Characteristics of XBRL adoption in Germany

Carsten Felden

Abstract The distribution of the eXtensible Business Reporting Language (XBRL) is globally driven by the growing information needs of stakeholders in and around enterprises and by the mandatory reporting requirements of public entities. The aim of this paper is to show the adoption level and the impact parameters of the adoption of the XBRL standard in Germany and to compare it with the adoption of other information and communication standards. In order to gain knowledge and an understanding of this topic, managers from different business units used a survey based on institutional theory and the technology acceptance model. The results are discussed in terms of the lessons learned in the context of diffusion research. It is shown that the influence of social groups and top management leadership determine the level of XBRL adoption. The positive arguments for XBRL seem to be underrepresented or provide insufficient reasons for adoption. Comparisons with the adoption of other information and communication standards show differences in the parameters which influence adoption.

Keywords XBRL · Adoption · TAM · Institutional theory

1 Introduction

As information systems (IS) include a large amount of information, the process of financial reporting tends to focus on the format that underpins the exchange of financial information and that gains importance with regard to regulatory activities, rather than on the physical data storage system in question (Williams et

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al. 2006, p. 91). The requested exchange is based on the need for an addressee-oriented supply of information directed by the enterprise toward the high number of prospective stakeholders that pursue or consolidate possible investments and make strategic decisions or legal regulations (Institute of Internal Auditors (IIA) 2008; Williams and McLeod 2007). Such an exchange does not necessarily involve a log-in effect based on proprietary data formats (Vogl and Barrett 2010, p. 67). In the late 1990s, this challenge was the starting point for an increasing interest in the standardized exchange of financial information. This discussion led to the development of the eXtensible Business Reporting Language (XBRL) that is used to structure financial reporting strategies (Farewell 2006, p. 162; Debreceny et al. 2009). In the summer of 2009, a survey of the heads in various company departments (especially finance and information technology (IT) departments) was conducted, which aimed to shed light on the use of XBRL in enterprises in order to gain information about the implementation of XBRL. This study analyzes the diffusion of XBRL from the perspectives of adopters and non-adopters and discusses the results from both points of view. In addition, personal meetings were held with heads of the finance and technology departments (Chief Financial Officers (CFOs), Chief Technology Officers (CTOs), and Chief Operations Officers (COOs)), because it was believed that direct conversations would provide useful results for this study. By replicating existing theories, this paper provides insight into the adoption of the XBRL standard in Germany. Moreover, factors that foster XBRL adoption shall be compared with the adoption of other information and communication standards in order to identify their inherent drivers. Thus, the aim of this paper is to support an academic discussion about the adoption of standards as well as a practical discussion which will increase the transparency regarding the drivers behind the adoption of XBRL.

Even though XBRL is currently not the only report format[1] in Germany, the German finance authorities in the context of the federal initiative KONSENS (Koordinierte neue Software-Entwicklung für die Steuerverwaltung [Coordinated Software Development for Tax Administration]) have chosen XBRL as the standard for the transfer of tax balance data (XBRL Deutschland 2010). As a result, from December 31 2011 onwards, financial reports will have to be transferred electronically via XBRL. Administrations are hoping that media disruption and bureaucratic burdens will therefore be avoided (XBRL International 2010). The responsibility for the quality and the deployment of information will still reside with the company. Current discussions about semantic technologies in the IS discipline illustrate the potential of machine-readable formats (Bonsón et al. 2009, p. 46). Several academic studies have already been completed in the USA in order to determine the status quo of XBRL adoption within companies (Pinsker and Li 2008, p. 47). However, the situation in Germany has not yet been analyzed. Overall, it can be stated that only a small number of descriptions of instances of XBRL adoption can be found in the literature. Unfortunately, this restricts the feasibility of observing the possible benefits of XBRL. Hence, XBRL enthusiasts may experience difficulties when they try to convince the decision makers in their companies to adopt XBRL. The sample of this study shared

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[1]Alternative formats are portable document files (pdf), MS Excel files (xls) or files which use the Extensible Markup Language (XML).

the opinion that successful XBRL projects in companies would support the adoption of XBRL and put pressure on competitive companies.

There are various reasons behind the significance and relevance of the current study. XBRL is an innovation and is therefore unique (Bergeron 2003). As a data transfer standard, XBRL influences functional content, companies' processes and governance with regard to the aforementioned aspects. Based on XML technology, XBRL is generic enough to find its way to users friendly. As users usually come from different departments, discussions regarding the aforementioned aspects are encouraged, while proprietary developments are restricted. Such a generic standard implies that the results of other studies which are concerned with data exchange standards cannot be directly transferred to decisions regarding the adoption of XBRL. In this context, Wolfe argues that the determinants of innovation adoption differ from the characteristics of the innovation itself (Wolfe 1994, p. 415).

The need for a deeper understanding of the parameters that encourage companies to adopt or reject XBRL is significant, because it helps regulators to transfer political implications into effective and market-oriented strategies. In the USA, Henderson et al. (2009) and Wolfe (1994) have already proven that such reflections favor XBRL adoption within companies. The results of previous research show that it is necessary to gain an awareness of factors that foster the adoption of XBRL in order to reach decision makers within companies in such a way that they are able to accomplish XBRL adoption (Fillis et al. 2004, p. 178; Au and Enderwick 2000, p. 266).

In order to examine the research questions, some information about the background of XBRL is required. In order to identify the reasons for adopting XBRL, an empirical study was conducted in Germany and its results will be presented in this paper. Subsequently, the results will be discussed and complemented with the content of conversations with significant figures of authority in German companies which compete on the international stage, as well as small- and medium-sized enterprises (SMEs), in order to gain the best possible impression.

2 Background and research questions

The progressive debate about XBRL, the increasing maturity of semantic technologies, the growing adoption of XBRL within public as well as industry sectors, the realization of complex policies and the implementation of XBLR in companies all require fundamental observations and classification of XBRL.

2.1 Background

The central argument for the application of XBRL is based on the automatic production and absorption of high quality data about the company's performance. The language uses the general availability of the World Wide Web in order to load data directly into data warehouses or the decision models of decision makers (DiPiazza and Eccles 2002, p. 3). Under XBRL, a taxonomy defines relevant terms for a given universe of discourse. A universe of discourse is usually a nationally defined set of accounting principles, like International Financial Reporting Standard (IFRS) or

United States—General Accepted Accounting Principles (US-GAAP). The taxonomy is organized into so-called linkbases for different purposes (labeling, calculation, presentation, reference, definition), and creates a network of relationships between the terms. An information supplier constructs an instance document, which provides data in order to identify relevant facts and which is connected to the concepts defined in one or more taxonomies. The process of connecting taxonomies to explicit data is called *tagging* (Debreceny et al. 2009). The XBRL literature assumes that the aforementioned advantages of the standard provide sufficient reasons to implement it. After all, the standard was designed to become *the only* consistent and extensible standard for the coding and transfer of business data. Thus, it also represents an important component which helps to improve the quality of data within reporting chains (DiPiazza and Eccles 2002, p. 5).

Liebowitz and Margolis define standards as common conventions which support user interactions (Liebowitz and Margolis 1996, p. 283). Norms, values and other influences have an effect on people's perceptions, dispositions and behavior (Markus and Kitayama 1991, p. 224; Triandis 1989, p. 305), as well as their adoptive behavior with regard to innovations. Up to now, Hofstede's five dimensions of culture have been taken into account during the development of behavioral scientific models (Hofstede 1980). Unfortunately, they are not suitable for analyzing the behavior of individual consumers. In accordance with this paper's research questions, it is necessary to identify the relevant values (Becker and Connor 1981, p. 37; Prakash and Munson 1985, p. 279). The adoption of innovations is influenced mainly by social factors, which leads to the argumentation that they have to be taken into account (Fisher and Price 1992, p. 477). However, not only social factors influence people's behavior, but also their attitudes toward certain behaviors. Such attitudes constitute an important factor which determines whether or not a certain behavior is performed (Fishbein and Ajzen 1975). Königstorfer, for example, considers engagement and social aspects to be influential factors, as described by the theory of reasoned action (TRA) (Königstorfer 2008).

Diffusion research[2] examines, inter alia, the distribution of standards in order to gain knowledge about the determining characteristics and parameters of the diffusion process. The factors described in diffusion research mostly apply to singular goods. Innovations in the field of information and communication technology hint at strong distinctions. The speed and dynamics of adoption processes and the interactions between the application of adopters, the constructive effects of standards and the importance of the *critical mass* are some of these distinctive features. Table 1 shows examples from diffusion research regarding the different facets of information and communication technologies.[3]

Table 1 outlines the standards in the area of information and communication, in which there is no common argument which covers all standards. This demonstrates the need for this research, because no comparable research results in the field of standards and diffusion offer knowledge about XBRL adoption. The characteristics

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[2]For details about diffusion research in the context of information and communication technologies, please see Markus (2004, p. 4).

[3]The studies shown have been selected due to the availability of information about standard adoption.

Table 1 Results of diffusion research in the context of Information and Communication Technology (ICT) standards

Standard	Authors	Main results
Programming language		
Java	Regan (1996) JAXenter (2010)	Influence of opinion leaders (Oracle, Symantec etc.) Obligation to an open standard Availability via public media Availability and distribution of information via the Internet supports rapid diffusion
Software		
Enterprise resource planning (ERP)	Westarp and Wendt (2000) Rajagopal (2002)	Relevance of positive net effects Relevance of individual communication networks Related to a full market structure view (exchange and linkage structures)
Data exchange		
Electronic data interchange/ Electronic data interchange for administration, commerce and transport (EDI/ EDIFACT) with subsets such as ODETTE, VDA, SAP iDOCS (proprietary subset) and the American version ANSI X12	Palmer (1989) Schleife et al. (2010) Weitzel (2004)	Introduced for the resolution of a specific problem Industry communities support the diffusion. Due to this, industry saturation has a positive effect on the diffusion In the context of SAP iDOCS, the distribution of the SAP ERP system supports the usage of the proprietary EDI format A further adoption parameter is the potential transaction partner Additionally (but not a main discussion point), the support of internal business processes is a decision criterion
Product/processes (XML-based)		
Partner interface processes (PIP of RosettaNet)	Boh et al. (2007) Nelson and Shaw (2003)	Awareness of e-business demands and communication of the benefits of usage Support from the respective governments, especially in Asia Centralized standard design with national adjustments (carried out by the national subsidiary of RosettaNet), with the character of a closed standard Influencing the RosettaNet business partners, so that they implement PIP in their tools
Bundesverband Materialwirtschaft Einkauf und Logistik catalogue (BMEcat)	Schleife et al. (2010) BMEcat (2010)	The users are critical, due to their active contributions to BMEcat development Perceived usefulness (unification of the e-commerce catalogues of different suppliers) as an adoption driver (focusing on the German market)

Table 1 (*Continued*)

Standard	Authors	Main results
Electronic business/ Universal business language (ebXML or UBL)	Schleife et al. (2010) Chen (2003)	Standard-setting organizations such as OASIS and UN/CEFACT as driving forces Defined as an open standard Main argument: low cost burden of market entry for SMEs Flexibility of individual e-business process modules appeals to potential users (in terms of perceived usefulness) In addition, the opportunity to combine it with, e.g., RosettaNet or SWIFT
Electronic classification (eCl@ss) (in combination with openTRANS for data exchange and GTIN for product identification)	Schleife et al. (2010) Puschmann and Alt (2005)	Adoption criterion is the argument that it is seen as a harmonized product description standard, which can be used throughout the industry Project support and initiation by public institutions such as the Federal Ministry for Economic Affairs and Employment to make this standard available for SMEs Perceived vertical (along an industry) and horizontal (along the value chain) harmonization with a focus on the German market

of adoption listed above suggest relevant aspects for a discussion of the adoption of XBRL. With regard to the research questions, the comparison of selected standards can be used to discuss the results of the proposed research model.

XBRL has been developed as a de facto[4] and open-source standard (XBRL International 2010). As soon as a company adopts a standard, it has to face several risks. A company can never foresee whether another company will adopt the standard or whether another company will adopt the standard in the near future (Lerner and Tirole 2005, p. 99). In the event of a positive externality,[5] the company will be successful in terms of increasing the number of users, which will facilitate broad data exchange (Burnett et al. 2006, p. 33). The XBRL community tries to promote the added value of XBRL in order to illustrate the advantages of its use. Important arguments refer to its interoperability, system integration and data analysis. Indeed, current research shows that the adoption of this standard is primarily driven by institutional committees and regulatory bodies rather than voluntary participation (Hamerman 2005).

Papers which have been published in this area are primarily concerned with the expected benefits, technical mechanism and functioning of XBRL. Even when the term *adoption* is used as a keyword, the papers rarely refer to the determinants of the

[4]De facto means that the standard is used without being evaluated by a standardization or regulatory body (see Gorry and Morton 1989, p. 57).

[5]These externalities are defined as realizations of information relations. They describe the positive coherence of the value, to entry into a network and network expansion. In addition, the usage of a standard and its diffusion is matter for consideration (see Katz and Shapiro 1985, p. 424).

adoption of the XBRL standard itself.[6] Pinsker and Li (2008), for instance, investigated the cost-benefit ratio of XBRL implementation. They analyzed the positive and negative effects that might affect the company and consolidated their research with expert interviews. The sample in this survey claims that XBRL provides a large number of advantages, which compensate for the expected cost of its implementation. They attest that XBRL is a key technology (Pinsker and Li 2008, p. 49). Pinsker himself is concerned with the decision-making process with regard to reported elements that have to be outsourced via reporting systems (Pinsker 2007, p. 73). Doolin and Troshani categorize XBRL "as a technology, as a standard, as a business tool [and] in education" (Doolin and Troshani 2004, p. 100). They focus on the general understanding of XBRL. Debreceny's adoption study analyzes the extent to which XBRL has been distributed worldwide and concludes that XBRL International fosters the distribution of the standard. XBRL International organizes relevant representatives in so-called jurisdictions that support the distribution of the standard (Debreceny 2007, p. 3). Bonsón et al. (2009) describe XBRL adoption models that refer to regulators. They distinguish between a *voluntary model* and a *compulsory model*. The voluntary model, on the one hand, invites the user to use XBRL, while the compulsory model, on the other hand, compels the user to use XBRL (Bonsón et al. 2009, p. 46). As both models shall be compared and discussed with regard to adoption, several criteria have been developed. They show that a global standard procedure is not desirable, because political, economic and social conditions vary from one country to another. Nevertheless, the regulators determine which model shall be used (Bonsón et al. 2009, p. 46). Yoon et al. (2011) examined whether or not XBRL could minimize existing information asymmetries in the Korean stock market. In order to answer this question, they used Korean companies' financial XBRL reports and checked their proposed hypothesis using statistical procedures. Their results show that major enterprises benefit from the implementation of XBRL, because existing information asymmetries decreased. SMEs are unable to note such a significant effect (Yoon et al. 2011). Henderson et al. observed American companies in an attempt to expose features that support the adoption of XBRL. They focused on American regulators, auditors and investors who were encouraged to define their interest in implementing XBRL (Henderson et al. 2009). Markelevich et al. (2010) analyzed the correctness of the XBRL submissions of capital-oriented companies in Israel. They point out that the number of errors in the reports submitted to MAGNA (the Israeli register of the publications of capital market-oriented companies) have increased. The main reason for the increase in the number of errors in the reports is seen as the very short XBRL adoption period. However, it should be noted that the Israeli XBRL adoption case is unique in this sense. The reason for this is that the appropriate Israelian Security Authority (ISA) did all of the tagging for all the filers. The only task given to the companies was to correct the errors (Markelevich et al. 2010).

In conclusion, there are no studies which present general success factors which support the adoption of XBRL. Existing studies fail to address either the national

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[6]See, for example, Doolin and Troshani (2004), Bergeron (2003), DiPiazza and Eccles (2002), Boyd (2004), Deshmukh (2004), Jones and Willis (2003), Abdolmohammadi et al. 2002, Zhu and Fu (2009) and Marshall et al. (2009).

context or the adoption itself. They concentrate instead on financial reporting or errors within these reports. In the following, the focus will be on Germany, as this economic area has not yet been analyzed and might allow generalization to other international activities, because the approach of the public regulator is comparable with the activities of other international regulators.

2.2 XBRL in Germany—research framework

In Germany, public initiatives can be seen as the most significant supporter of XBRL. In 2007, the Federal Gazette (Bundesanzeiger) and the German Central Bank (Deutsche Bundesbank) initiated a voluntary filing program. In contrast to other report forms (pdf, MS Word), the Federal Gazette offers a low-cost opportunity to file XBRL reports in order to foster the adoption of the standard in Germany. The aforementioned KONSENS project will use XBRL exclusively—other formats are not permitted.

In Germany, however, private projects also exist, including institutional initiatives. In 2003, the Fraport AG started to use XBRL for their annual financial statements. In 2004, the German stock exchange (Deutsche Börse AG) started an XBRL project. Investors and analysts need to be equipped with financial data, and so the Deutsche Börse AG established a database offering filed financial data. In the following year, the Deutsche Bank AG began to implement XBRL in the context of credit risk management processes. For this purpose, they developed a prototype which is able to extract the necessary credit risk data from different source systems and transfer it to the bank. In 2006, ThyssenKrupp implemented XBRL in order to improve its external/internal reporting. Finally, DATEV AG try to offer SMEs a software-based accounting service; they have been using XBRL for transferring data since 2007.

The internationalization of the German IS discipline is associated with the adoption of behavior-oriented research. This led to the fact that the Technology Acceptance Model (TAM) and Institutional Theory (InT) have gained importance in the German IS community. In the following, these two approaches shall be outlined in order to provide a theoretical basis for the analysis of success factors of adoption.

InT analyzes the way in which structures, guidelines and rules can be established within organizations. In this context, the generation, distribution and adoption of these factors shall be analyzed with regard to space and time in organizations (cf. Table 2).

The elements listed above show the explanatory potential of the InT, indicating reasons for implementing XBRL (Scott 1995; Selznick 1948). Companies interested in the implementation and assertion of XBRL are able to receive the necessary information about what may influence the expansion of XBRL.

The TAM analyzes in a behavior-oriented manner the way in which users perceive the utility and simplicity of IT and whether or not IT helps to fulfill tasks more easily. Davis concludes that both factors influence the system application (Davis 1986).

Figure 1 shows that an explanatory model of XBRL usage results from its practical deployment (Davis 1989, p. 319). As soon as XBRL is regarded as being beneficial, organizations become more willing to adopt and use XBRL.

The goal of this research is to describe the status quo of XBRL adoption in Germany and to identify factors in order to present explanations for the aforementioned

Table 2 InT schema

	Regulative	Normative	Cognitive
Compliance basis	Expediency	Social binding	Assumptions
Mechanism	Coercive	Normative	Mimetic
Logic	Participation	Adequacy	Orthodoxy
Indicators	Rules, laws, sanctions	Certification, accreditation	Global validity, isomorphism
Legitimacy basis	Legal sanctions	Moral governance	Culturally supported, conceptual correctness
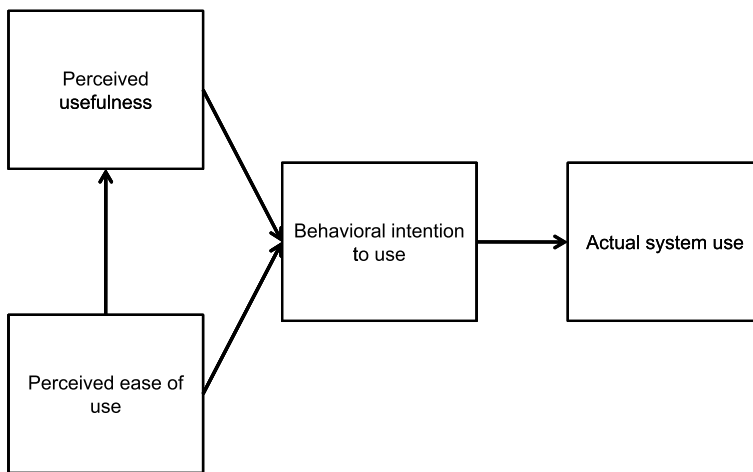
Fig. 1 TAM schema

observations. As both theories and the framing aspects of diffusion research show high explanatory potential and have therefore been addressed in the literature, the first research question is:

Research question 1 (RQ1): Which of the theories presented in the literature better identify factors that favor the adoption of XBRL with regard to a competing theory approach?

This research question may also be modified:

Research question 1a (RQ1a): Can the implementation of both theories offer a unified model of XBRL adoption in Germany?

In 2002, Watson et al. used InT to interview managers from different companies about the implementation of a data warehouse (Watson et al. 2002, p. 491). This study offered the opportunity to differentiate between functional and technical aspects in order to illustrate the usage and benefits of this implementation. In 2004, Simmers also used InT to analyze the interaction between business intelligence and organizations. However, his study shifted to a more abstract level, focusing on the

stakeholder level (Simmers 2004). Three years later, Pitsakis used InT to analyze the results of a survey of business intelligence managers. He showed the close connection between technologies and organizational structures and concluded that analytical information systems have to be regarded as an essential part of organizations, as they help to fulfill environmental requirements (Pitsakis 2007). This supports the usage of this theory as a background for the following research question.

Research question 2 (RQ2): Are the communication advantages of the standard seen clearly within the context of internal and external reporting so that they positively influence its adoption?

In the context of business intelligence, the TAM has been used, for instance, by Schmaltz to identify individuals' acceptance of information logistics within companies (Schmaltz 2010). In 2007, Hart et al. analyzed the acceptance and perception of online analytical processing (OLAP) software via the TAM. They identified the recognizable utility of OLAP, which fosters the distribution of OLAP within companies (Hart et al. 2007, p. 105). Two years later, Jiang researched adoption behavior, referring to existing theories and artifacts of business intelligence. He concluded that usefulness leads to an increasing degree of adoption (Jiang 2009, p. 558). Due to the fact that XBRL can be seen as a part of business intelligence, this theory serves as a basis for the following research question.

Research question 3 (RQ3): Is XBRL in a position to achieve widespread use through its own advantages (perceived usefulness and simplicity), or is this only possible as a result of public pressure?

This paper contributes to diffusion research in the context of XBRL, as seen from the perspective of business intelligence research within the German IS discipline. Diffusion research deals with the description of the dissemination of innovations from one confined system to another. Rogers defines the diffusion of an innovation as the "process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers 1995, p. 11).

The following section describes the underlying research method. The constructed theory and the defined research framework will be described.

3 Method

From July 7 2009 to August 31 2009, an empirical study based on the two aforementioned theories was conducted. In the course of this study, online questionnaires were sent to people from various institutions. In addition, companies that will have to use or are interested in using XBRL in the coming years were interviewed personally. As previously mentioned, the questionnaire included competing theories in order to invite different descriptions of the current status quo of XBRL in Germany. The questionnaire was based on InT and the TAM. Figure 2 shows the dependent variable concerning the adoption of XBRL. On the left hand side, one can recognize three areas of InT to which an additional segment (the opportunity for perceived top management leadership) has been added. On the right hand side, one can see the four areas of the TAM.
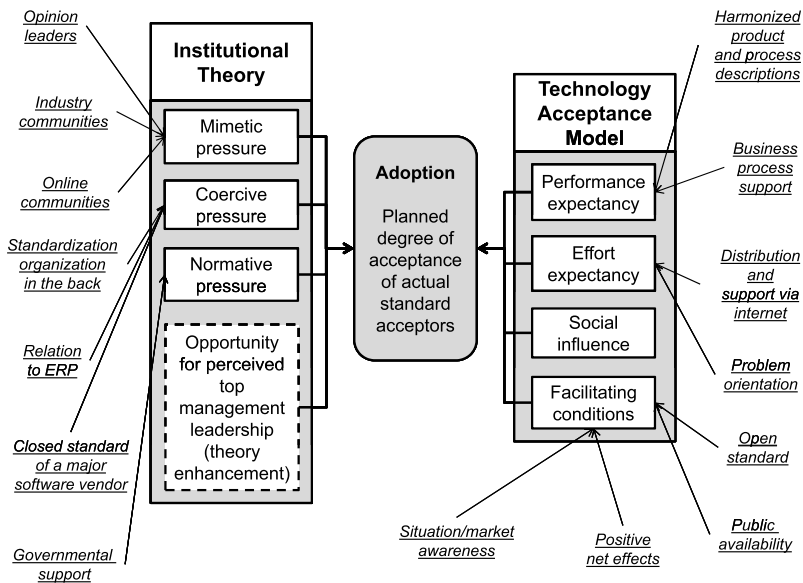
Fig. 2 Competing theories for analyzing the adoption decision

The influence of top management leadership enhances the theoretical framework of InT. In today's global environment, firms' top management teams face a complex environment filled with financial turmoil and market uncertainty (Garrison et al. 2008, p. 21). With regard to technology, one consistent finding has been the importance of top management in leading the technology adoption and implementation processes (Reich and Benbasat 1990; Beath 1991; Thong and Yap 1995; Fink 1998). Once top management commits to an IT project, this helps to ensure its success through the allocation of the necessary resources (Ang and Pavri 1994, p. 122). In addition, top management can foster the desired corporate culture by integrating the new IT (Ke and Wei 2008, p. 208). Beatty and Lee (1992) advocate the importance of management leadership in the implementation of computer-aided design and manufacturing (CAD/CAM) in Britain and Canada. Seyal et al. (2007) found top management leadership to be a significant factor in predicting Bruneian SMEs' EDI adoption. Scupola (2003) produced a similar finding with regard to Italian SMEs and Internet commerce. Chen and McQueen (2008) claim that top management leadership is the most significant motivating factor in predicting the growth of e-commerce in the context of small Chinese firms in New Zealand. Teo and Tan (1998) found top management leadership to be a significant predictor of Internet adoption in Singapore. Tarafdar and Roy's (2003) process framework pinpoints top management leadership as a key predictor of Indian organizations' ERP implementation success. Ettlie et al. (2005) identify top management leadership as a strategic factor involved in the ERP adoption of US Fortune 1000 firms. Due to these arguments, the *opportunity for perceived top management leadership* can provide additional insight into the adoption of XBRL.

Table 3 Distribution of study participants[7]

Organization	Number of addresses contacted	Number of responding addresses	Quote (%)
TDWI Germany	11,000	29	00.2636
XBRL Germany	25	10	40.0000
KONSAG	20	18	90.0000
VDMA NRW	250	31	12.4000
Other	20	19	95.0000
Total	11,315	107	00.9456

In order to answer these questions, a quadripartite questionnaire including 84 questions was developed.[8] After the classification, if the company was a capital market-oriented company and therefore interested in XBRL, the questionnaire was equipped with a general section in order to classify the participants' role and knowledge. The second part consisted of questions based on InT, while the third and fourth parts of the questionnaire included questions based on the TAM. The evaluation was performed via regression analysis. In the course of the evaluation, each question and independent variable was grouped into theory segment-related clusters.[9] Table 3 indicates the response rates of the interviewed institutions.

Functionally/technically heterogeneous and distinctive members characterized the interviewed organizations. *The Data Warehousing Institute* (TDWI) in Germany primarily includes consultants and employees of the IT departments which participated in the survey. XBRL Germany primarily consists of members of the auditing and consulting industry as well as members of finance and control departments. The *Consolidation Working Group* (Konsolidierungarbeitsgruppe, KONSAG) is a consolidated interest group of large SAP users (focusing on globally-oriented German companies), which mostly includes technical but also IT-oriented members. The participants were located at the CFO, CTO and COO levels. The *Association of Mechanical Enginering and Plant Engineering* (Verband der Maschinen und Anlagenbauer, VDMA) represents medium-sized industries and focuses on functional aspects. The *Others* group consists of research partners that work in IT departments. The participants in the last two groups came from the first-line management of finance and control departments. These departments are usually in charge of IT.

In addition to the online questionnaire, personal conversations were held with the business representatives who would have been responsible for the implementation of XBRL. These representatives belonged to the finance and accounting departments,

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[7]The presented numbers and quotes are based on questionnaires which were completed in full. Incomplete questionnaires do not form part of the analysis.

[8]Participation was voluntary and no incentives were provided. There were no follow-up actions, because it was an anonymous questionnaire. Therefore, no e-mail addresses were available. The questions were either open text, radio buttons or Likert scales from 1 (no agreement) up to 5 (full agreement).

[9]The online questionnaire was tested with participants who were not part of the set of responding companies. The questionnaire was sent out via the mailing lists of the participating organizations. It was anonymous and available for eight weeks.

investment companies, logistics departments, technology departments and consulting and software departments. Furthermore, the results were discussed with the *American Securities and Exchange Commission* (SEC) as well as the London-based *International Accounting Standards Committee and Foundation* (IASCF). The knowledge gained was used to generate new insights into regulative approaches.

4 Results and evaluation

This section introduces the analytical results, which were calculated using a data mining tool.[10] First, the following table shows the results of the regression analysis of the model data. In this context, reliability and validity will be addressed. The ongoing process focuses on the model quality and the relevant independent variables. Moreover, the underlying dataset will be modified in order to answer the questions posed above. In doing so, both theories will be analyzed separately in order to identify their explanatory power. The analysis of the theories creates a distinction between adopters, undecided adopters and non-adopters. In addition, it will differentiate between IT experts and technical representatives of finance and control departments.

The gray shaded cells in the table show the independent variables, which will be discussed later on. The variables printed in bold are significant, while the other variables have at least some effect. However, there may be dependencies among individual variables that may limit the perceptions of the evaluation. This has to be taken into consideration, as the two theories are used corporately and therefore ask similar questions. In order to characterize the validity of the results, the complete dataset and the following analysis have been checked for multicollinearity. Using the condition index <30 and the variability index <10, none of the elements of the analysis show evidence of multicollinearity. Each variable was then analyzed using Cronbach's alpha and a correlation matrix. This was done three times (for each variable, for the IT/finance variables and for the adopters). Cronbach's alpha, as a measure of reliability, can adopt values between $-\infty$ and 1; however, only positive values indicate reliability: 0.8 indicates a good result, while 0.9 indicates a very positive result. All of the measured values were found to have values between 0.8 and 0.9, which are good. The previously conducted study of multicollinearity allows statements to be made about the linear dependency between individual variables. The correlation matrix, on the other hand, facilitates a deeper insight into the study, but does not change the result. In conclusion, all of the values and analyses match the appropriate standards.

5 Discussion

The following discussion is true to the motto of Nicholas Carr (XBRL will be subsumed under the term IT): IT doesn't matter, spend less, follow don't lead, focus on risks not opportunities! (Carr 2003, p. 41)

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[10]SAS Enterprise Miner 6.2.

Table 4 Results of the regression analysis

	(1) Full dataset ($R^2 = 0.8827$; Adjusted $R^2 = 0.8711$)		(2) Adopter = no ($R^2 = 0.8130$; Adjusted $R^2 = 0.7289$)		(3) Adopter = undecided ($R^2 = 0.8081$; Adjusted $R^2 = 0.7417$)		(4) Adopter = yes ($R^2 = 0.7671$; Adjusted $R^2 = 0.6833$)		(5) IT department ($R^2 = 0.9312$; Adjusted $R^2 = 0.9118$)		(6) Finance department ($R^2 = 0.8969$; Adjusted $R^2 = 0.8779$)		(7) InT – full ($R^2 = 0.2401$; Adjusted $R^2 = 0.2084$)		(8) InT – Adopter = no ($R^2 = 0.4391$; Adjusted $R^2 = 0.3494$)	
	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$	t-Value	$Pr > \lvert t \rvert$
Intercept	−2.11	0.0372	0.09	0.9288	0.03	0.9757	1.76	0.0899	0.90	0.3735	−2.17	0.0351	−0.07	0.9426	−1.76	0.0907
Normative	1.01	0.3133	−0.29	0.7760	1.12	0.2725	−0.66	0.5148	0.42	0.6749	−0.22	0.8303	2.73	0.0076	0.54	0.5962
Mimetic	−0.79	0.4326	1.47	0.1564	−0.64	0.5273	−0.38	0.7103	−1.26	0.2162	0.68	0.4995	0.52	0.6023	3.51	0.0017
Coercive	−1.71	0.0899	−0.96	0.3464	−1.46	0.1558	−0.65	0.5199	−1.25	0.2219	−1.70	0.0960	0.44	0.6577	−1.80	0.0841
Leadership	0.76	0.4483	−0.64	0.5307	−0.02	0.9845	0.57	0.5721	−0.91	0.3722	0.51	0.6092			−0.64	0.5254
Facilitating conditions	1.44	0.1543	−0.63	0.5386	−0.27	0.7901	1.36	0.1865	2.60	0.0141	0.66	0.5146				
Performance expectancy	0.88	0.3816	−0.69	0.4967	1.16	0.2546	1.07	0.2936	0.35	0.7252	1.52	0.1352				
Effort expectancy	0.06	0.9540	0.47	0.6448	1.98	0.0583	0.52	0.6060	−0.74	0.4643	−1.05	0.3009				
Social influence	9.50	**<.0001**	5.14	**<.0001**	4.05	0.0004	−0.02	0.9808	8.44	**<.0001**	6.25	**<.0001**				
Top management leadership	1.93	0.0573	−0.51	0.6170	−0.33	0.7409	3.93	0.0006	−1.71	0.0967	3.85	0.0003				

Table 4 (*Continued*)

	(9) InT – Adopter = undecided ($R^2 = 0.2594$; Adjusted $R^2 = 0.1639$)		(10) InT – Adopter = yes ($R^2 = 0.2130$; Adjusted $R^2 = 0.1081$)		(11) TAM – full ($R^2 = 0.8736$; Adjusted $R^2 = 0.8669$)		(12) TAM – Adopter = no ($R^2 = 0.7871$; Adjusted $R^2 = 0.7427$)		(13) TAM – Adopter = undecided ($R^2 = 0.7693$; Adjusted $R^2 = 0.7308$)		(14) TAM – Adopter = yes ($R^2 = 0.7130$; Adjusted $R^2 = 0.6636$)	
	t-Value	$Pr > |t|$	*t*-Value	$Pr > |t|$	*t*-Value	$Pr > |t|$	*t*-Value	$Pr > |t|$	*t*-Value	$Pr > |t|$	*t*-Value	$Pr > |t|$
Intercept	3.37	0.0020	5.46	< .0001	−3.35	0.0012	0.76	0.4522	−0.51	0.6123	1.63	0.1131
Normative	1.75	0.0901	−0.53	0.6010								
Mimetic	0.64	0.5240	2.28	0.0298								
Coercive	1.05	0.3031	−1.84	0.0762								
Leadership	−1.39	0.1741	0.54	0.5903								
Facilitating conditions					2.36	0.0203	−1.25	0.2243	0.82	0.4192	2.33	0.0273
Performance expectancy					0.42	0.6750	−0.50	0.6185	0.84	0.4077	1.15	0.2602
Effort expectancy					−0.76	0.4478	0.77	0.4494	1.66	0.1076	−0.32	0.7543
Social influence					9.61	< **.0001**	6.97	< **.0001**	3.88	0.0005	−0.17	0.8680
Top management leadership							−0.57	0.5745	−0.38	0.7047	3.75	0.0008

5.1 Findings of the theoretical model

RQ1: The separate evaluations of the theories show that the TAM is prevalent. InT did not obtain any usable results. From ***Analysis 7*** onwards, InT and TAM are dissociated from each other. An *R_Square* of 0.2401 indicates that the variables do not provide an acceptable explanatory model (***Analysis 7***). ***Analysis 8*** to ***Analysis 10*** present individual results concerning the InT variables. None of the models obtained an adequate *R_Square* value. Only the cluster *no standard adoptions* is able to explain 44% of the values. In this case, the variable *mimetic* is important. This means that the more companies are against XBRL adoption, the more companies would follow this decision. ***Analysis 11*** hints at a strong explanatory model. *Social_Influence* is a significant variable that offers an explanation (in ***Analysis 14*** *Top_Management_Leadership*).

RQ1a: The overall view shows that both theories together establish an explanatory model. ***Analysis 1*** shows a *R_Square* with a value of 0.8827, which allows the assumption that a combination of both theories leads to a positive explanatory model. However, one can only identify the influence of the dependent regression value *XBRL_adoption* on the variable *Social_Influence*. This means that the more influence social groups have on or within companies favoring XBRL, the more likely it is that XBRL will be adopted. The variable *Top_Management_Leadership* is located above the limiting value and includes a positive *t_value*. This underlines that a decision by top management can lead to XBRL adoption. The results up to and including ***Analysis 6*** have to be interpreted analogously.

5.2 Results regarding diffusion research

RQ2: The full theoretical model (***Analyses 1 to 6***) does not show any variables that confirm the notion that XBRL is adopted due to its advantages with regard to internal and external reporting. The perceived characteristics of the adoption of other ICT standards which would positively influence the variables of the proposed theoretical model have a lower impact on XBRL in Germany. As a result of this discussion, these variables are not regarded as specific determinants of the distribution processes, but as non-specific parts of information or environmental factors, which have a direct or indirect influence on the decision-making process of adopters (Weitzel 2004).

One significant aspect of diffusion research has been identified as opinion leaders and is listed, for example, in the coding language Java (Regan 1996; JAXenter 2010). Therefore, *mimetic pressure* should show a significant value, but only ***Analysis 8*** shows a relevant result. Up to now, no nationally or internationally leading software department has promoted the use of XBRL. The community can be described analogously. The jurisdiction of XBRL Germany e.V. is a very heterogeneous group. This may well be positive in terms of content, but there is no opinion leader and no software company that is able to represent the standard to the market. In addition, there is a lack of market coverage by other standards (Schleife et al. 2010; Chen 2003) that would foster a vertical distribution. Business representatives argue that auditing companies are the main drivers behind the distribution of XBRL. This could be seen as *coercive pressure*, if such consulting companies made XBRL mandatory for their auditing processes, but none of the analyses showed a significant value for this variable.

In addition, the use of the Internet for information distribution and the subsequent support for the use of this technology is no longer an advantage, as it is available to every information vendor. In connection with *facilitating conditions*, none of the analyses showed any results which are comparable to existing diffusion research results. However, there may be a potential risk that information could get lost within the context of a broad discussion of information overload. Network effects linked to standards are not yet well-marked and cannot be noticed by prospective customers. Only *Deloitte* hints at positive network effects, when customers send required reports to companies via XBRL (Williams and McLeod 2007). However, the application should include several scenarios that have already been used extensively in order to shed light on the advantages of adopting XBRL. The comparison of the adoption of XBRL and parts of PIP by RosettaNet in Asia (Boh et al. 2007, p. 57; Nelson and Shaw 2003, p. 258) shows that this standard adoption is fostered by governmental authorities in order to apply the standard to the market. This can be seen as normative pressure. Furthermore, this is a central standard and the comparable use of XBRL could lead to national content characteristics. However, only *Analysis 7* confirms this statement, and none of the other analyses support this finding.

It can also be stated that XBRL does not seem to follow the way of EDI/EDIFACT (Palmer 1989, p. 25). If it did, TAM variables like *performance expectancy*, *effort expectancy* and *facilitating conditions* would show significant values. The central difference can be found in the initial situation. When EDI/EDIFACT was first defined, there was no such concept which was able to harmonize data exchanges. Consequently, the use of EDI/EDIFACT has been perceived as more distinctive than XBRL today. Nowadays, communication partners argue that there are several semantic standards for data exchange available that somehow have to be implemented within companies (Puschmann and Alt 2005, p. 122). The application of standards such as EDI/EDIFACT or ERP systems are regarded as substantial investments concerning ICTs (Westarp and Wendt 2000, p. 5) and already cover some of the advantages of XBRL. The diffusion of XBRL is currently bound to the pressure of public/regulatory bodies and does not correspond to other diffusions of information and communication standards.

5.3 Results of the adoption of the XBRL standard

RQ3: Regarding RQ3, it is interesting to note that the TAM and InT, as used in the examples in the previous study, indicate that the perceived usefulness and application of IS concepts within organizations leads to an increase in their adoption and distribution. This cannot be recognized in the context of XBRL. The advantages listed in the literature are not familiar nor convincing. This leads to a main obstacle: publicizing XBRL.

Only a few participants in the study already knew about XBRL (see Fig. 3), which limited their knowledge about the potential of XBRL.

The participants' experience of XBRL, which is less marked, is associated with their lack of knowledge about XBRL (see Fig. 4).

All results of this study show that *Social_Influence* is a dominant factor as regard the adoption of XBRL. It does not indicate the perceived advantages of XBRL.
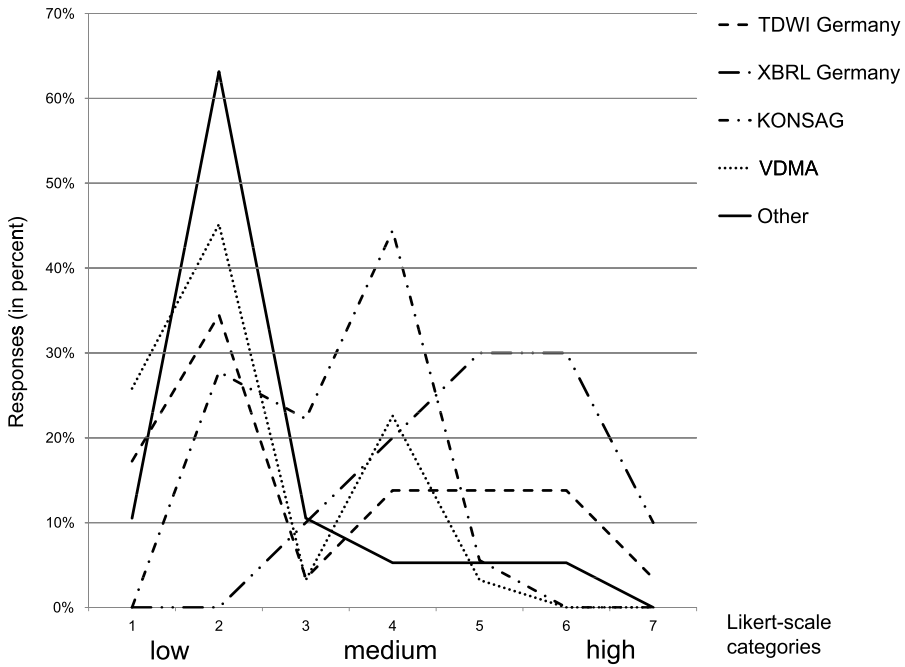
Fig. 3 Study participants' knowledge of XBRL (as a percentage, rated on a Likert scale)
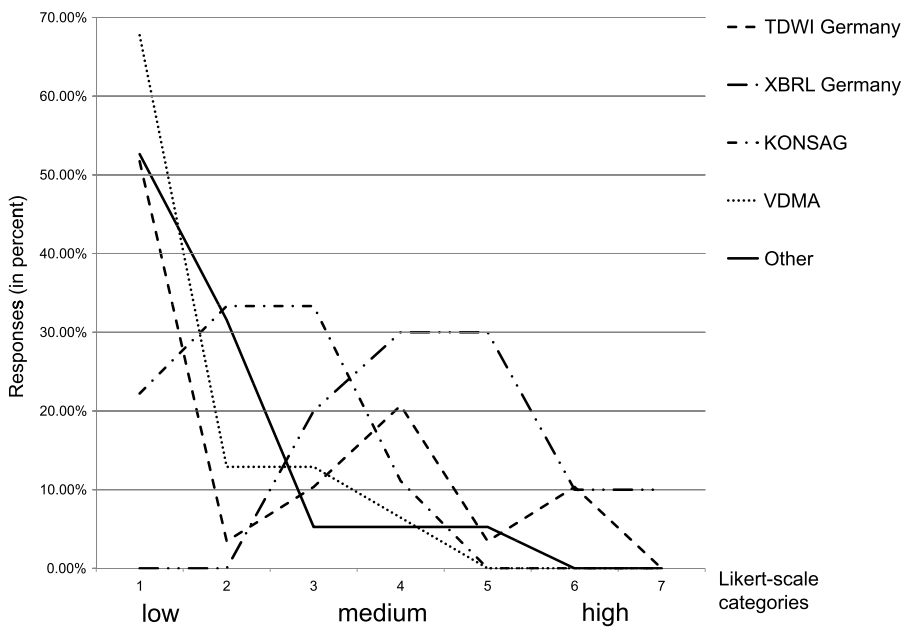

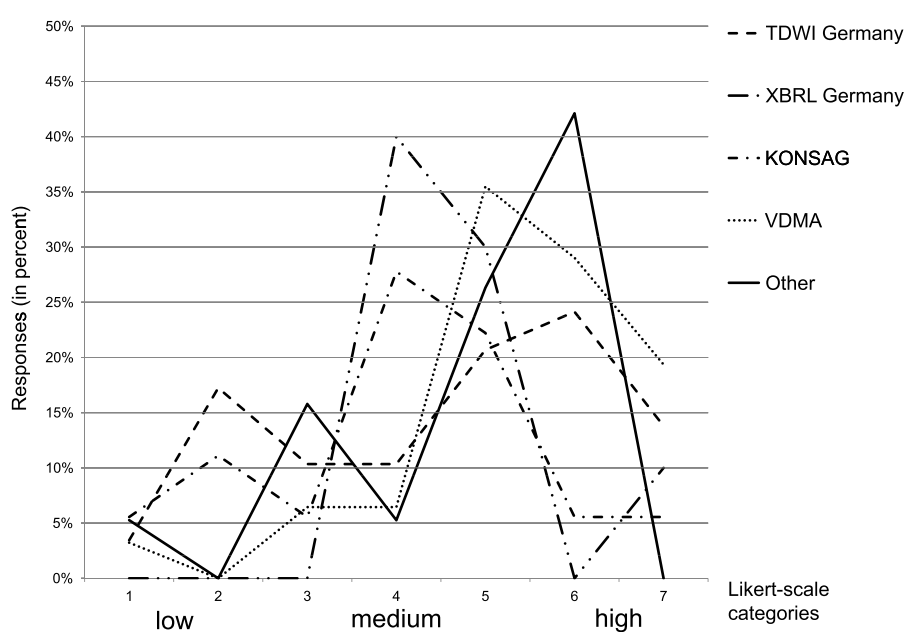**Fig. 4** Study participants' experience of XBRL (as a percentage, rated on a Likert scale)

Fig. 5 Need for top management support (rated on a Likert scale)

In addition, *Top_Management_Leadership* seems to be another factor which has a favorable effect on the distribution of XBRL in Germany. Figure 5 shows that representatives of TDWI in particular regard the support of top management as a necessary feature.

The previously stated advantages of XBRL usage do not provide a reason to adopt the standard. Discussions with IT representatives from the companies showed that IT departments are usually unable to introduce new topics into companies. They usually focus on taking requests in order to fulfill their role as service providers within companies. This supports Carr's argument in 2003 that the importance of IT has been subordinated. Some of the discussion partners compared this with the implementation of IFRS. The responsible departments put pressure on their companies to implement IFRS as quickly and as early as possible. In contrast, as regards XBRL, which is seen as an IT service, discussion and implementation is hesitant. The following figure shows the obstacles preventing XBRL implementation.

The main arguments against implementing a standard are based on cost and complexity. There is clearly no perceptible pressure from competitors to implement the standard.

However, two dates make this result surprising. First, foreign filers of the US SEC and (as a result) German companies, which are listed on the US stock exchange, will have to do their filing using XBRL by June 15 2011. Second, the introduction of the *electronic tax balance* in Germany will start for the fiscal year following December, 31 2011 (the original date was December 31 2010). For this reason, the variable *Normative* of the InT must be in a high gear. In fact, representatives of the financial industry (who are using XBRL within their internal credit and loan reporting) stated
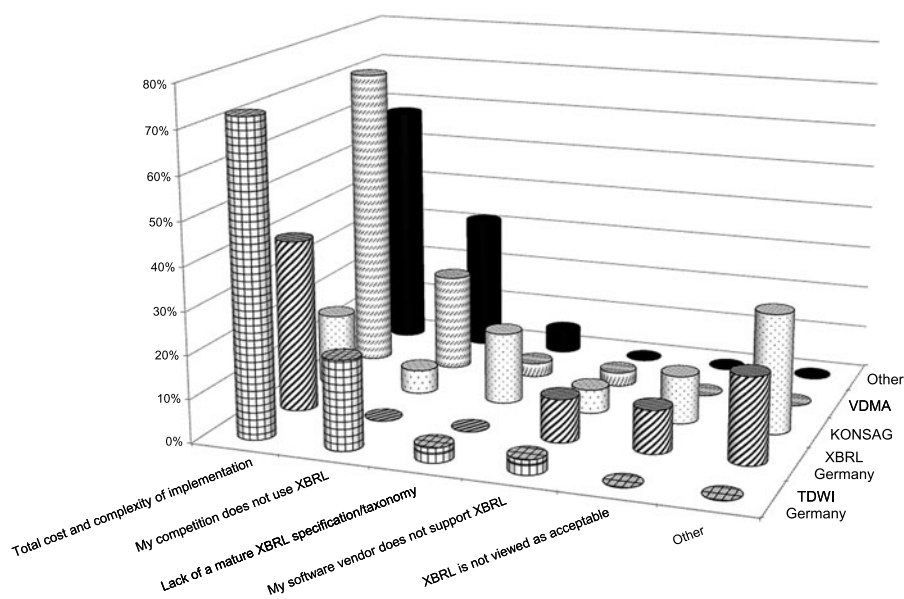
Fig. 6 Obstacles preventing XBRL implementation (in percentage)

that this factor is not important to them. In addition, a filing service, which translates reports into XBRL documents, can be outsourced to the market. The company would fulfill their obligation without defining an XBRL project. This makes the *spend less* element of Nicholas Carr's motto obvious.

A technology company offered a totally different perspective. The company wants to be seen as a technology leader, meaning that it is of importance to implement XBRL fully in order to support this position. An XBRL project had already been initiated, meaning that the necessary XBRL documents were being produced inside the company. This is an exception. Usually, the *follow, don't lead* and *focus on risks not opportunities* elements are the most obvious. XBRL may be of intersectoral interest, because some companies have already initiated internal meta-data projects. The aims of these projects are to regulate company-wide data exchange or to accomplish compliance within the organization. None of them were using XBRL, although XBRL would be an appropriate candidate for such tasks. Its use would lead to an improvement in the variables *Performance_Expectation* and *Facilitating_Conditions*. However, this did not happen. The answers show that the standard was not known and, for this reason, it was overlooked. It is common practice for the Federal Gazette to take XBRL files at a reduced fee, but the money saved is not a sufficient argument for initiating an XBRL project. Surprisingly, most of the companies did not know that they were obliged to send off their tax balance via XBRL. This led to the conclusion that the information supply was not appropriate. In fact, the number of publications relating to XBRL in scientific journals is low (Gräning et al. 2011, p. 225). The number, which appears in practitioner journals, which are read in companies, is even lower. However, companies have to understand that the electronic tax balance will be realized without any alternatives. This creates a need for internal capabilities to
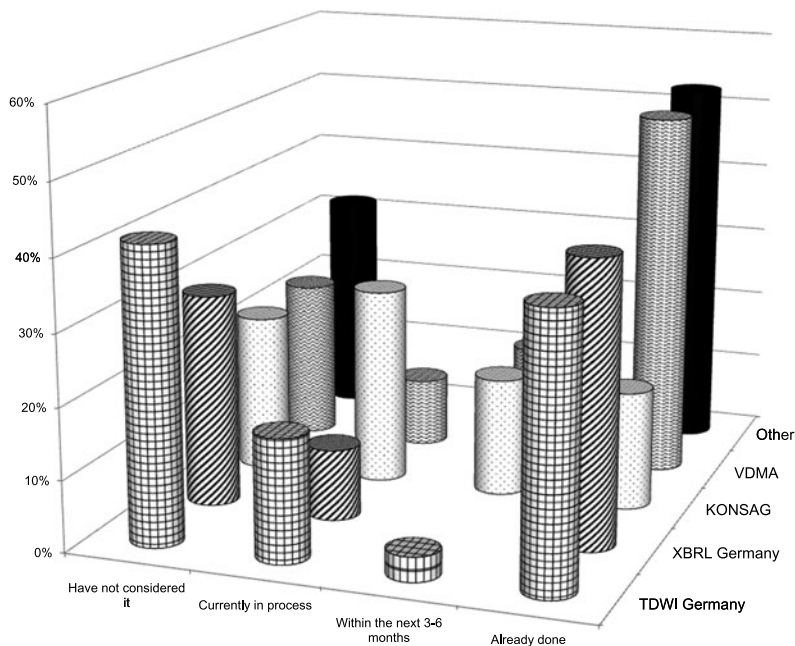
Fig. 7 Timeframe of XBRL adoption (in percentage)

implement XBRL within the company or at least strategically planned outsourcing. Figure 6 shows the timeframe of an adoption decision and software implementation.

Figure 7 shows that several participants did not plan to adopt the standard. A comparable number of participants wanted to fulfill this task within the next 12 months. This reflects the demands of the electronic tax balance requirements.

Figure 8 displays the planned implementation of XBRL software tools. Although there is not really a standard adoption, two groups exist: the first stated that an implementation was already being considered, while the other confirmed that it had already been done.

The latter group in particular characterizes the attitude of SMEs. These companies are the typical market of the software service provider DATEV AG. Eighty percent of SMEs are using DATEV software services, which support accounting and reporting activities, and (as previously stated), DATEV is already using XBRL. Therefore, widespread coverage of the SMEs is possible without knowledge of the SMEs themselves. It is questionable whether capital market-oriented companies can gain additional benefits by covering reports to the Federal Gazette, banks or investors with XBRL. However, it is necessary to evaluate whether or not such a realization is efficient for SMEs (Mascha et al. 2009, p. 47). IT systems and consulting companies are requested to develop offers for the market. Larger software companies are just starting to develop XBRL interfaces. For example, a large German ERP software vendor offers a tool which produces XBRL files using Microsoft Excel.

In conclusion, the XBRL discussion in Germany is characterized by the headline push versus pull. This is comparable to all of the other XBRL initiatives in the world.
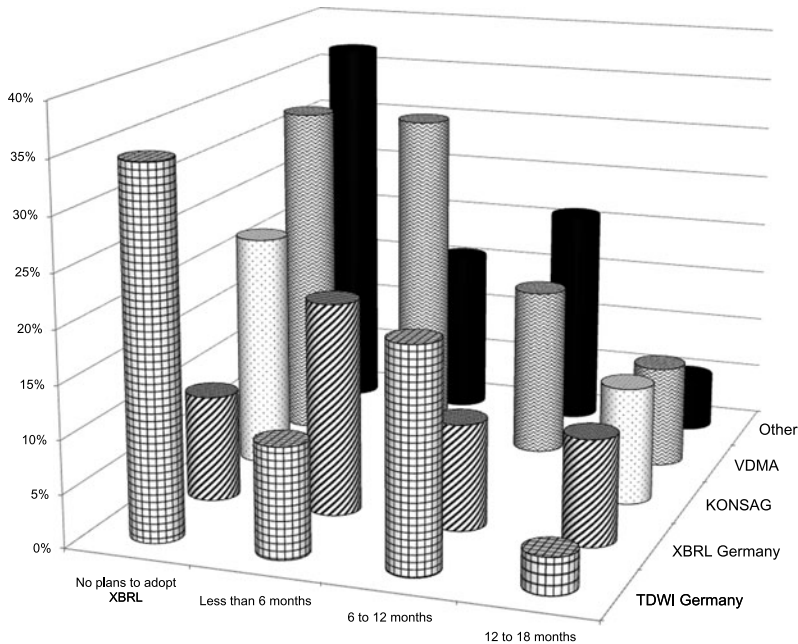
Fig. 8 Timeframe of software implementation (in percentage)

A pull occurs if decision makers feel confident in using XBRL within their organization. However, profitability is not seen. This requires the standard and the related effects to be well-known in the market. Push seems to be the best way to support the diffusion of the communication standard—not just in Germany, but also globally. Interviews have shown that the existing knowledge about XBRL, the related dates and obligatory XBRL usage, is too low. This means that regulators and public authorities like financial administrations should be concerned about publicizing the respective projects so that companies can better assess how to use XBRL as an obligation or within organizations.

6 Conclusions

This paper presented a study of the status quo of XBRL adoption in Germany. For this purpose, a theoretical model was developed, which is based on InT and the TAM, in order to answer the four research questions. The study results have been compared with the adoption of previous communication standards.

In the context of the first two research questions, the generated theoretical model is principally applicable to explaining XBRL adoption. In an isolated view, the TAM gained a much better result compared to InT.

With regard to the research questions *RQ2* and *RQ3*, it has to be stated that the international diffusion of the communication standard is driven by obligation. German projects are still voluntary. However, German filers at the US stock exchange

and also the KONSENS project are leading towards obligatory usage of XBRL for German companies. Thus far, publications have concentrated on demonstrating the potential and benefits of XBRL implementation. All of these studies conclude that this communication standard offers advantages for companies. However, the present study shows that XBRL is not a company-driven topic. The US SEC confirmed that the same situation occurred in the USA one year before the US SEC filings began for US filers. The main obstacle is that relevant and compulsory XBRL projects are not yet well-known. Furthermore, project costs are a reason for outsourcing the necessary tasks. This shows that it is not yet perceived that XBRL supports the enforcement of corporate governance. Moreover, not only the transferred XBRL file is of importance; the specification of a company's language may be the result of using XBRL for internal reporting. It should be noted that the use of XBRL does not guarantee accuracy. However, regulators and filers should learn from US projects to be better prepared for regulatory reporting (Debreceny et al. 2010, p. 296).

In relation to the previous adoption of various communication standards, it has been shown that, for large software vendors, there is no motivation to offer consumers an appropriate implementation and, for this reason, to make it easier to use. However, it has to be stated in this context that, for example, with regard to EDIFACT, different requirements were valid, especially with regard to the heterogeneity of existing data formats and the associated complexity of developing interfaces for all kinds of data import cases. Nowadays, business software has an improved level of flexibility and is able to deal with lots of data formats. However, XBRL also supports inter-company process linkages. An auditing process is one example of a more intensive usage of a non-systems-related communication standard. Such aspects are missing from former standards, which concentrate more on the data exchange itself.

Finally, it is obvious that an XBRL-related lobby is of major importance in Germany. It is important to integrate large software vendors as opinion leaders in order to ease the change in reporting and to reduce investment risks. For example, the US market has shown a flurry of XBRL projects in an attempt to fulfill obligatory demands. The result was a large number of errors in the files. This is already a subject of further research (Debreceny et al. 2010). More benefits must become obvious within organizations in order for them to initiate their own project calculations in reply to Nicholas Carr's statements.

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