1 Search procedure

As to the sustainable innovation in this study, archival data was collected in German newspapers over 15 years, starting by May 1998 until May 2013. A period of 15 years was chosen in order to cover a representative period before and after the most influential EU regulations such as the ban of the traditional light bulb. Together with the research students who collected data of the lighting market in the Netherlands and in the UK, we agreed upon common search terms: Energy efficient light bulb (Energiesparlampe), lighting (Lichttechnik), LED light (LED Licht), sustainable lighting (nachhaltige Beleuchtung), energy efficient lighting (Energieeffiziente Beleuchtung), energy saving (Energiesparen). In consultation with the students who collected data in Germany as well but for different innovations, we selected common newspaper and magazine sources. Partly we used LexisNexis, as the most complete news archive in the Netherlands, but since access to German news was limited, the largest part of newspaper articles was accessed directly from the respective newspaper websites. As recommended in other literature (e.g. Franzosi, 1987) we selected a few newspapers to collect the events. The newspapers selected for the data collection were: Handelsblatt, as one of the leading German language business newspapers which is published daily; Wirtschaftswoche, as another German language business newspaper but published weekly; and Spiegel online, one of the most visited German language news websites. In addition to that, the German government archive bundestag.de was selected as additional source to access legal documents. These news sources cover all possible perspectives on the development in the lighting market.

3.4.2 Event coding

To start with, newspaper articles found by using the search terms successively within or time frame are collected and screened for their relevance. The screening leads to an exclusion of newspapers that do not contain relevant information such as for instance newspapers that deal with lighting in the context of interior design. Those articles considered relevant for the story are classified in the coding scheme. The coding scheme (appendix A), based on the institutional theory literature contains the following categories:

1) Event: in the ‘event’ category, the event description, duration (in case of a law-like event) and event label and action are coded. Thereby event label and action consist of a composed code for actions executed by either the government, industry participants, public or professional actors, constituting of either a coercive, normative, or mimetic
pressure. The single action types such as e.g. law proposal or advocacy are based on literature as enlisted in the literature review.

2) Reference: the reference column contains information about the source of the coded event such as date, data source, headline and the abstract in original language. By including this into the coding scheme, the transparency and traceability of the coding itself is ensured.

3) Institutional pressure: besides distinguishing between coercive, mimetic, and normative institutional pressures, a scale within these categories indicates the strength and the trend of the pressure, i.e. whether the action has a supportive (+) or undermining (-) effect on the diffusion of the innovation. The scale indicates strong pressures with +/- 2 as actual actions and weaker pressures with +/-1 as statements or less influential actions.

4) Institutional actor: the column of institutional actors constitute of the level on which the pressure is caused, i.e. on a national or European government level, company level, public or professional level. The action is repeated in the respective subsequent column.

5) Company response: the category of company response is dedicated to two focal companies per country. Since in Germany, the biggest market players and most often mentioned companies are Philips and Osram, those are selected as focal companies. Next to the company name, the company action is being specified in another column. The different options for company actions have been established after a pre-coding across all sustainable innovation research students and thus, in contrast to all other codes, are based on practical occurrence rather than on theory (figure 4). Besides this we also analyze the actual company response and tactic as based on Oliver (1991) and institutional entrepreneurship literature (Pacheco et al., 2010; Woolthuis et al., 2012).

<table>
<thead>
<tr>
<th>Investment /De-investment in internal capabilities</th>
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<tbody>
<tr>
<td>Innovation, product introduction / Decreasing market offer</td>
</tr>
<tr>
<td>Partnering / Quit Partnering</td>
</tr>
<tr>
<td>Marketing of new product, market development / Stop marketing, market exit</td>
</tr>
<tr>
<td>Setting up new BU, facility / Shutting down BU, facility</td>
</tr>
<tr>
<td>Introducing new business model / Shutting down business model</td>
</tr>
<tr>
<td>Acquiring other businesses (M&amp;A) / Spinning off businesses</td>
</tr>
<tr>
<td>Lawsuits / IP wars</td>
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<tr>
<td>Increasing prices / Decreasing prices</td>
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</tbody>
</table>

Figure 4 Overview additionally added company actions
6) Recipient: the column ‘recipient’ indicates on whom the pressure exerted will have an impact. National and European governments, companies, public, professional, mutually not exclusive, can represent recipients of pressures.

Hereby, from one article several events can be derived, containing information originating from different actors. Hence, scanning an article, considering it relevant for the coding scheme, we start by copy pasting the quote we refer to into the coding scheme. After filling in the references and indicating the kind of event, the strength of the pressure is being determined. Actor, action and recipient are added and in case one of the focal companies is mentioned, and the company action will be coded. The company action is only considered a response according to our framework, when clearly pointed out in the newspaper article.

3.5 Data analysis

Langley (1999) refers to data that deal with “sequences of ‘events’…involve multiple levels and units of analysis…[and] their temporal embeddedness often varies in terms of precision, duration, and relevance” as process data (Langley, 1999: 692). Van de Ven and Poole (2005) argue, how process studies explain how series of events make sense of a phenomenon over time. Case studies as well as archival data are research strategies within process research that help to identify and reconstruct processes (Van de Ven & Poole, 2005). In Langley (1999)’s research study different approaches to analyze and make sense of process data and dynamic phenomena are exposed. In this study, three of the strategies for sensemaking will be applied that complement one another to enhance the quality of the theory developed. First, the narrative strategy allows establishing a chronology of the event data in order to be able to analyze the data later. The narrative captures the flow of the events and the causal connections that thrive the story through its sequences (Poole et al., 2000: 2012). Whereas this strategy leads to enhanced accuracy (according to Weick, 1979) it does not reach a high degree of simplicity and generality. Therefore one will make use of the quantification which implies a systematically listing and coding of qualitative data according to a predefined framework. By reducing the complexity of information, one will eventually obtain a quantitative set of data that can be analyzed. In combining the two strategies, simplified and quantified data is contextualized. Employing additionally a temporal bracketing strategy, makes it possible to separate the process data into sequences, and analyze continuous data in units to explore and replicate theoretical ideas (Langley, 1999).
4. Analysis

In total 338 events were collected in ‘Handelsblatt’, ‘Spiegel online’, ‘wiwo’, and ‘bundestag’ in a time span between May 1998 and May 2013. Those events were assigned to the respective institutional pressures and organizational actions and responses, and analyzed with regard to existing theory and by making use of the strategies as pointed out by Langley (1999). Firstly, an overview of the overall findings is given by using several graphs to represent trends and distributions. Secondly, in order to understand the event history of sustainable lighting, a storyline is built to capture the whole picture of the evolution. Therefore the story about how the lighting market developed is broken down into three periods. Each sequence is described and patterns are tried to be discovered. Finally, after each sequence the findings are highlighted and conclusions are drawn.

4.1 Overall analysis and findings

This part shall give an overview of the overall findings of the analysis before breaking down the case story into several sequences.

As to the distribution of the institutional pressures coded over the 15 years, coercive pressures are not very distinctive until 2007 (figure 5). In 2007 the discussion about climate protection and energy saving started which led to the passage of the European ban of incandescent light bulbs in 2008. This has incrementally been effectuated until 2012 and is assumed to be a major factor of change in the lighting market. Mimetic pressures have been cumulating from 1998 until 2013 which can be explained by the increasing activities of companies with regard to the new markets and technologies. Normative pressures are equally increasing from 1998 and are mainly attributed to advocacy and professional opinions which are found quite often around other happenings such as the origination of new technologies and the effectuation of new laws.
As to the distribution of the institutional actors over the entire time horizon, companies are the dominant actors in the institutional field (figure 6). Through their actions, companies cause mainly mimetic pressures but also normative pressures on the institutional field. European regulators as well as the German government are found to be less prevailing actors but central and influential for the diffusion when causing coercive pressures. Besides, they also try to stimulate the diffusion by actions such as campaigns, or public procurement, which result in normative pressures. Professionals and the general public also exert influence on the field, mainly through opinion statements.
As to companies’ strategic responses, an overview at this point is skipped due to the limited amount of strategic responses found in the newspaper articles. Since companies seem to act more than they react, the following graphic shows the distribution of the coded company actions (figure 7).

![Figure 7: Overview company actions](image)

As figure 7 points out, companies mostly proved to invest in internal capabilities (such as R&D), acquiring other businesses, introducing and marketing new products and set up partnerships or engage in cooperative projects. In the following section these actions will be deeper analyzed.

### 4.2 The event history of sustainable lighting

The diffusion of sustainable lighting is demonstrated by comparing the change in the amount of produced LED lights to the amount of produced incandescent light bulbs (Statistisches Bundesamt, 2013). Since data was available only from 2001 onwards, in particular the development in the market between 2001 and 2013 is analyzed. As shown in figure 8, the amount of produced LED light reaches its overall peak in 2004, while also the amount of produced incandescent light bulbs has been constantly decreasing until becoming steady from 2004 forward. Thus the first event sequences analyzed is the period from 1998 to 2004. Subsequent to that, between 2004 and 2009 the amount of produced LED light has been decreasing while the amount of incandescent light bulbs remains unchanged. The European ban of incandescent light bulbs is assumed to be of major influence during this period, also reflected by the sudden divergence between amount and value of incandescent light bulbs as well as LED lights. Hence, the time span between 2004 and 2009 consists of another event sequence analyzed. The third phase in the development of sustainable lighting is marked by
both a slight increase in the production amount as well as a remarkable discrepancy between amount and value of produced LED light from 2009 forward. This division into the following three single phases is also supported by the evolution of the institutional pressures (figure 5).

Figure 8 LED light and incandescent light development

4.2.1 Phase 1: Discovery and advocacy of a new technology (1998-2004)

Description

While the origin of light emitting diodes goes back to the beginning of the 20th century, a breakthrough in the lighting technology was set by Nakamura, a Japanese engineer who initiated the “white revolution” by introducing the key to white LED lighting during the 1990s. In 2000 all major players such as Philips, Siemens, or General Electric Lighting start to explore and invest into the new technology [8]. This first period is marked by the introduction and intense research of LED lights and several mergers and acquisitions between companies that involve access to patents and knowledge. Throughout the year of 2000, Companies built up alliances such as Philips Lighting and Agilent Technology who formed
LumiLeds and General Electric Lighting and Emcore Corp. that set up GELcore [10\(^1\)]. Osram as one of the leading companies on the LED light market acquired new technologies from Cree Research to further develop highly luminous LED light [11\(^2\)] and fully acquires Opto Semiconductors [13\(^3\)].

Furthermore from 2000, LED light starts to replace traditional lighting also in the automobile industry. Leading car manufacturers such as BMW, Maserati, General Motors, and Alfa Romeo equip their new cars with taillights and sidelights in form of LED lights [7\(^4\)] and in 2002 Osram and Ford introduce the first car equipped with LED lights [17\(^5\)].

Industry participants announce the potential of the LED light technology but at the same time are aware of its current limits. As stated in 2001 by the CEO of the Bartenbach Light Laboratory, at present, the high price of LED light prevents the LED light technology from becoming an alternative to traditional room lighting [15\(^6\)]. Nevertheless with regard to an overall attentiveness concerning energy saving and subsidized initiatives [2, 5, 108], companies clearly engage in promoting the new technology. For instance the initiative ‘Next Generation Lighting’ founded in the US in 2003, is strongly supported by leading lighting manufacturers such as Philips and Osram [24, 23\(^7\)]. Osram director Bobst predicts a replacement of traditional car lighting by LED lighting over the next decade [18\(^8\)]. First newspaper journalists claim that the LED light technology will revolutionize in particular the lighting market, due to their longevity and potential to transfer electricity almost entirely into light, compared to incandescent light bulbs that primarily generate heat [12\(^9\)].

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1 Einige dieser Firmen taten sich im vergangenen Jahr zusammen: Philips Lighting und die HP-Tochter Agilent Technologies bildeten LumiLeds Lighting; General Electric Lighting und die Emcore Corp. in New Jersey sind Partner eines Joint Venture namens GECore (Wiwo, 2000).


3 Die Opto Semiconductors, das Gemeinschaftsunternehmen mit Infineon, will Osram ganz übernehmen, nachdem sich die Schwestergesellschaft vom optoelektronischen Geschäft trennen will (Handelsblatt, 2000).

4 Zu den Vorreitern bei den Leuchtdioden oder LEDs (Light Emitting Diodes) gehört BMW. Dort wird der gerade überarbeitete 5er mit neuen Rücklichtern ausgerüstet, vorne gibt es von LEDs gespeiste Leuchtringe als Standlicht. Laut dem Leuchtenhersteller Automotive Lighting in Reutlingen ist BMW mit der neuen Technik nicht alleine - Maserati, General Motors und Alfa-Romeo haben ebenfalls entsprechendes im Programm (Spiegel online, 2000).

5 Auf der Chicago Auto Show haben Osrarn und Ford in diesem Frühjahr das erste Auto vorgestellt, dessen Leuchten komplett mit LED (Light Emitting Diodes) bestückt waren (Handelsblatt, 2002).


7 Damit das Energiesparwunder möglich wird, entstand in den USA eine Initiative namens Next Generation Lighting, die sich die Verbreitung der Leuchtdiode auf die Fahne geschrieben hat. Zu den Förderern zählen die größten Leuchtdiodenhersteller der Welt…Osram…Philips…sowie der japanische Konzern Nichia; Die Tochter Osram Opto Semiconductors, angesiedelt in Regensburg, will entscheidend dazu beitragen, dass sich eine Prognose des amerikanischen Energieapartments erfüllt. Danach soll sich der Stromverbrauch für Beleuchtung bis 2025 weltweit um zehn Prozent reduzieren (Wiwo, 2003).

8 "In zehn Jahren dürften die Leuchtdioden die Glühlampe beim farbigen Autolicht weitgehend ersetzt haben", schätzt Osrarn Chef Wolf-Dieter Bobst (Handelsblatt, 2002).

9 Die lichtstarke LEDs werden in den kommenden Jahren vor allem den Beleuchtungsmarkt revolutionieren. Sie haben all das, was Glühlampen fehlt: Sie sind winzig, nahezu unzerbrechlich, entwickeln fast keine Wärme und leuchten bis zu 100
Various industry participants launch new products between 2002 and 2003 such as e.g. caplights [19], or operational lights [21] based on LED technology and make further progress in research and development of e.g. headlamps [29] for cars. This involves innovations in the field of LED light technology but also in the category of energy saving lights. *Osram for instance presented in 2002 an energy saving light bulb with adjustable luminosity* [16\(^{10}\)].

**Findings**

Throughout the period between 1998 and 2004 company actions by the two focal firms Osram and Philips represent a significant amount of all coded events (approx. 25%). *After the initial successful progress in the LED light technology by Nakamura, all other major industry participants entered the LED light market* [9\(^{11}\)]. Investments in research and development, mergers and acquisitions and new product launches as mentioned above indicate company actions, which result in the creation of mimetic pressures on the institutional field. The commitment to the new technologies is also reflected by an increase in the amount of produced LED lights reaching its overall peak in 2004 (figure 8). Meanwhile the decreasing amount of produced incandescent light bulbs indicates that the industry incrementally is turning away from the obsolete technology.

Hence it can be noticed that an increasing number of companies is getting involved into the LED technology. Hereby, the companies seem to act uniformly and imitate each other’s behavior. Strength and direction of the resulting pressures from these company actions show almost exclusively a clear support for the diffusion of sustainable lighting. This indicates that the mimetic pressures towards a shift on the lighting market are increasing; however uncertainty in the field and in relation to the new technology appears to be prevalent as well, given that the product is still in the developing and testing phase and the fact that there is no clear market yet. This confirms the theoretical point of view, which states, that uncertainty causes mimicry among organizations in the field and leads to the creation of isomorphism (DiMaggio & Powell, 1983).

While the emergence of mimetic pressures in consequence to company actions is prevailing, other pressures appear to be less significant in this period (23 mimetic pressures compared to 31 pressures coded in total). Through innovation activities, companies aim at

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\(^{10}\) Eine Energiesparlampe, die sich zwar nicht dimmen lässt wie eine normale Glühbirne, bei Bedarf jedoch nur halb so hell leuchtet wie üblich, bringt Osram jetzt auf den Markt (Wiwo, 2002).

\(^{11}\) Nach Nakamuras Erfolgen stürzten sich alle Mitbewerber auf das Galliumnitrid: Siemens, Philips, Hewlett-Packard (HP), Xerox, General Electric, Sharp, Sanyo, Sumitomo, Toshiba, Toyoda Gosei, NEC und Sony (Handelsblatt, 2000).
setting new expectations and standards, represented by attempts to create normative pressures, e.g. Osram director predicts a LED light future or the initiatives of Philips and Osram concerning the ‘New Generation Lighting’ campaign in the US [18, 23, 24].

Nevertheless, due to the limited amount of evidence found throughout this first period, it is not clear yet in how far the company actions and the resulting pressures have an impact on the shaping of new expectations and building of new institutions.

4.2.2 Phase 2: Towards a European regulative framework (2005-2009)

Description

With an advance in the new LED technology, established companies in the European market face increasing competition from Asia [40]. Companies prepare themselves by investing more into R&D and acquisitions to become more innovative [46]. In September 2005, Osram explains their focus on improving the luminosity and decreasing the production costs [40][12]. Companies recognize the enormous growth potential in the LED light market. According to Philips director van Strijp in 2005, annual growth rates of at least 25% are

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12 Herr Goetzeler, Osram bekommt bei den Leuchtdioden, den LEDs, Konkurrenz aus Japan. Wie rüsten Sie sich jetzt dagegen? Mit Innovationen…Unser Fokus liegt darauf, die Helligkeit zu steigern und die Herstellungskosten zu senken (Handelsblatt, 2005).
expected [43\textsuperscript{13}]. Despite high expectations and confidence [52], the high costs of the LED lights are still an issue in all branches. In 2005, experts and industry participants, e.g. BMW are of the opinion that LED light is not able to keep up with existing technologies such as the xenon-lighting in car lighting [45\textsuperscript{14}].

In 2006, Audi and Toyota launch the first car that uses LED headlights [57, 59]. In general, cities in Germany start switching over to LED lighting, although compared to other countries such as Japan where LED traffic lights are omnipresent, they are considered to be lagging behind [55\textsuperscript{15}]. The European commission announces in October 2006 to introduce stricter regulations concerning lighting on streets and buildings [89]. Although also the general public learns about the energy saving potentials when it comes to lighting, the amount of incandescent light bulbs sold in 2006 (280mn bulbs) is still much higher compared to the amount of sold energy saving light bulbs (30mn bulbs) according to Handelsblatt in 2007 (Löwer, 2007).

The climate report of the United Nations at the beginning of 2007 creates a worldwide discussion about urgent measures to save energy. In February 2007, when Australia as one of the first countries enacts a law that bans incandescent light bulbs, politicians and parties in Germany call for a similar regulation in the European Union. Politicians of the Social Democratic party as well as from the Alliance ‘90/The Greens call for a European regulation against incandescent light bulbs [69, 76, 77\textsuperscript{16}]. The German government announces to cooperate with industry participants to find a common path but also to consider a statutory solution [63\textsuperscript{17}]. However, Philips claims that technological change will also continue without a consensus in the governments [64\textsuperscript{18}]. Van Deursen, Philips current CEO of the lighting division, reveals their intentions to end the production for incandescent lighting by the end of the decade [65\textsuperscript{19}]. The association of the electrical industry, ZVEI, suggests in case of a

\textsuperscript{13} Jährliche Wachstumsraten von 25 Prozent bescheinigt Peter van Strijp, Vize-Chef von Philips-Lighting, der jungen Branche (Handelsblatt, 2005).

\textsuperscript{14} Der Kunde hat mit Xenon ein sehr gutes Lichtsystem im Fahrzeug", gibt Martin Enders, Leiter der Abteilung Licht und Lichtsysteme zu bedenken. Auch seine Techniker nehmen die LED-Forschung ernst. Enders glaubt aber, dass LEDs bei Kosten und Performance frühestens im Jahr 2012 mit schwenkbaren Xenonscheinwerfern mithalten können (Handelsblatt, 2005).

\textsuperscript{15} In deutschen Städten wie Aachen werden einzelne Anlagen bereits mit Dioden ausgestattet. Andernorts ist man weiter. In Japan seien LED-Ampeln ein Selbstläufer, berichtet Hangleiter (Spiegel online, 2006).

\textsuperscript{16} Nach dem australischen Verbot herkömmlicher Glühbirnen fordern nun auch Politiker der SPD und der Grünen den Umstieg auf Energiesparlampen (Spiegel online, 2006).


\textsuperscript{18} Selbst wenn die Bundesregierung der Initiative Australiens nicht folgen sollte, wird der technische Wandel weitergehen, sagt Robert Pfarrwallner, Geschäftsführer Philips Licht Mitteleuropa (Handelsblatt, 2007).

\textsuperscript{19} In zehn Jahren will Philips laut von Deursen gar keine Glühbirnen mehr herstellen (Handelsblatt, 2007).
The lighting industry collectively wants to contribute to the protection of the environment and stop selling incandescent light bulbs until the end of 2015 [84, 85]. Spiegel online blames the industry to demand a stepwise effectuation of the ban since a fast ending of the traditional light bulbs does not represent their [the industry’s] interests so as to prevent them from being left with stocks of unusable products [8721]. Van Deursen (Philips) states that they are working on influencing politics accordingly [9622].

More and more local authorities inside and outside Germany decide to switch to more energy efficient lighting and collaborate with the big lighting manufactures, e.g. Philips reveals that Cuba bought huge amounts of energy saving light bulbs to distribute them for lower prices among their people [9823, 99]. With the hype around energy saving lighting, companies improve the technology in energy saving light bulbs [93] and increase their turnovers [82, 95].

With increasing prices for electricity, people are more interested in energy saving solutions [109, 137]. In 2008, more and more cities all over Europe begin to replace traditional lighting by LED lighting, with the goal to realize energy savings but also to reduce smog traced back to lighting. Philips starts around 15 joint pilot projects all over Europe in order to gain experience and contribute to shaping the new market as a Philips employee explains [11224].

The discussion among politicians in Germany, the European Commission and industry associations about banning traditional light bulbs carries on throughout 2008. The ZVEI insists on the governments to establish a regulatory framework to improve the incentives for investments in energy efficient products [13025]. Eventually in December 2008, the EU directive was passed wherein a gradual ending for the incandescent light bulb until the end of
2012 is being determined [147]. This starts with a ban of light bulbs with 100-200 watt in September 2009, followed by a ban of bulbs with 75-100 watt in September 2010, subsequent to which bulbs with 60 watt will be forbidden from September 2011 and finally all other bulbs are affected by the end of 2012 ("Glühlampenverbot: Welt ohne Birne?", 2009). Although according to the lighting manufacturers, the market for new energy saving technologies is booming [133, 137, 138], companies have to deal with the increasing number of Asian competitors [134, 139]. Nevertheless, the European commission decides against an extension of the in 2001 introduced antidumping measures against Asian products [127, 140]. Whereas Osram fights to maintain them, Philips as well as several retailers and environmentalists vote against a prolongation.

Subsequent to the European ban of incandescent light bulbs, resistance to the inflicted law becomes evident within the European parliament. Politicians characterize the new law ban as paternalism and want to effectuate another ballot [16526]. Environmentalists and journalists of Öko-test magazine claim that besides being dangerous for the environment and not holding what they promise, energy saving light bulbs do not have a big impact on saving energy compared to other appliances [189, 197]. Product tests reveal, that many energy saving light bulbs, also from Philips and Osram, cannot compete with the luminosity of the equivalent incandescent light bulbs they are supposed to replace [19327]. Still, German politicians such as Sigmar Gabriel, current German environment minister from the social democrats (SPD) promote the new lights by distributing light bulbs during the election campaigns in 2009 [19228].

Newspapers such as Spiegel online and Wiwo report ‘LED euphoria’ [16729] among industry participants and authorities. This is supported by the EU directive passed in March 2009 which bans mercury vapor bulbs from 2015 [186]. That includes a replacement of at least one third of old street lighting from 2015 (Burger, 2011). Still, at the same time, do-it-yourself-stores and other retailers disclose that the general public increases buying and starts building up stocks of incandescent light bulbs [18030], being hesitant with the replacement of

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26 Vor allem Europaskeptiker, aber auch Vertreter der Konservativen und Liberalen befürchten ein "Ökodiktat" und eine Bevormundung der Verbraucher (Bundestag, 2009).
28 Sigmar Gabriel, amtierender Bundesumweltminister von der SPD, setzt jedoch nicht allein auf sogenannte Give-aways. Er verkauft den Bürgern an seinem Wahlkampfstand auch Energiesparlampen für einen Euro (Spiegel online, 2009).
29 Aus der allgemeinen LED-Euphorie stechen zwei Projekte hervor, die sich nicht auf die beschriebenen wirtschaftlichen und ökologischen Möglichkeiten beschränken. So fiel der Spruch von den "aufregenden Zeiten" für Laternen im Rahmen einer Konferenz in San Francisco, bei der auch die Steuerung der Straßenbeleuchtung per Mobilfunk demonstriert wurde (Spiegel online, 2009).
30 Aber schon legen viele Bundesbürger Glühlampen-Vorräte an (Wiwo, 2009).
their traditional light bulbs [195]. *Osram reacts surprised to the consumer behavior, having expected a decline in demand for traditional light bulbs. Now they want to re-adapt the production capacities [18131].*

**Findings**

In the second phase, the industry field in the LED light market intensifies with an increasing amount of Asian competitors entering the European market, leading to companies investing in particular in R&D and product marketing to stay competitive. Still at least at the beginning, the adoption of sustainable lighting seems rather moderate, even though companies such as the car manufactures launch new products using LED technology, the figures of traditional light bulbs compared to LED light but also energy saving light bulbs as stated above, indicates that consumers do not seem to change their habits. Nevertheless mimetic, uniform action among companies seems to persist on the industry field.

A turning point is reflected by the climate report at the beginning of 2007 subsequent to which Australia passes the law that bans incandescent light bulbs from 2009 onwards. Other countries such as Brazil and Venezuela already banned traditional light bulbs earlier in 2005 (Derbyshire, 2009). Still, after Australia has passed the ban, increasing political discussion in Germany becomes evident, accompanied by lobbying activities from manufacturers and industry participants. Company actions in terms of lobbying and political actions, e.g. ZVEI states: "necessary technologies are existent, now it is up to the government to come up with incentives" [7432], affirm existing literature whereby companies make an effort to create favorable conditions for themselves (Hillman & Hitt, 1999; Oliver & Holzinger, 2008). Company projects in cooperation with authorities (e.g. Philips starts pilot projects all over Europe [112]) and attempts to convince and appeal to the public ("*European lighting manufacturers want to protect the environment by quitting the business with incandescent light bulbs*" [8433]) can be understood as collaboration and framing and theorizing tactics as part of institutional entrepreneurship theory (Woolthuis et al., 2012; Pacheco et al., 2010).

These actions lead to pressures on the institutional field. It is interesting to see what follows now, shortly after these actions in terms of targeted legislation and other favorable conditions.

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31 Die Glühlampen-Hersteller zeigen sich überrascht vom plötzlichen Boom. Osram habe bei 100-Watt-Leuchten einen Rückgang erwartet, doch die Nachfrage aus dem Handel sei unverändert hoch, sagt Unternehmenssprecher Till Moor. "Wir passen nun die Fertigung an die Nachfrage an und fahren sie nicht wie geplant zurück (Wiwo, 2009).


33 Europas Lampenhersteller wollen etwas für den Klimaschutz tun und keine traditionellen Glühlampen mehr verkaufen - innerhalb der EU (Spiegel online, 2007).
Through other governments that already passed the law, mimetic pressures are exerted on the German and European government. Owing to the strong industry engagement on the one hand and political discussion on the other hand, normative pressures increase and result in the predicted effects: a European government reaction in form of the introduction of a few relevant regulations. First in October 2008, the imposed taxes on cheaper Asian products introduced in 2001 are not being extended. Shortly afterwards in December 2008, the EU directive against incandescent light bulbs is introduced. Following these stimuli, the EU passes another directive in the beginning of 2009 that commands a replacement of almost a third of the existing street lights by 2015. These regulations impose coercive pressures on other institutional actors to adopt the new norms.

However, the decreasing amount of produced LED lights until the end of 2009 indicates that an adoption does not really take place yet. Critics of environmentalists and experts for health and environmental related issues as well as consumers that strongly build up stocks of incandescent light bulbs generate opposing normative pressures on the field.

As conclusion of the second phase, the observations indicate that the attempts of the industry and government to create a market for the new technologies and replace existing norms and beliefs (reflected in figure 10) are not that fruitful yet.

![Figure 10 Cumulated pressures 2005-2009](image-url)
4.2.3 Phase 3: The future lighting market (2010-2013)

Description

At the beginning of 2010, the leading utilities providers RWE, Eon, and EnBW advertize their support for helping households to save energy, by providing online portals with advice on energy saving, or offering intelligent control systems for appliances in private households. RWE for example builds a subsidiary, the “Effizienz GmbH”, which only focuses on such energy services, being aware of the emergence of a new market towards energy efficiency and the need for customer retention in light of the fierce competition (Flauger, 2010). Campaigns such as “energy efficient cities” implemented from the German Federal Ministry for Education and Research in 2010, try to stimulate change in cities and communes [229]. Philips and others aim at benefitting from the trend of energy saving and predict increasing revenues [207]. Subsequent to the overall economic downturn, both the European market leaders as well as Asian competitors put their hopes on the LED light market where, according to the American research institute i-suppli, demand is currently surpassing supply [208]. The market growth makes companies invest in LED technology, Philips invested 80% of their expenditures for research and development into this segment [209]. Others such as Osram focus on communicating the new technology to consumers and Osram CEO Goetzeler predicts price decreases of at least 10% per year [21134] to overcome the current barrier in the market of private households. Above that, Osram extends their worldwide production facilities to get ready to meet the increasing demand [212].

While the LED technology is still about to reach its final breakthrough, organic LED lights (short ‘OLED’, which are an advancement of the LED lights, using organic semiconductors instead of inorganic materials such as the gallium-nitride ordinary LEDs use) are being launched from Philips in 2009 and from Osram in 2010 [227, 228]. Promotional programs and subsidies from the German government have been supporting the research and development of OLED lights in the initiative “Innovationsallianz OLED 2015” from 2006 to 2009 (Photonikforschung Deutschland, n.d.). The European Union aims at increasing the efficiency of OLEDs with another subsidy program called “OLED 100” (not further specified) [224]. Osram CEO Goetzeler reveals the importance of being the first company that enters the market to gain a pivotal competitive advantage [21535]. Fighting for the market leader position, all companies aim at decreasing the manufacturing costs of OLEDs [214,215]

34 “Die Preise fallen um mindestens zehn Prozent im Jahr”, verspricht Goetzeler (Handelsblatt, 2010).
35 “Wer bei OLEDs als Erster am Markt ist, der hat einen Vorteil!”, sagt Goetzeler (Handelsblatt, 2010.)
and make them suitable for large scale use [230]. In August 2011, the first pilot project for OLED serial production is opened in Regensburg in Germany [265].

In a Wiwo article from October 2010, industry experts, LED retailers and lighting experts from the University Münster, claim that high quality LED lights are much cheaper to produce than signalized by the high prices of the manufacturers. After the investment costs are recouped, according to their opinion, LED lights will become extremely affordable [233].

While the market research institutes IMS and the director of Cree Inc. predict further growth of the LED light market, the technology is improving and the adoption increases as for example in the automobile industry [220, 221, 222]. As Lexus and Audi, Mercedes now offers their first car equipped with LED lights instead of xenon or halogen lights [223, 224]. In order to further support the change to LED lights, the German Federal Ministry for Environment instigates the modernization of the cities by more subsidy programs in 2011 and 2012. An environmental innovation program (‘Umweltinnovationsprogramm’) of €4.7mn has been implemented and in addition to that, subsidy programs that directly target the replacement of street lights by LED lights were introduced. Between 2011 and 2012, around 1160 requests have been sent from local authorities to participate in those programs, which represent a volume of €51mn and could lead to a replacement of 500,000 street lights overall, according to the Federal Agency [335]. As a research study by the climate consultancy firm Climate Group asserts, many cities have faced difficulties in financing the transition to LED and therefore not realized it yet [334, 335]. Although cities are aware of the potential of energy saving through LED lights, the market research institute Trendresearch assumes that the given subsidies are not sufficient and cities will choose cheaper alternatives such as sodium vapor lights until the prices for LED lights decrease significantly [336, 338].

Panasonic launches a new type of LED light in the beginning of 2011 and intends to attack the European market leaders Philips and Osram [245]. They argue it has become

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37 Wie schon Lexus und Audi bietet ab Ende des Jahres auch Mercedes die ersten LED-Scheinwerfer an, bei denen sämtliche Halogen- oder Xenonbirnen durch Licht emittierende Dioden (LED) ersetzt werden (Spiegel online, 2010).

38 Viele Städte haben festgestellt, dass LED-Projekten noch eine große Hürde entgegensteht: die Verfügbarkeit einer erschwinglichen Finanzierung" (Handelsblatt, 2012).

39 Demnach kommt nur ein Prozent des Lichts auf deutschen Straßen von LEDs. Einen Anteil von 31 Prozent haben Quecksilberdampf-Lampen (HQL), die ab 2015 nicht mehr verkauft werden dürfen. Die Lücke schließen werden, so die Prognose, zunächst die weniger effizienten, aber günstigeren Natriumdampf-Leuchten. LEDs werden sich nach Einschätzung der Marktforscher erst dann durchsetzen, wenn die Preise deutlich sinken (Handelsblatt, 2012).

40 Der Elektronikkonzern aus Japan hat einen neuen Leuchtdioden-Typ entworfen. Damit will er die Marktführer in Europa, Philips und den Siemens-Ableger Osram, angreifen (Handelsblatt, 2011).
possible to produce on the assembly line which will massively increase the number of competitors on the market. The price will determine who will hold its market position in the end [247\textsuperscript{41}]. As one consequence to the fierce competition, companies take legal action against the violation of IP rights. For example in June 2011, Osram files a lawsuit against Samsung in Germany aiming at an import embargo for patent infringing products [255\textsuperscript{42}]. In the course of another court case against LG, Osram demands in August of the same year from the Korean Trade Commission an export embargo for LED lights produced by LG, due to their discontinuation of payment fees for utilized property rights [260\textsuperscript{43}].

On the other hand, critics on the ban of incandescent light bulbs are still prevalent in Germany. The German Federal Environmental Agency reports at the end of 2010 about the health risk and the risk for the environment energy saving light bulbs cause. In case the bulbs break, toxic mercury can escape into the air [240]. Subsequent to that, the consumer organization (Verbraucherzentrale) and leading EU deputies request to suspend the ban [241, 242]. The EU commission is accused of reacting to the hype about climate change by using symbolic politics that do not generate added value neither for the people nor for the environment [244\textsuperscript{44}]. Nevertheless, tests from the German consumer organization ‘Stiftung Warentest’ reveal, that the quality of energy saving light bulbs has been increased and that these light bulbs offer huge benefits both from an economic as well as ecological point of view [261, 262].

From the 1\textsuperscript{st} of September 2011, the next step of the European ban, the ban against 60-watt bulbs is effectuated. At the same day, Osram and Philips increase the prices for energy saving light bulbs [263, 269], blaming the global scarcity of raw materials needed for the manufacturing of energy saving bulbs and an increasing global demand for the cost explosion [263\textsuperscript{45}]. Only illuminants that do not contain these respective materials, such as LEDs are excluded from the price rise [272].

\textsuperscript{41} "LED kann am Fließband hergestellt werden", sagte Yoshimasa Shimizu, zuständig für die Businessstruktur im Lichtgeschäft. "Deshalb wird die Zahl der Mitspieler im Markt dramatisch steigen." Den Unterschied werden am Ende die technisch schwierige Farbtechnik und der Hitzeschutz machen. Gleichwohl wird auch der Preis letztlich eine wichtige Rolle spielen bei der Frage, wer sich im Markt behaupten wird (Handelsblatt, 2011).

\textsuperscript{42} Im Konkurrenzkampf um die LEDs führt Osram nun schwere Geschütze auf: Das Münchener Unternehmen wirft den koreanischen Konkurrenten Samsung und LG Patentverletzungen vor und reicht Klage in den USA, Deutschland, Japan und China ein (Handelsblatt, 2011).

\textsuperscript{43} Der Leuchtmittelhersteller verlangt von der örtlichen Handelsbehörde KTC den Export von Leuchtdioden der LG -Tochter LG Innoket zu verbieten, wie Osram am Montag mitteilte (Handelsblatt, 2011).

\textsuperscript{44} Der Ausschussvorsitzende warf der Brüsseler Gesetzesbehörde vor, dass sie mit dem Glühbirnenverbot "getrieben vom Klimaschutzwahn Symbolpolitik betrieben hat, die weder dem Klimaschutz noch der Gesundheit der Menschen dient" (Spiegel online, 2010).

\textsuperscript{45} "Die zunehmende globale Knappheit dieser Materialien hat zu einer Kostenexplosion geführt", schreibt Osram laut "FTD" in einem Brief an die Kunden. Hintergrund sei die gestiegene Nachfrage nach Seltenen Erden wie Europium, Terbium und Yttrium und die restriktive Exportpolitik Chinas, das einen großen Teil der Abbaugebiete kontrolliert (Spiegel online, 2011).
In the beginning of 2012, decreasing profit margins of the leading companies are reported [304]. Osram and Philips are pressured by price erosions, an increasing number of Asian competitors and by the high prices for raw material [283, 284]. The industry association ZVEI requests in a hearing of the Bundestag further incentives for industry, retail, and private households to stronger motivate energy efficient buying [291\textsuperscript{46}]. But the manufactures continue advocating the LED technology, a chief engineer at Osram states “the semiconductor technology still has a lot of potential” [299, 315, 317\textsuperscript{47}]. New products and campaigns to promote also the design and the ambience created by LED lights are launched worldwide [300], e.g. Osram covers skyscrapers in Baku with LED light and install LED lights in the opera in Oslo etc. [300]. Throughout 2012, companies try to enhance their profits in the lighting segment, especially with new innovations [304, 305, 306, 310]. By the end of June in 2012, Osram wins the lawsuit against LG, which in consequence forbids LG the usage of a certain technology for backlighting in TV and computer screens, signifying “a decision with tremendous economic impact” according to court [309\textsuperscript{48}].

In addition to that, in 2012 the European commission puts more pressure on the German government asking them to “stricter control the embargo against incandescent light bulbs in stores”, stated by one of the energy commissioners [313\textsuperscript{49}]. This happens as a reaction to increasing sales of special incandescent light bulbs, which are not made for private usage but for industrial sectors such as the craft sector. The commissioner requires “retailers to clearly indicate that these bulbs are not for household usage and keep them in separate sections” [314\textsuperscript{50}].

Nevertheless, also still as an effect of the economic downturn, the profit margins of the lighting manufacturers stay volatile, for the end of 2012 Philip discloses a profit decrease of more than 50% compared to the same quarter of the previous year [329\textsuperscript{51}, 330]. Osram is about to get spun off from Siemens as their CEO Löscher states that Siemens does not want to carry the high investment costs of Osram alone which occur in context of the transition to a

\textsuperscript{46} Erforderlich ist daher ein kongruentes und abgestimmtes (Gesamt)Anreizsystem, welches sich auf sämtliche Bereiche d.h., (a.) öffentliche Hand, (b.) Industrie, Handel, Gewerbe, Dienstleistungen und (c.) Privathaushalte erstreckt (Bundestag, 2012).

\textsuperscript{47} Davon geht mehr als die Hälfte in den Bereich LED, der günstigere und effizientere Lampen entwickeln soll. ”Die Halbleiter-Technologie hat noch viel Potenzial”, sagt Ulrich Steegmüller, Technikchef von Oram Opto Semiconductors (Handelsblatt, 2012).

\textsuperscript{48} Nach einer Entscheidung des Landgerichts Hamburg dürfen die Unternehmen in Deutschland nicht mehr Fernseher und Computerbildschirme vertreiben, die eine bestimmte LED-Technik für die Hintergrundbeleuchtung nutzen. Das Gericht sprach am Donnerstag von einem Urteil mit ”erheblicher wirtschaftlicher Bedeutung”(Handelsblatt, 2012).

\textsuperscript{49} Die Bundesrepublik müsse das Handelsverbot für Glühlampen strenger überwachen, sagte eine Sprecherin von Energie Kommissar Günther Oettinger (Spiegel online, 2012).

\textsuperscript{50} Kommissionssprecherin Holzner betonte, diese Speziallampen müssten in den Geschäften in einer gesonderten Abteilung oder einem eigenen Regal ausgelegt werden (Spiegel online, 2012).

\textsuperscript{51} In der Lichtsparte verdiente Philips 101 Millionen Euro - mehr als die Hälfte weniger als im Vorjahresquartal (Handelsblatt, 2012).
new lighting market \[312^{52}\]. Claiming a market position on the LED light market means high investments in the context of constant price erosion \[346^{53}\]. Due to the bad situation on the stock market, the initially planned IPO has been postponed, Osram will be hand over to Siemens shareholders whereby Siemens stays anchor shareholder \[312, 328\].

The beginning of 2013 shows new innovation introductions such as the first LED lights produced in series production \[343\], LED light controlled by wireless lan \[339\], or LED light that illuminate almost like the traditional light bulbs \[348\]. Osram announces cost savings for the future to improve their financial situation, but reveals a general positive outlook on the development of the LED light market throughout the next years \[347, 359\]. Market researchers from McKinsey predict a prosperous future for the LED technology, according to McKinsey analysts, production costs will rapidly decrease around 30% per year, and by 2020 60% of all revenues in the lighting segment will be achieved through LED technology \[298^{54}\].

Findings

Company actions towards energy efficiency spread across industries. The big German utility providers offer energy efficiency related services, government campaigns aim at stimulating change and research institutes predict a boom in the sustainable lighting market.

Government subsidy programs, on the one hand to support companies’ R&D of OLED lights, but on the other hand also for municipalities to sponsor the transition from traditional public lighting to LED light, lead to coercive pressures in the field. In conclusion to that, Philips and Osram reveal investments in R&D, launch the first OLEDs and pursue marketing activities. These competitive processes also cause mimetic pressures in the field. Subsequent to the introduction of the subsidies, an increasing number of cities participate in the governmental programs and switch over to energy efficient street lighting, whereby they often collaborate with companies (the lighting manufactures put their focus on business with

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52 Die nachlassende Konjunktur trifft Siemens mit voller Wucht. Der Quartalsgewinn blieb hinter den Erwartungen zurück. Nun will der Konzern die schwache Tochter Osram an die Aktionäre abgeben - Siemens ist das Problem los; Für Osram setzen wir nun klar auf einen Spin-Off, nachdem ein klassischer Börsengang aufgrund der anhaltend schwierigen Situation an den Kapitalmärkten in den nächsten Monaten nicht wahrscheinlich ist\(^{52}\) Handelsblatt, 2012).

53 Die Zukunft der Siemens-Tochter, die an die Börse strebt, wird auf dem hart umkämpften LED-Markt entschieden. Um sich dort gegen die asiatischen Herausforderer zu behaupten, sind allerdings hohe Investitionen bei permanentem Preisverfall notwendig (Handelsblatt, 2013).

corporations and authorities, for example concerning the replacement of old street lights forbidden by law from 2015 [234]55).

Hence, the industry field is marked by an increasing competition, new product launches and price battles among the big players, resulting in mimetic pressures. In response to that, companies such as Osram file lawsuits against competitors, which at least in one case resulted in embargoes against a competitor from outside Germany. As reaction to the effectuation of the third step of the EU directive, both Philips and Osram increase their prices, framing it as necessity due to an increase of costs of raw material. It is interesting to see, that only LED lights are not affected by the price increase.

Promotion and marketing activities are undertaken to increase the sales numbers. However the sluggish diffusion and the decreasing profits of the manufactures prove the opposite. Looking at the development of the production amount of LED lights, although they slightly increase since 2009, the rise seems rather insignificant. Next to that, the amount of produced incandescent light bulbs stays equal (figure 8).

At the same time consumer critics and political discussions still try to topple the ban against the traditional light bulbs. But these normative pressures on EU regulators seem to be futile, or at least no reaction to those becomes evident.

Overall, this phase shows the results of the attempts in the previous phases, where companies actively took the lead to get new regulations through, obtain subsidies and better market conditions, hence tried to change existing norms and beliefs and the status quo in the lighting market. By reacting to these pressures and following the industry requests, the government put pressure on the industry field. Competition increases and companies become more aggressive, e.g. file lawsuits or increase prices.

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55 Die Lampenhersteller setzen zunächst vor allem auf das Geschäft mit Firmenkunden und Behörden - beispielsweise bei der Umrüstung von Straßenlaternen. Weil die EU auch die veralteten Quecksilberdampflampen ab 2015 verboten hat, muss laut Schätzungen fast jede zweite Straßenleuchte dann ausgetauscht werden (Handelsblatt, 2010).
Figure 11 Cumulated pressures 2010-2013
5. Conclusion

This thesis aimed at gaining new insights into the dimensions of institutional theory through the combination of two broadly researched fields of theory, institutional pressures (DiMaggio & Powell, 1983) and companies’ strategic behavior (Oliver, 1991; Pacheco et al., 2010; Woolthuis et al., 2012). By using a rather unusual qualitative method, collecting and coding of newspaper articles over a time horizon of 15 years, this question has been researched with regard to the diffusion of sustainable lighting in Germany. Throughout the reading and coding of these articles a broader picture of how companies deal with their institutional environment and vice versa has been created, which enabled me to answer the beforehand established research question:

“What are the dynamics between companies and their institutional field? To what extent does this stimulate the diffusion of sustainable lighting?”

In order to answer the first question, I will quickly recollect the assumptions made in the theoretical framework. According to institutional theorists and in particular represented by the approach of DiMaggio and Powell (1983), actors within an institutional field are part in and subject to coercive, mimetic, and normative pressures, leading at the first place to isomorphism. Companies aim at gaining legitimacy to secure their organizational survival (Meyer & Rowan, 1977). They choose between a variety of strategic responses and tactics as reaction to institutional pressures, depending on the degree of organizations’ willingness, ability, and need to conform (Oliver, 1991). In extension to this, institutional entrepreneurship theory covers how companies recognize, discover and create opportunities that prompt change in the institutional field (Pacheco et al., 2010; Woolthuis et al., 2012). The integration of political strategic management theory into this framework gives further indications about specific attempts of companies to influence their political environment (Hillman & Hitt, 1999; Oliver & Holzinger, 2008).

To sum up the case study, the history of sustainable lighting or in particular LED lighting was initiated by companies starting to invest into R&D, introducing innovative products and promoting them to change existing norms and beliefs. New technologies attracted new competitors, resulting in a huge amount of produced LED lights in 2004 for which no market existed yet. In the light of the climate crisis, companies started to strongly engage in influencing politics and getting the necessary regulative support for their products. While companies certainly tried to influence the creation of new regulations, the German
government as well as the EU commission faced also pressure from other governments that already did the step towards more sustainability, by introducing a ban against incandescent light bulbs. Through several EU regulations the market conditions were created, new norms and beliefs were declared. In response to the regulations, adoption was stimulated across industries, even traditional utility providers adapted to the new paradigm of more energy efficiency. Further governmental incentives led to greater adoption and new innovation introductions. Increasing competition and price erosions were assumed to foster the diffusion of LED lights beyond that. However, at the given time of the analysis, critics were still prevalent and the diffusion still weak.

As to the findings of the case study, company actions - investments in R&D, marketing, lobbying, partnering, etc. – are the main cause for mimetic and normative pressures on the institutional field. 70% of all pressures are related to company actions. However, companies although aiming at changing existing norms and beliefs, seem to act uniformly. Within the industry field and even across industries and countries (cf. the actions of the big utility providers and also the behavior of Asian competitors as far as detected through the analysis), they orientate along others and adapt to each other. This is further demonstrated by collective industry or industry association action that strives to influence policies and direct governments towards energy efficiency regulations. The behavior among industry participants confirms existing theory concerning isomorphism arising in the organizational field. Uncertainty in the context of the new technology and market makes companies model themselves on other companies (DiMaggio & Powell, 1983). This assumption has been taken up by Oliver (1991), who pointed out that the context as one antecedent, influences strategic behavior. Hence uncertainty and interconnectedness produces mimicry and facilitates the diffusion of norms and values. But whereas Oliver (1991) argues that companies do mainly react to pressures within their institutional field, this approach cannot be found in the case of the lighting companies in Germany. In contrast, companies act and take the lead, tactics as to institutional entrepreneurship theory are applied (Pacheco et al., 2010; Woolthuis et al., 2012). Through lobbying, building collaborations with local authorities, and framing and theorizing to persuade and appeal to people, companies try to change norms, and initiate the right policies and favorable conditions for their products. In particular the theoretical approach of political strategic management (Hillman & Hitt, 1999; Oliver & Holzinger, 2008) can be fortified with this case study. Companies behave proactively to reach particular political objectives and strengthen their competitive advantage as pointed out by Hillman and Hitt (1999).
In reaction to these pressures, the government proves to be a powerful force in shaping and creating a new market, thus inflicting new pressure on the institutional field at the same time.

As to the remaining actors, the general public and professionals initiate normative pressures, mainly through opinion statements but also through action, which is of more direct impact such as the consumer boycotts. Through excessively buying traditional bulbs and avoiding the energy efficient alternatives, consumers managed to antagonize the diffusion of sustainable lighting. This represents a strong coercive pressure to which companies adapted as demonstrated in the non-decreasing amount of produced incandescent light bulbs until 2012. Existing theory dealing with consumer activism and social movements shows how consumers can shape and influence corporate action (Den Hond & De Bakker, 2007). While these researchers focused on how activist groups influence and trigger corporate social change activities, in the case of lighting, the consumers’ rejection shows their successful attempt to undermine, or perhaps rather postpone, change. Besides the coercive pressure resulting from the consumer boycott, the general actions by public and professionals appear to be of minor importance, revealing no directly related effect on other institutional participants.

Going back to the initial conceptual model, company actions represent the starting point towards a diffusion of sustainable lighting. But eventually, the interplay between company actions, competitive processes, resulting pressures and reactions of other actors, in particular the government, allowed a movement towards the diffusion of sustainable lighting.

Hence as to the second research question, the extent to which these dynamics can stimulate the diffusion of sustainable lighting, the conditions for a diffusion of sustainable lighting have been created through joint industry and government action. The fact that diffusion is slow and consumers do not seem to adopt the new technologies can be related to the incremental effectuation of the law. This did not lead to a decrease in the produced amount of incandescent bulbs, but enabled consumers to postpone the switch to alternative lighting until the final effectuation of the ban by the end of 2012. This trend might at the first sight seem contradictory to what has been stated in the news about the overall boom of the new LED light technology [154, 186] and increasing turnovers in companies’ LED light segments [25, 95, 133, 137, 152]. But on the other hand, other articles refute this trend by exposing an overall dissatisfaction about energy efficient lighting solutions, reported profit downturns or even the impact of the financial crisis on the amount of production [146, 159, 207, 284, 288, 304, 329]. So at this given point of time, a final diffusion is not obvious yet. However, only since the beginning of 2013 there are no incandescent light bulbs available
anymore. Since the regulatory framework exists and prices of LED lights are announced to strongly decrease in near future, eventually diffusion certainly will take place.

To sum up the findings of the case study, the interaction between companies and regulators has created a general framework for the adoption of energy efficient lighting. Figure 12 shall give an overview of the development and the interactions between some of the more influential company actions and pressures.

![Overview institutional pressures and focal companies’ actions](image-url)
6. Discussion

6.1 Overall discussion

As to the findings of this study, companies adopt a proactive role and take the lead in the institutional field. Instead of being respondent to institutional pressures as assumed by Oliver (1991), their actions lead to mimetic and normative pressures aiming at shaping the institutional field and political environment to their own preference. This confirms institutional entrepreneurship theory (Pacheco et al., 2010; Woolthuis et al., 2012) and the political strategic management approaches (Hillman & Hitt, 1999; Oliver & Holzinger, 2008). In response to those company pressures, the government reacts by introducing regulations and incentives, i.e. causes pressures towards the overall adoption of energy efficient lighting. This eventually leads to the formation of a market for the energy efficient lighting technologies. Nevertheless, diffusion is not fully achieved yet at this given point of time.

In order to explain the outcomes of this study, several reasons may have had an impact on the results. One explanation for the role of the companies might lie in the strong presence of the industry lobby in Germany and their impact on government and legislation. In Germany, as in some other countries such as Sweden and Japan, companies are known for formally taking part in the public policy process (Hillman & Hitt, 1999). As the results have shown, companies adopt a proactive position, invest in and invent new technologies and use the government to help reach sufficient sales volumes. This demonstrates how industry-government cooperation can actually create the general frame for the adoption of more sustainable innovation and hence lead to a reduction of our ecological footprint.

While companies adopt energy efficient lighting technologies far before a market or necessary regulations were created, the decreasing amount of produced LED lights and the consistency in the amount of produced incandescent bulbs indicate that consumers did not adopt the new technologies yet. A barrier for the penetration of more energy efficient lighting is still seen in the superior price in contrast to the usability consumers recognize [122, 160, 188] and the general dissatisfaction about the quality and luminosity of energy efficient lights [125, 163, 182, 339]. Since the gradual banning of the last inefficient light bulbs has only been effectuated by the end of 2012, consumers still had the choice whether or not to adopt the new technology. Compared to the development of energy efficient lighting and the positive adoption of consumers in the Netherlands and especially in the UK (Brouwer & Klein Woolthuis, 2013), consumers in Germany seem to outbid the time of the traditional light bulbs. As to the diffusion in the UK, energy saving light bulbs and halogen light bulbs
have replaced the traditional light bulb as main source of lighting, mirrored by constant decrease of the amount of incandescent light bulbs owned per household since 1998. In the Netherlands the replacement is also taking place although not as significant as in the UK yet. In 2011 the incandescent light bulb is still the dominant light used in households even if the numbers have been constantly decreasing. Besides this, since 2010 in both countries an increase in LED lights is registered (Brouwer & Klein Woolthuis, 2013). Even though directly comparable sales data, in particular for energy saving light bulbs, could not be found for Germany, facts such as a voluntary earlier phase out of incandescent light bulbs in the UK which has been agreed upon among retailers and energy companies, reflect a different institutional context in comparison to Germany. This is highlighted by a steady amount of produced incandescent light bulbs in Germany which did not decline until 2012 (figure 8).

It can be concluded, that without institutional pressures and joint action from industry and government, a diffusion of sustainable lighting would most likely not be very successful at this time. Consumers apparently do not see the attractiveness of the product being still of largely critical opinion about energy saving solutions. Since this research only observed the diffusion until the very beginning of 2013, conclusions about the final adoption cannot be drawn at this moment. But since the EU directive is fully effectuated now, an ultimate diffusion is going to be reached throughout the next years.

6.2 Implications

This research study contributes to existing theory by integrating previously separate bodies of literature, the various institutional pressures and the framework of strategic responses and actions. By considering normative, mimetic, and coercive institutional pressures and by analyzing different institutional agents causing them, it was possible to gain new insights in the way how diffusion of innovations is supported or undermined. While Oliver (1991) pointed out an organizational reactiveness to pressures, this thesis confirmed a proactive behavior, supporting the approach of institutional entrepreneurship (Pacheco et al., 2010; Woolthuis et al., 2012), extended by companies’ political strategic management (Hillman & Hitt, 1999; Oliver & Holzinger, 2008). Hence by refuting an organizational passivity in form of strategic responses, and revealing companies being rather anticipatory and proactive, this thesis contributes to existing theory about organizational behavior in the context of institutional theory and amplifies the understanding of the dynamics in the institutional field. Moreover, existing institutional theory could be confirmed in terms of how
pressures and processes lead to the origination of isomorphism. Besides, the study also underlined the embeddedness of norms and beliefs within a society and how that constrains institutional change.

Since the case in Germany proved only little diffusion so far, it becomes obvious that a natural market for lighting is missing and thus incentives by the government are important. Furthermore the case study proves the strength of the industry in influencing the government and winning them over for their cause. While the context of climate change and a switch to renewable energies and a focus on better energy efficiency favored the industry venture, this still implicates the power of the big market players to determine their market environment. In this context it is questionable whether political activity in general is beneficial for the diffusion of sustainable innovation or if it more often does prevent change and the development towards more environmental friendly technologies. Hereby a direct comparison between different countries and different sustainable innovation would lead to more generalizability of the results.

6.3 Limitations and future research

Due to difficulties in obtaining sales data, the amount and value of produced lights was used as obtained from the federal statistical office Germany. Thereby only data concerning incandescent light bulbs and LED lights was accessible over the chosen time horizon, thus only these two types of lighting were compared in the analysis. This reduces the explanatory power of the comparison between traditional lighting and sustainable lighting since e.g. fluorescent lighting is missing in the analysis although very often mentioned in newspaper articles. Furthermore, explanatory power is reduced by not inspecting the distribution of the different types of lighting in the households through sales data but focusing on the change in production numbers over the years. This might slightly influence the results, although the overall outcome of the diffusion analysis should not be strongly affected.

In order to gain additional knowledge about how companies strategically react to pressures or rather act anticipatory, deeper insights by means of e.g. interviews are necessary. In the context of our coding scheme, logically, every coded action also represents a response to something, but through solely analyzing newspaper articles, it does not explicitly say when, and in assumption or response to what, strategic decisions happen inside companies. Furthermore it is assumed that companies know beforehand about new regulations and happenings on the market and adapt as early as possible to any given situation (e.g. through
usage of scenario analysis) which implies that if this action is published in the newspaper, it is likely to involve a time lag. Thus this research topic could be enriched through adding additional (qualitative) data analyses.

Further limitations involve the analysis of the actual change process stimulated by the dynamics on the field and the diffusion of sustainable innovation. By including the process of institutional change into the analysis of the diffusion of sustainable innovation, it might become clearer at which stage intervention through the government could be beneficial. Sustainable innovations mainly are no products in which consumers see a direct additional value and thus are willing to pay more for, hence stringent regulations are a must to foster the diffusion and become more eco-friendly.

To explain the refusal of consumers in Germany, it might be interesting to look at cultural differences between consumers, especially since the diffusion in the UK and the Netherlands proved to be much more successful. As one indicator for these cultural differences, the dimensions of Hofstede could be used. For instance, indicating a much higher uncertainty resistance coefficient for the German culture compared to especially the UK but also to the Netherlands (The Hofstede Center), might lead to an explanation of why German consumers refuse the new technologies and wait for the government to provide them with clear guidance. As stated in the newspapers, many people complained about the little information about LED light, the questionable quality of the light and the applicability and replacement possibilities. This can also lead to further practical implications on how to initiate any technological change in certain countries.
References


Frost & Sullivan (2011). The LED revolution and key opportunities for lighting companies in the global market.


Senge, P. M. (2010). *The necessary revolution: How individuals and organizations are working together to create a sustainable world*. London: Nicholas Brealey.


Appendices

Appendix A The coding scheme

Appendix B Capita Selecta (including interrater reliability test)

Appendix C Coding Backup Definitions