Aalto University
School of Economics

Factors in ICT Innovation's Diffusion from an Environmental Context Perspective: The Case of XBRL

Information Systems Science

Master's thesis

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ABSTRACT

Objectives of the Study

The main objective of this study is to uncover which are the key dimensions that accelerate or retard the diffusion of XBRL within the context of an organization's environment. There has been a lack of an environmental perspective on the diffusion research in previous studies on XBRL. As the globally coordinated standard of XML specifically developed for financial information reporting, the diffusion of XBRL is in a sense the study of the diffusion of digital online financial information.

Academic background and methodology

The academic background of thesis includes the theories of the diffusion of innovations, standards, and models for external pressures impacting innovation adoption. The main theoretical model used for the empirical analysis is the Technology-Organization-Environment framework. The focus centred on the variables in the environmental context of organizations and this was divided into the four parts: technology support infrastructure, government regulation, industry characteristics and market structure, and cultural and other institutional pressures. The methodology implemented in the study included a case-study approach of target country environments with the data collected from semi-structured interviews.

Findings and conclusions

The findings of the study showed that the most important factors found affecting the diffusion of XBRL are regulatory pressures. Additionally, to a lesser extent the occurrence of path dependencies, certain national market characteristics, and the support infrastructure have an impact.

Keywords

XBRL, diffusion of innovations, digital financial reporting, XML standard, technology-organization-environment

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ABSTRAKTI

Tutkimuksen tavoitteet

Tutkimuksen tavoitteena on paljastaa mitkä avainkohdat kiihdyttävät ja hidastavat XBRL:n diffuusiota yrityksen ulkopuolisen ympäristön kontekstissa. Aiemmat tutkimukset XBRL:n diffuusiosta eivät käsitelleet ympäristön näkökulmaa. Koska XBRL on maailman laajuisesti koordinoitu XML-pohjainen standardi, joka on kehitetty taloustietojen raportointiin, XBRL:n diffuusion tutkiminen toimii samalla digitaalisten taloustietojen viestinnän diffuusion tutkimuksena.

Kirjallisuuskatsaus ja metodologia

Tutkielman kirjallisuuskatsaukseen kuuluu innovaatioiden diffuusioteoriat, teoriaa standardeista, ja mallit innovaatioiden ulkopuolisista adoptiotekijöistä. Tutkielman pää teoreettinen malli joka toimii myös empiirisen analyysin perustana on Tornatskyn ja Fleisherin kehittämä teknologia-organisaatio-ympäristö -rakenne. Keskipisteenä oli organisaatioiden ympäristöjen vaikuttavat tekijät jotka ovat jaettu neljään ryhmään: teknologian tukirakenne, valtion sääntely, toimialakohtaiset ominaisuudet ja markkinarakenne, sekä kulttuuriset ja muut institutionaaliset tekijät. Tutkimukseen käytettyyn metodologiaan kuului tapaustutkimuslähestyminen kohdemaiden ympäristöihin. Tietojen keruu tapahtui puolistrukturoiduilla haastattelustruktuurilla.

Tulokset ja päätelmät

Tutkimuksen tulokset osoittivat viranomaispaineiden olevan merkittävin vaikutustekijä XBRL:n diffuusiossa. Lisäksi, pienimmiksi vaikutustekijöiksi osoittautuivat polkuriippuvuus, määrätyt maakohtaiset markkinaominaisuudet, sekä teknologian tukirakenneominaisuudet.

Avainsanat

XBRL, innovaatioiden diffuusio, digitaalinen tilinpäätösraportointi, XML-standardi, T-O-E, yrityksen ympäristötekijät

ACKNOWLEDGEMENTS

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1. INTRODUCTION

1.1. Real-Time Economy Program

This research study included in this thesis is a part of the Real-time Economy Program which is a joint project between Tekes (The Finnish Funding Agency for Technology and Innovation) and the Aalto University School of Economics. The program's objective is to create a business environment where all business transactions occur in digital format, are automatically created, and completed in real-time. Out of the several stages of the program, the currently on-going one specifically tackles the digitalization and automation of accounting processes. The methods used to advance the program's objectives include research, teaching, public influence and business projects. The specific contribution of this paper to the program includes advancing the digitalization of the financial reporting process by promoting the electronic reporting standard XBRL.

1.2. Motivation and Objectives

"Getting a new idea adopted, even when it has obvious advantages, is often very difficult. Many innovations require a lengthy period, often of many years, from the time they become available to the time they become widely adopted. Therefore, a common problem for many individuals and organizations is how to speed up the rate of diffusion of an innovation." (Rogers 1962)

The objective of this paper is based on the principle stated above by Everett Rogers, who was one of the major contributors to innovation diffusion theory. The current time-period is referred to as the information age, where accessibility and information manipulation will be the main building blocks of competitiveness. The innovation process consists of the three indistinct phases of invention, innovation and diffusion (Enos 1962, Mansfield 1968, Dosi 1988). This paper will focus on diffusion. The way in which an innovation differs from an invention is simply that

innovations connote the implementation and adoption of an invention. The diffusion of innovations involves the spread of innovations and the theories associated with the concept attempt to examine how, why and the speed at which it occurs.

Information communications technology (ICT) is undoubtedly a prerequisite for enhancing competitiveness and for modernizing societies and economies (Dutta & Mia 2011). At the organizational level, ICT is an absolutely essential element influencing the productivity of an organization.

XBRL or (Extensible Business Reporting Language) is a global standard for digital financial reporting. It is an innovative and complex technology that has benefits including comparability (Baldwin et al. 2006), greater efficiency (Farewell & Pinsker 2005) and improved accuracy (Baldwin et al. 2006). There have been varying levels of success in the diffusion of XBRL between the potential adopter populations in different countries. The diffusion of complex technological innovations is difficult to predict due to their combination of network characteristics, high switching costs and high knowledge burdens which create uncertainty (Wilton & Pessemier 1981). This signals a clear need for analysing the factors accelerating or retarding its diffusion in national contexts. In addition to this, the differing levels of success have been surprising and have been a result of non-obvious factors. Therefore in order to improve techniques of the organizations involved in promoting the standards, these factors need to be undisclosed.

During the current time-period where many federal governments are facing severe sovereign debt crises, XBRL forms a possible pathway for reducing the administrative burden and as a result the sovereign budget deficits.

Additionally, recent historical developments have increased the urgency for improved methods to ensure the efficiency and transparency of organizations. An example of this was when the large energy, commodities and services company, Enron was exposed practicing irregular accounting procedures which bordered on fraud, resulting in the end in organizations bankruptcy.

While there have been numerous studies on the diffusion of innovations, there is still a need to focus on XBRL specifically. XBRL is an interesting case since it is an example of an innovation

that has many potential perceived benefits yet has been slow to diffuse. Many external influences have however taken a proactive approach to promoting its diffusion. The majority of previous studies approach researching the adoption of XBRL only from the technology, adopter, or organizational perspective. These studies are at risk of suffering from an individual-blame bias where characteristics of the adopters are blamed for a lack of innovativeness when the blame is more likely in the system in which the adoption occurs.

This innovation is therefore an interesting subject to study in terms of how external environments can impact the diffusion of complex ICT innovations and what are the implications and risks involved with innovations diffused in within this context.

In conclusion, the reluctance of highly beneficial ICT innovations to diffuse throughout the potential adopter population can become a significant retardant on the economic and competitive development of nations. The factors involved that influence the rate of an ICT innovations diffusion are difficult to pinpoint. In this paper I will strive to gather information from different countries to extrapolate what the critical factors are in a macro environment. Therefore my research question is:

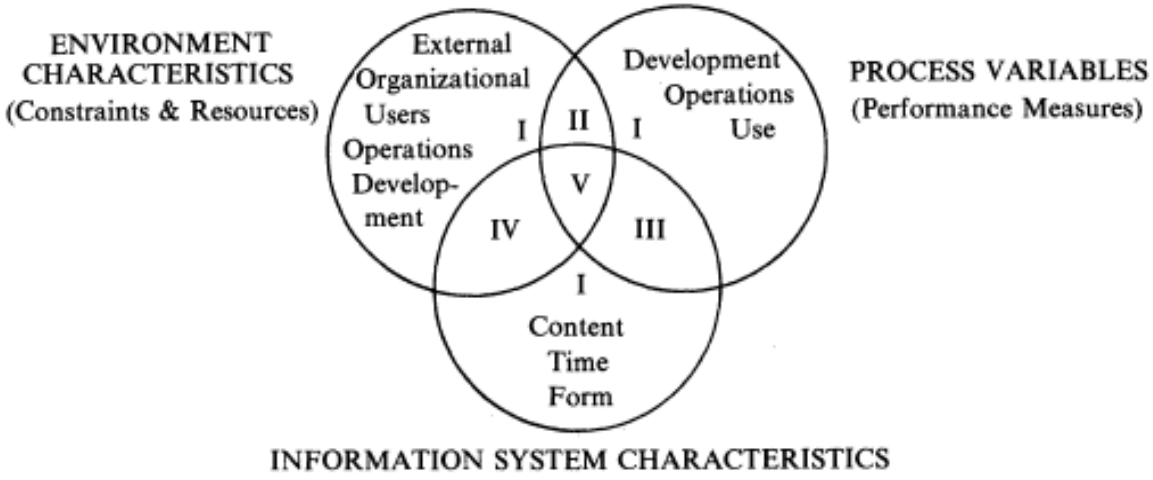
What are the key dimensions that accelerate or retard the diffusion of an innovation such as XBRL within the context of an organization's environment?

The paper will have two separate aims for the theoretical section and for the empirical part. Firstly in the theoretical section of the study, the specific environmental variables that have an impact on the diffusion of XBRL will be determined. Each of the variables will be supported and justified with prior literature. Secondly, the empirical part will take the variables and the framework established in the first section and determine the degree for which each variable has accelerated or retarded the diffusion of XBRL.

1.3. Scope of thesis and research question

There have been numerous studies relating to the diffusion of innovations, therefore the following segment has been dedicated to outlining the scope of this thesis. A justification will also be given for why the scope will be narrowed down to studying the diffusion of a specific technology, XBRL at the macro level. Ives et al. (1980) developed a holistic model for information systems research and can be seen below in figure 1.

Figure 1: Categories of MIS research



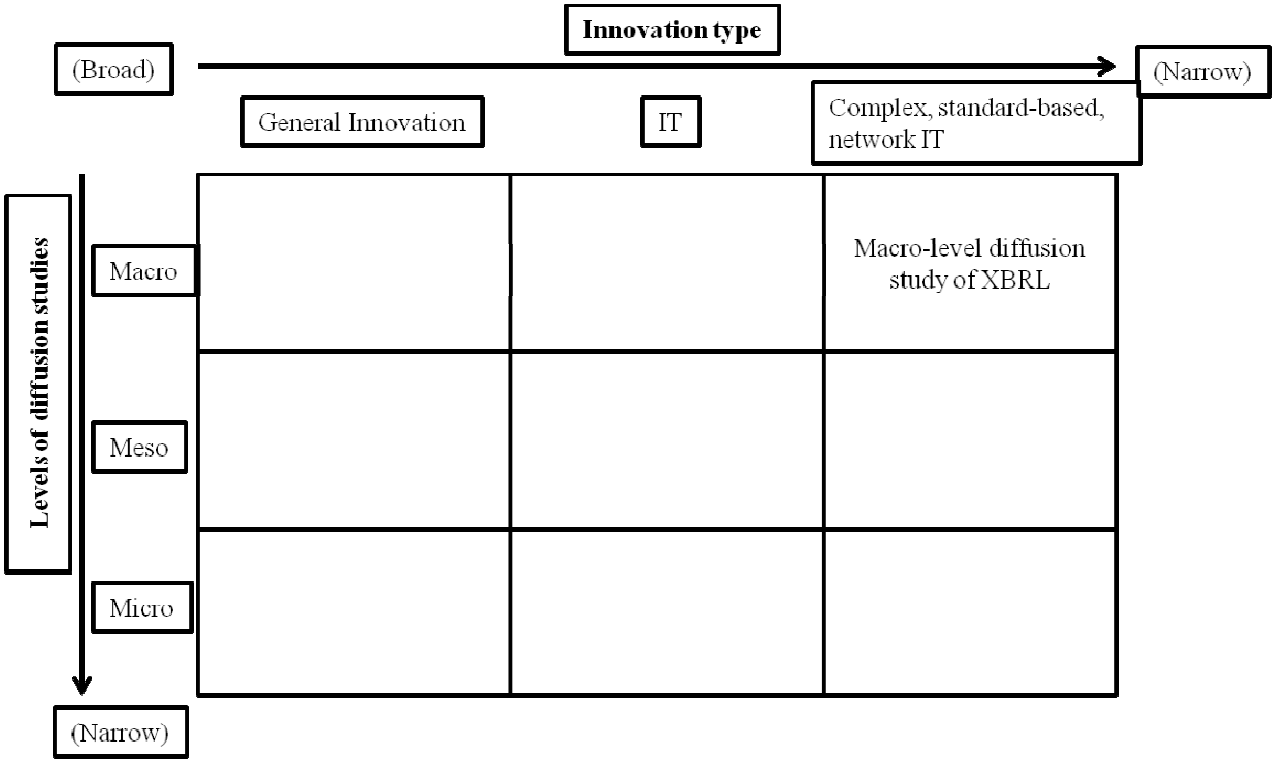
(Ives et al. 1980)

The three main categories of information systems research that the model describes include environment characteristics, process variables, and information system's characteristics. The environment characteristics group in itself contains five categories of variables. Firstly, the external environment contains the legal, social, political, cultural, economic, educational, resource and industry/trade considerations. Secondly, the organizational environment consists of the organizational goals, tasks, structure, volatility, and management philosophy/style. The user environment, on the other hand, is the environment that closely affects the primary decision makers. The IS development environment follows as all the factors influencing the development

of the system. Lastly, the IS operation's environment consists of all the resources required for the operation of the system.

In terms of this model, the two variable groups that will be involved in this paper are a portion of the environment characteristics as the independent variables and its influence on certain process variables as the dependent variables. This type II research as Ives et al. (1980) labels it, is one of the most common forms of IS research.

Figure 2: Levels of diffusion analysis



(Saxena & Wagenaar 1995, Damsgaar & Lyytinen 1994, Lyytinen & Damsgaard 1998)

Saxena & Wagenaar (1995) and Damsgaar & Lyytinen (1994) both referred to the different levels of diffusion studies which range from the macro level, meso level and micro level of factors. The macro level of diffusion studies is the scope of factors that involve national and broader environmental forces. Institutional perspectives when applied by for example DiMaggio & Powell (1991) to organizations established the need to take into account social influence on

firms and environmental pressures. The meso level of diffusion involves the industrial and segment related variables. Finally the micro level consists of organization-specific factors that are involved in the diffusion of innovations.

The macro-level innovation diffusion studies have been progressed by work by for example Lundvall et al. (2002) and Edquist (2005). They introduced the concept of innovation systems and national innovation systems. While Rogers (1962) famously compiled theoretical frameworks for the diffusion of innovations Lyytinen & Damsgaard (1998) critically questioned the applicability of traditional innovations theory and suggested that it is not adequate for explaining the diffusion of a "complex, standard-based and network information technology". As a result, the scope of this study has been further narrowed to a diffusion framework for the focus technology which is XBRL.

Another important distinction to note about this study is, for example, that the diffusion analysis will focus on inter-firm diffusion in contrast to intra-firm diffusion. In other words the adoption of the innovation standard between firms and not the extent at which each individual firm has internally implemented the standard in their processes. This has been purposefully left outside the scope of the thesis. The exact definition for an organizations adoption of XBRL will, for the purpose of this paper, be the ability to file an annual financial statement in XBRL format. Additionally, while there are many participants in the financial reporting supply-chain the adoption of XBRL will be examined in terms of private and publically listed organizations and therefore banks, stock exchanges, analysts, and regulators will be left out of the scope of the thesis.

1.4. Structure

The structure of the paper includes eight main parts. After the general introduction of the paper, a section will be devoted to describing the financial reporting supply chain of organizations and their financial information. This section along with the following section introducing XBRL will serve to brief a reader to the unfamiliar characteristics of the technology and relevant background

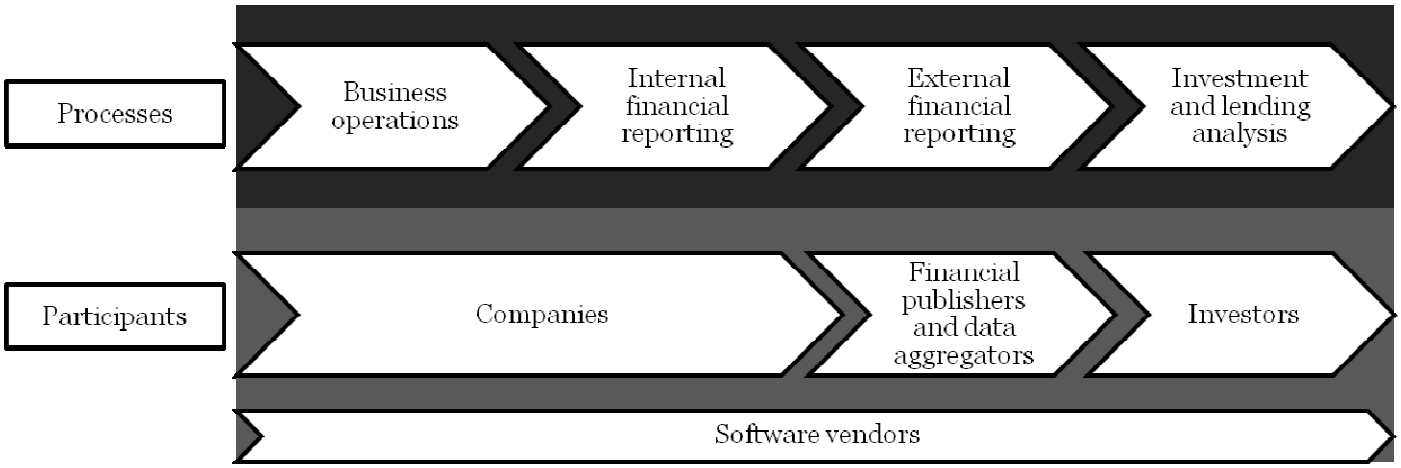
information to help follow the paper. The third part will be a general literature review of the concepts of innovation diffusion, starting from the core theories of the topic and progressing towards the theories relevant to the papers empirical study. This will be followed by a section developing the main theoretical model chosen for the paper in more depth.

For the empirical aspect of the paper, the methodology of the research study will be described in further detail, in section 5. In brief, the methodology of the empirical study will include semi-structured interviews and a qualitative approach. The last three parts of this paper will then include the hypothesized results, the actual results and an in depth discussion of the findings relating to the research.

2. FINANCIAL REPORTING SUPPLY CHAIN

The financial reporting process involves participants from companies, financial publishers and data aggregators, as well as investors. The goal of financial reporting and financial statements is to provide "company shareholders and stakeholders with information that aids in the prediction of amounts, timing, and uncertainty of future cash flows." (Encyclopedia Britannica Online 2012) The core processes involved in the reporting supply-chain are business operations such as invoicing, internal financial reporting, external financial reporting as well as investment and lending analysis. Software vendors are involved in each of the different supply-chain phases. The figure 1 below is an overview of each of the processes and participants.

Figure 3: Financial reporting supply-chain



(International 2011)

More specifically the origin of the supply chain is within the reporting entities. These organizations report the information internally as well as externally to various regulative authorities. Each of these regulative authorities have differing requirements for the form and content of their incoming financial reports. Secondly, there are accountants and other consultants. This includes actors such as legal representatives that aid in preparing the reports used by the reporting entities. The role of data aggregators includes simply re-organizing the data in order for it to be utilized by other parties. The end-users of the financial information are the analysts and consumers. Lastly, standard setters exist in order to control and dictate, for example, which accounting standards are used.

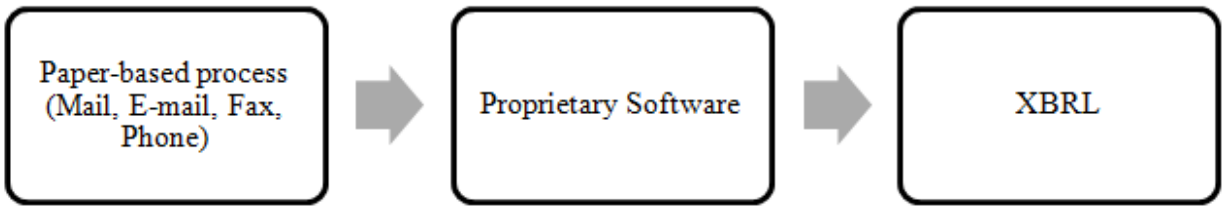
From the perspective of organizations filing their financial statements, there are two general forms of reporting. The two processes differ according to whether the organization is a publicly listed company or if they are simply registered to the local registration office for businesses. Listed companies tend to use International Financial Reporting Standards (IFRS), in for example the United States and European Union, while non-listed firms tend to apply local reporting Generally Accepted Accounting Principles (GAAP) standards such as the US-GAAP or the Italian GAAP. The listed companies file and interact with the securities regulator in the country (eg. Securities and Exchange Commission in the United States, Finansinspektionen in Sweden) while the non-listed companies interact with the companies registrar (eg. Infocamere in Italy, Bolagsverket in Sweden).

There are three different forms of reporting systems that are commonly used in financial reporting. The most primitive form of financial reporting is the paper-based process where each transaction is recorded and transmitted and recorded to the following participant in the supply-chain manually on paper or in simple non-standardized ways using PDF or HTML attachments. When transmitted in this form, the financial information requires manual human labour to read, process and re-utilize its information.

Secondly, there are more sophisticated reporting systems, which involve the use of proprietary software. The extensiveness and flexibility of the software determines its ability to reduce manual human labour and to improve financial reporting efficiency. There is currently a vast range of financial reporting software offered by software vendors.

Lastly, XBRL represents the newest development for financial reporting. The Financial reporting systems migration figure below summarizes the financial reporting systems development from paper-based processes to XBRL. The following section will discuss XBRL in more detail and how it impacts the financial reporting supply-chain.

Figure 4: Financial reporting systems migration



3. XBRL EXPLAINED FURTHER

In the following section, XBRL will be explained in further detail. XBRL or (Extensible Business Reporting Language) is “a language for the electronic communication of business and

financial data, which is revolutionizing business reporting around the world." (International 2011) It is a part of the XML (Extensible Markup Language) language family, which is a standard in itself for electronically exchanging data between organizations over the internet. XBRL allows individual items of financial information, such as "net profit", to be tagged in computer readable form with specific item-related information, such as whether it is a fraction, percentage. Since XBRL is the XML standard specified for financial information it represents in a sense the application of XML technology to this specific purpose. The paper could essentially be also expressed as the study of XML technologies diffusion into financial reporting.

A non-profit organization called XBRL International has been formed as a consortium of approximately 450 major companies, organizations and government agencies from around the world, in order to promote the innovations development and adoption. XBRL is mandated by some regulatory authorities in certain countries, yet is generally driven by market forces. As a result, XBRL is classified as a free and open standard.

XBRL can be applied to handle data in different languages and different accounting standards. The term "extensible" in its name actually refers to its flexibility to be adapted to meet different requirements and uses. Data can be transformed in XBRL-format by suitable converting tools or it can be generated in XBRL by appropriate software. XBRL is developing as a standard in tandem with the development of certain accounting standards. For example, many parts of the world are moving from using local financial reporting standards to IFRS. Each different financial reporting standard requires a corresponding taxonomy to convert the standard requirements in XBRL format. For IFRS for example, a taxonomy called the IFRS-GP taxonomy has been developed. The IFRS Foundation has stated that taxonomies are available for most of the major national financial reporting standards (IFRS Foundation 2011).

3.1. The impact of XBRL on the financial reporting supply chain

In terms of the financial reporting supply-chain, XBRL impacts each participant. Firstly, for the reporting companies themselves, internal financial information can be consolidated across subsidiaries and organizational divisions more efficiently and reliably. The reduction in manual

human input required in collecting, compiling and preparing the financial data allows for resources to be focused on analyzing, forecasting, and the decision making process. In terms of an organization's external reporting procedure, the costs involved in regulatory reporting are reduced and information can be sent as well as received closer to real-time. Investor relations are improved due to an increase in transparency as a result of the more user-friendly and easily comparable financial information.

For the receivers of the financial information such as regulators, government entities, stock exchanges, investment analysts and banks, the impacts of XBRL are also significant. The financial information can be received without having to re-enter the data by manual human input. Administrative costs are therefore reduced and the accuracy of report filings can be easily monitored. Financial information in XBRL format can be compared more quickly, efficiently and reliably. The transparency and clarity of financial reporting is improved with the standardization. Investment decision making benefits from being able to compare financial information with more powerful tools and methods.

The providers and vendors of software and solutions for reporting and analysing financial information will provide new XBRL-compatible software and services to the different participants within the supply chain.

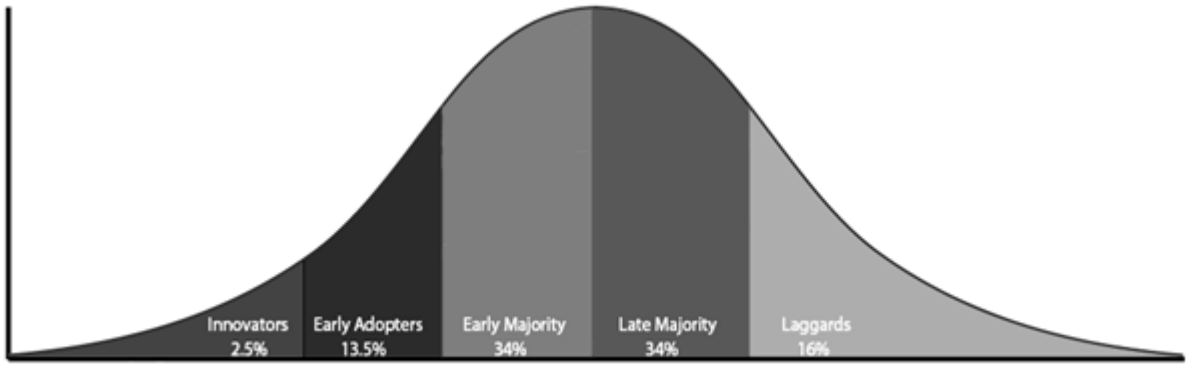
4. LITERATURE REVIEW

In the following section, the past literature relevant to this study will be covered. Firstly, the fundamental theories relating to the diffusion of innovations will be discussed in section 4.1. Secondly in section 4.2, the diffusion theories concerning an organizational perspective will be overviewed. In section 4.3, non-efficient choice perspective theories related to the diffusion of innovations will be covered. This will be followed by a review of standards literature and lastly, section 4.5 will consist of literature surrounding government intervention with standards adoption specifically.

4.1. Diffusion of innovations theory

Firstly, in this section innovation diffusion from the individual adopter perspective will be discussed. Rogers (1962) Defines the diffusion of innovations as "the process by which an innovation is communicated through certain channels over time among the members of a social system". The most widely accepted representation of how innovations diffuse through a market is the adoption lifecycle developed by Rogers (1962). This curve represented the cumulative frequency of adopters in relation to time. The figure 2 below shows a representation of this model where he established that an innovation diffuses through a series of adopter categories labelled as innovators, early adopters, early majority, late majority and laggards. The adopter categories as a result represent the different personal characteristics of adopters and therefore their differing levels of innovativeness Ryan and Gross (1943).

Figure 5: Adoption lifecycle



(Rogers 1962)

The different phases of the an adoption decision experienced by adopters were also categorized in his work and begin from the knowledge of the innovation and moves on to persuasion,

decision, implementation and confirmation. In relation to this diffusion theory Moore (1991) recognized that each adopter category requires differing strategic approaches. According to him, the most difficult phase of a technology is to diffuse itself passed the early adopters to the early majority, which he calls bridging the "chasm". This classical theory depicts the diffusion to develop from an initially slow rate of adopter increase to a rapid "take-off" after the chasm has been overcome. After a S-shaped cumulative adoption curve is reached as the population of potential adopters is depleted Gabriel Tarde (1903). In addition to this, one of the main conjectures of Rogers (1962) includes that the rate of adoption of an innovation is determined by an individual's perspective on an innovation and these key perspectives can be categorized in terms of how they see the innovations relative advantage, compatibility, complexity, trialability and observability.

Lastly, there is a large contrast between the decision-making process of individuals considering adopting an innovation and that of an organization (Kwon & Zmud 1987, Robertson & Gatignon 1986). Similarly the managerial influences and decision power relations within an organization require a different perspective on diffusion theory (Leonard-Barton & Dechamps 1988). The classical model for the diffusion of innovations is also inadequate for certain innovation types. This basic theory also does not take into account innovations that are susceptible to interdependencies and large knowledge burdens (Fichman 1992). Therefore these three continuations to the diffusion theory will be discussed in the following sections.

4.2. Organizational perspective on diffusion theory

The organizational perspective on innovation diffusion is extremely relevant to this study, most importantly because the innovation is an organizational innovation and is adopted or rejected in terms of organizational players. The theoretical frameworks most often used in diffusion studies when analysing from an organizational perspective are the firm level diffusion theories from Rogers (1995) and the technology – organization – environment (T-O-E) framework by Tornatzky & Fleischer (1990).

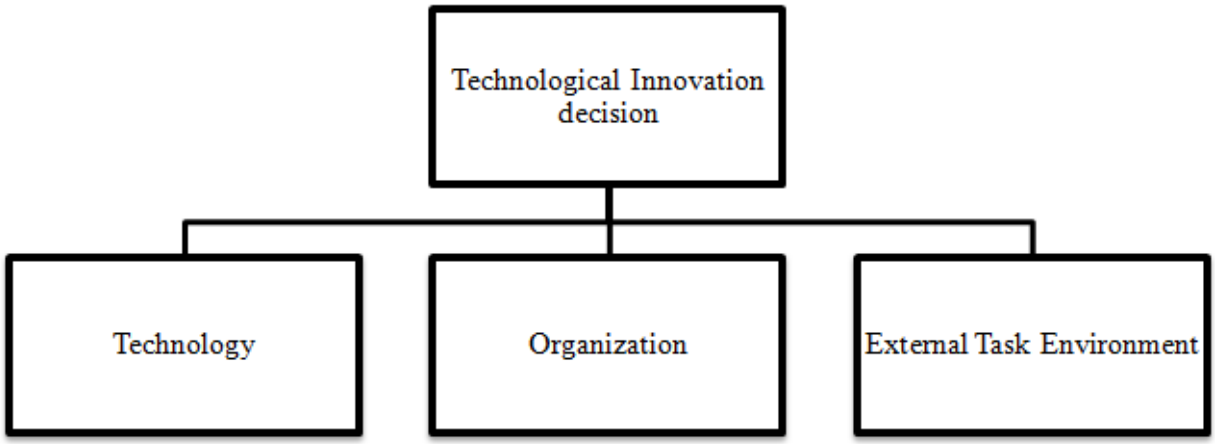
Rogers (1995) portrayed the organizational level diffusion factors to involve three categories. The first category relates to the individual leadership characteristics involved and how an attitude towards change impacts the diffusion of innovations. Secondly, the organizations internal structural characteristics are evaluated which includes aspects such as the centralization of the firm, its complexity, formalization, interconnectedness, organizational slack, and its size. Lastly, the external characteristics of the firm are assessed in terms of system openness. This model has been implemented in several information system research studies specifically.

The T-O-E framework which can be seen in figure 8, categorizes the aspects that influence a firms innovation adoption into technological aspects, organizational aspects, and environmental aspects (Tornatzky & Fleischer 1990). The technological aspect specifically refers to the characteristics of technologies the organization is currently using as well as the availability of other technologies not in use by the firm.

The organizational aspect of the framework pertains to the characteristics and features of the firm that influence its interaction with innovations. Examples of these characteristics include the size of the firm, top management innovation-leadership, availability of slack resources and others.

The last dimension of the framework is the environmental dimension which includes the external surroundings in which the firm is active. Examples of these factors include the industry structure, competitive environment, and interaction with regulatory bodies. This last category will be the main focus of the study and is expanded upon in detail in section 5. Since unlike the traditional diffusion of innovations theory, the T-O-E framework includes the environmental context it is especially useful in examining the intra-firm innovation adoption (Oliveira & Martins 2011).

Figure 6: Technology - Organization - Environment Diffusion Model



(Tornatzky & Fleischer 1990)

There have been numerous studies that have used the T-O-E framework as the main theoretical model. Some examples of studies that utilized Rogers (1962) diffusion of innovations model along with the T-O-E framework include: material requirements planning (Cooper & Zmud 1990), intranet (Eder & Igbaria 2001), corporate web sites (Beatty et al. 2001), Enterprise resource planning (ERP) (Bradford & Florin 2003), and e-business (Zhu et al. 2006, Hsu et al. 2006).

The T-O-E model was also used as the sole framework in numerous studies including: Electronic data interchange (EDI) (Kuan & Chau 2001), open systems (Chau & Tam 1997), Enterprise resource planning (Pan & Jang 2008), business-to-business (B2B) e-commerce (Teo et al. 2006), e-business (Zhu et al. 2003, Zhu & Kraemer 2005, Zhu et al. 2006, Lin & Lin 2008), and knowledge management systems (Lee et al. 2009).

The adoption of XBRL has been previously investigated most notably by Pinsker (2008), where two theoretical models for technology adoption were evaluated in terms of their applicability to XBRL research. The two models investigated were the Technology Acceptance Model (TAM) (Davis 1989) and the theoretical model of Absorptive Capacity (Cohen & Levinthal 1990). This individual and organizational perspective on adoption did not in my opinion take into account the

environmental pressures involved in an organization's XBRL adoption decision. In his earlier paper Pinsker (2007) acknowledges this limitation and suggests future research to take into account for example the regulatory environment of XBRL and to utilize the "Neighborhood Effect" phenomenon established by Zhang et al. (2002) in their study. The "Neighborhood Effect" established that firms do not make their adoption decisions independently alone and are influenced by social and physical contexts. This study will attempt to add onto this earlier research and assess the environmental context of XBRL adoption.

4.3. Efficient-choice perspective and beyond

The general theories presented by Rogers (1962), in his works made the basic assumption that individual adopters make perfectly rational and independent choices based on perfect information. Adopters would than always choose to adopt or reject an innovation based on whether it improves efficiency. This efficient-choice perspective on the diffusion of innovations has been challenged by a range of other sources. DiMaggio & Powell's (1983) works on institutional isomorphism and Abrahamson's (1991) theoretical framework on administrative technologies are some examples of these. These two frameworks will be outlined below and used to expand on the (Tornatzky & Fleischer, 1990) T-O-E framework.

Institutional theory involves studying how structures, rules, and norms can influence social behaviour (Scott, 2004). Institutional isomorphism therefore includes the phenomenon of the convergence of social behaviour according to this influence. DiMaggio & Powell (1983) identified three distinct categories of institutional isomorphism that have become the most frequently cited in this field. Firstly, coercive isomorphism exists by parties looking for legitimacy through regulative authorities which impose or influence their perspective. Secondly, mimetic isomorphism exists as a response to experiencing uncertainty and legitimacy gained from culture and conception. Thirdly, normative isomorphism involves legitimacy gained from professionalization originating from inter-organizational contact and education.

Figure 7: Mechanisms of Institutional Isomorphism

Coercive Isomorphism	Mimetic Isomorphism	Normative Isomorphism
• Regulative	• Culture • Conception	• Professionalism • Education

(DiMaggio & Powell 1983)

In his research, Abrahamson (1991) clearly applies this social theory to the diffusion of innovations theory and administrative technologies. According to Abrahamson (1991) research tends to focus overwhelmingly on what effects the diffusion rates of innovations and more on why and how are technically inefficient innovations diffused and efficient innovations rejected. These other theoretical dimensions are identified by him as the outside-influence dimensions and the imitation-focus dimensions.

Figure 8: Theoretical Perspectives on Diffusion and Rejection

TABLE 1
Theoretical Perspectives Explaining the Diffusion and Rejection of Administrative Technologies

		Imitation-Focus Dimension	
		Imitation Processes Do Not Impel the Diffusion or Rejection	Imitation Processes Impel the Diffusion or Rejection
Outside-Influence Dimension	Organizations Within a Group Determine the Diffusion and Rejection Within This Group	Efficient-Choice Perspective	Fad Perspective
	Organizations Outside a Group Determine the Diffusion and Rejection Within This Group	Forced-Selection Perspective	Fashion Perspective

(Abrahamson 1991)

The model rejects two major assumptions in the dominant perspective of the diffusion of innovations spearheaded originally by Rogers. Firstly, the fact that groups of organizations are able to freely and independently choose to adopt technologies is countered by realizing that organizations outside the group have an impact on the decisions of the individual parties (Abrahamson 1991). Secondly, the assumption of organizations being guided by clear goals and having a clear impression of the potential efficiency of the innovation (March & Olsen 1976), is countered simply by accepting that there exists a degree of uncertainty in organizational adoption choices.

4.4. Evolution of technological change and standards

Anderson & Tushman (1990) established a model for technological change describing the evolution of technological innovations. Initially, a technological breakthrough or technological discontinuity disrupts a market and commences an era of ferment where a variety of technical variations compete until a dominant design emerges. The dominant design is the basic form of a product or process that becomes the accepted market standard. The variety of standards and designs offered at this initial stage creates an uncertainty that the stakeholders for the innovation (eg. manufacturers, suppliers, customers, and regulatory agencies) compete to reduce. These stakeholders The next phase of technological change becomes the era of incremental change where the dominant design is only elaborated upon. Finally, the cycle then repeats itself once a new technological discontinuity appears.

Many potential adopters take a “wait-and-see” approach to the era of ferment, where they delay investing and committing to the innovation before a dominant design emerges. Anderson & Tushman (1990) even argued that without the emergence of a standard, the mass adoption and volume production of an innovation is unlikely to occur.

The methods of introducing innovations to markets involve two differing perspectives. A technology push was first developed by Schumpeter (1934) and placed an emphasis on pushing innovations to the market through research and development, production and sales. Alternatively, Schmookler (1962) contributed the perspective that many demand-pull or market-pull

determinants exist and that innovations need to adapt to existing patterns of demand in the market.

Certain innovation characteristics significantly impact their diffusion process. This is the case with innovations susceptible to network externalities or interdependencies. As Katz & Shapiro (1985) state, a positive consumption externality exists when the utility of a good or service increases according to each additional agent consuming it. It is also important to distinguish the differences between direct, indirect. Identified in Katz & Shapiro (1994), direct positive network externalities are when an increase in the innovation's users directly increases the value gained by each user from the innovation. Indirect positive network externalities occur when the increase in an innovation's diffusion results in an increase in the number of complementary goods, which in turn results in an increase in the value of the original innovation. Markus (1987) established that for interactive communications media the attractiveness of adopting increases relative to the quantity of others adopting it. Both indirect and to a degree direct network externalities are present concerning XBRL, which is a form of interactive media.

The following section will further review the established literature and background on standards. The implications of diffusion in terms of a standard are significant. The current existing literature on standards mainly consists of assessing De facto standards or the strategy involved in competitors attempting to set a dominant design with their product offering. These "voluntary" standards can be categorized in two forms, unsponsored standards and sponsored standards (David & Greenstein 1990). An unsponsored standard occurs when no party holds direct or indirect ownership of the standard yet is still widely publically available. A sponsored standard is one characterized by a party holding direct or indirect proprietary interest in the standard and promote its adoption to other firms.

While there is less literature concerning the strategic implications of promoting a De jure standard, they inherent significant challenges as well and are an important area of study. De jure standards take two different forms depending on whether they are voluntary and established by a standards organization or committee (agreement standard) or whether they are promoted by regulatory bodies and agencies (mandated standard) (David & Greenstein 1990).

The most widely used alternative classification of different standards was developed by David (1987). In his paper he identified the differences between compatibility or interface standards, minimum quality or safety standards, variety reduction or focusing devices, and information or measurement standards. Standards are not necessarily exclusively categorized into one of the classifications however they each have differing economic impacts (Swann 2000).

Compatibility and interface standards are based on establishing a set of specifications that allow for compatibility between parties. These types of standards result in unique implications for decision makers due to the impact of switching costs, network externalities and the lock-in effect. Switching costs is the basic concept outlined by Klemperer (1987) and Farrell & Shapiro (1988) where buyers in a market face significant costs when changing from one product to its substitute. Network externalities, as was already stated earlier refer to a system being more valuable when adopted by many other users (Farrell & Saloner 1985). These two phenomenon's directly lead to technological lock-ins where a group of users are reluctant to switch from an inferior old technology because they cannot be sure that the other users who create the network effect would follow.

Minimum quality or safety standards have several economic impacts. Due to information asymmetry there is a discrepancy between the availability of information between a producer and a consumer. This in turn can lead to adverse selection which is the idea that when consumers cannot differentiate between goods of differing quality, the lower quality goods can push aside those of higher quality. According to Leland (1979) standards however reduce the possibility of information asymmetry by providing consistency in information. Transaction costs or the costs involved in an economic exchange are reduced by standards. Firstly, standardization reduces uncertainty when considering the quality of goods. Secondly, standardization reduces the time required for searching between goods (Jones & Hudson 1996).

Variety reduction or focusing devices are standards that are intended for improving production efficiency. They reduce the variety of alternative choices which allows for economies of scale and a reduction in the cost of producing each unit.

Information and measurement standards on the other hand are a combination of the other classifications and can involve several of the possible economic impacts. The example given by

Swann (2000) has to do with different grades of petrol. This type of standard includes the compatibility component, an assurance of a certain quality as well as obvious economies of scale.

It is commonly agreed that standards have a positive effect on macro-economic performance and the types of benefits are best outlined by the study by The German Institute for Standardization (DIN) (2011). It mentions for example that standardization is a significant contributing factor in the diffusion of innovations. Additionally, standards are a catalyst for the development of new innovations and have a positive effect on trade and international competitiveness. The report even found that national standards could be more effective than international ones in terms of the response by consumers.

4.5. Government's role in standardization

Government involvement in standardization has traditionally been justified in terms of correcting a market failure, regulating a private monopoly, and to accelerate the growth of a specific new industry (Swann 2000). The market failure can be the result of several outcomes. The three main possibilities associated with market failure include externalities, increasing returns and imperfect competition, and thirdly the consequences of asymmetric information. Externalities occur when a private market outcome does not match its social benefit or drawback to all the stakeholders involved. For example a positive externality occurs when socially positive outcomes are underprovided by private investments and the market. Negative externalities occur, on the other hand, when socially negative outcomes are overprovided by private investment and the market. In this sense, a standard can be in certain situations considered a "public good" as it is non-rivalrous and non-exclusive (Kindleberger 1983).

The second main source of market failure is when increasing returns are highly present. In this case economic efficiency cannot be achieved without market regulation. Costs cannot be minimized when competition is high as the scope of production remains too small to take advantage of the increasing returns. Even if a monopoly emerges in the market, monopolies tend to reduce production in order to increase prices and in this way also cause an inefficient market outcome. The third source of market failure is caused by asymmetric information in the market

place. This concept relates to the imbalance of information between parties involved in a transaction and the implications of this imbalance. As Akerlof (1970) wrote, the average value of a product can decrease simply because the buyer does not have sufficient information to know the quality of a product, and will therefore be less inclined to purchase it for its value. This may even result in the producer having to leave the market if they are unable to achieve an adequate price for their good.

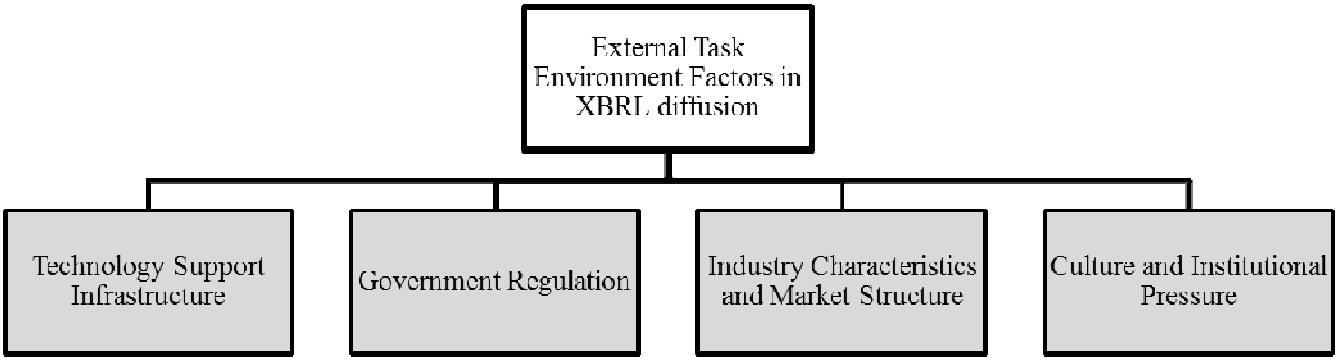
Alternatively to this perspective, government intervention can be associated with the risk of government failure. This term was first popularized by McKean (1965) and according to public choice theory several forms of government failure exist. McKean (1965) argued that even though market outcomes may be less than optimal, a government intervention is not any more likely to bring about a more socially preferable outcome. Alternatively, a government's lack of intervention when they had the opportunity to create a more socially desirable outcome is referred to as passive government failure.

Wang & Kim (2007) came to the conclusion, in relation to IT de jure standard-setting, that a market-friendly environment for government intervention in standardization is determined by three sets of factors. These factors included conditions relating to technology, the market, and government capability. More specifically, in terms of the technology, the government needs to have more expertise in the innovation than private actors and it needs to act during the standards era of ferment. In terms of the market-related conditions, when a market governance structure includes a dominating coalition of private technology suppliers and consumers, the government's role becomes minimal. Additionally, a government's capability also requires there to be demand-pull factors for the innovation. Swann (2000) expressed these concepts effectively when he established the three basic principles that need to hold true for governments to have a role in the standardization process: (1) Something is unsatisfactory about the market outcome; (2) government has the ability to make it better; and (3) government has the political will to spend money on it.

5. THEORETICAL FRAMEWORK OF THE STUDY

In this section I will outline the final theoretical model being used in the thesis. Tornatzky & Fleischer (1990) provided a useful foundation for the model however each component of the adapted model will be expanded upon individually. The main model used in this thesis is shown in the figure 3 below.

Figure 9: Main Theoretical Model



Adapted from (Tornatzky & Fleischer 1990) and (DiMaggio & Powell 1983)

5.1. Technology Support Infrastructure

The idea of studying the flow of technology and information among individuals, firms and institutions to promote innovation was first developed by Freeman (1987) and Lundvall (1985). This concept of a national innovation system was the first step towards viewing the macro-level actors as a whole in terms of their effect on innovation promotion. Innovation systems theory therefore involves complex relationships among the actors in the system.

The World Economic Forum in their annual Global Information Technology Report (Dutta & Mia 2011) have developed the Network Readiness Index (NRI) which they use to compare the leveraging and diffusion capabilities of countries in terms of information communications technologies (ICT). The index is comprised of three components of measurement. Firstly, the

market, political and regulatory, and infrastructure environment is taken in to account. Secondly, the readiness of the community's key stakeholders is calculated, including individuals, businesses, and the government. Lastly, the present usage of ICT in the market of stakeholders is taken into account.

An information infrastructure is necessary for the diffusion of an ICT innovation or standard. This infrastructure is partly shaped by a countries national income level as for example Vernon (1966) (1970) pointed out. There are however clear differences between the information infrastructures of countries as well as their ability to leverage ICT capabilities. This concept of different geographical regions being unequally able to influence their ICT development is commonly referred to as the global digital divide.

In terms of an adopter's external environment, Tornatzky & Fleischer (1990) include three main components that make up the technology support infrastructure of a market for an innovation. Firstly, the costs of labour impact a firm's disposition for adopting an innovation. Supported by works by Globerman (1975), Benvignati (1982), Hanna & McDowell (1984), and Levin et al. (1987) they argue that firms favour innovativeness designed to reduce the amount of labour required.

Secondly, the skill of the available labour force where the firm operates also impacts the tendency for an organization to adopt an innovation. Since new technologies require new skills and adjustments by a firm (Flynn 1988, Hirschorn 1984), a firm with access to a sufficient source of educated and experienced labour will have a smaller barrier towards innovation adoption. This coincides with Attewell (1992) as he noted the significance of knowledge barriers in impeding innovation adoption.

Thirdly, having access to services related to the innovation is a vital component in the market environment of an adopter. The more training and consulting opportunities that are available for the firm relating to the innovation, the easier it is for the firm in its decision-making and implementation. This coincides directly with the normative isomorphism described by DiMaggio & Powell (1983) in which inter-organizational actors, through for example professionalism, provide social legitimacy.

5.1.1. Path dependence

Path dependence in its broadest definition indicates the impact of historical events on current behaviour. This concept can act as a counter-theory which suggest that having a superior ICT infrastructure may lead to less economically optimal innovation diffusion. Farrell & Saloner (1985) established the theory that when firms are bound together with compatibility and a standard, it can impede their desire to move to a new and superior standard. They determined that this "excess inertia" is a result of whenever there is a lack of unanimity in decision-making or complete-information. Farrell & Saloner (1985) identified that when this lack of complete-information occurs two types of excess inertia are possible; symmetric inertia and asymmetric inertia. In the former scenario, firms and actors are all of the same opinion that adopting the new standard is beneficial however each of them only favour the adoption passably. Therefore the system lacks motivated parties to start the bandwagon. Alternatively, when asymmetric inertia occurs some of the actors view adopting the new standard as beneficial while others do not. Even in these cases when the overall benefit from the group is greater than the costs of switching, those that favour the switch are not sufficiently motivated to start the bandwagon.

Conversely, the case of "excess momentum" is also possible. This time the market inefficiency occurs when a new innovation is prematurely diffused throughout an environment. Farrell & Saloner (1986) described the reason for why this is possible as current adopters ignore the costs that their adoption of a new system incurs on older adopting parties.

5.2. Government regulation

Tornatzky & Fleischer (1990) describe how government regulation has the potential to either conduce the diffusion of innovations as well as retard them. None-the-less it is seen as a major factor influencing a firm's external environment. DiMaggio & Powell (1983) understood this perspective in terms of their social theory and isomorphic change and described regulatory pressures as coercive isomorphism.

The regulatory environment of organizations may be less absolutely influenced by national states then earlier due to the globalization of modern economies and the multinational nature of firms. The European Union for example has and will continue to become a significant influence for organizations, however as long as the majority of innovation-related policies are still made at the national level, the national state perspective should be used according to Edquist (2005) and Lundvall et al. (2002). Other coordination bodies other than governmental institutions can have an important impact on the adoption of standards. These coordination bodies take the form of international agencies, trade and industry associations, higher education institutions, trend setting and multinational corporations, financial institutions, labour organizations and religious institutions (King et al. 1994). They are forms of implicit and explicit communication between players.

The first factor included in the national diffusion factors has to do with coordination and strategy. "The coordination problem" is the term used in economics to describe a decision making situation for parties where they would achieve mutual gains whenever mutually consistent decisions are made. When goods exhibit network effects, they are characterized by this phenomenon. This was described by Rohlfs (1974) and his analysis of communications networks.

King et al. (1994) laid out each of the different potential forms of institutional intervention either influencing or regulating IT innovation. The forms of intervention in their four dimensional framework were categorized firstly by a perspective of either influence or regulation and then by the perspective of supply-push or demand-pull. Within these dimensions, the institutional actions can take one of six forms. Firstly, in terms of developing organizational familiarity and adoption intentions with the innovation, institutions can implement knowledge building or knowledge deployment. Other more proactive methods include for example directly or indirectly subsidizing the innovation as well as mobilizing the potential adopters with awareness programs and events. Lastly, institutions can forcefully set standards in markets to promote the development of an innovation or set an innovative directive, which specifically commands organizations and markets to use an innovation.

5.3. Industry Characteristics and Market Structure

Each innovation's diffusion occurs in its respective industry. The competitive environments of the innovation suppliers as well as the adopters are important perspectives in the external environment influencing diffusion (Robertson & Gatignon 1986, Nelson & Winter 1977). This section will discuss the most relevant literature relating to this perspective. Tornatzky & Fleischer (1990) outlined in their model that at least six components are significant when considering a firms industries characteristics. These six components included a firm's size, intensity of competition, customer-supplier relations, market uncertainty or volatility, the dimensions of competition, and the industry life cycle.

Firstly, larger firms tend to have more resources to invest into innovative projects and tend to be early adopters. As Tornatzky & Fleischer (1990) points out, several studies on environmental variables in different industries support this conjecture such as Kelley & Brooks (1988) study of metalworking plants in the United States, Levin et al. (1987) study of optical scanners in grocery stores, Hanna & McDowell (1984) study of automatic teller machines in the banking sector, Majchrzak et al. (1986) study of computer-aided design and computerized equipment in the machinery and transportation equipment industry, Globerman (1975) study of numerical control machines, and the Benvignati (1982) study of textile machinery innovations.

The intensity of competition within the market environment is another important factor. This intensity is directly linked to the percentage of market share that is concentrated to a few firms. The less concentrated the industry is, the more competitive the market will be. The empirical studies by Gatignon & Robertson (1989) and Hanna & McDowell (1984) found support for a positive relationship between high industry concentration and innovation adoption. Other studies such as Levin et al. (1987), Globerman (1975) and Benvignati (1982) however have found the opposite, suggesting that low industry concentration promoted adoption. In summary, the impact of an increased industry concentration has an ambiguous impact on innovation diffusion.

The relationships between suppliers and their customers influence an organizations adoption of innovations. In many cases key customers can assert their favoured technology on a supplier as for example is common in the automotive industry (Kelley & Brooks 1988). This coincides with coordination dynamics. When different sized firms and actors in standards decision-making have

differing relative gains in terms of compatibility. A large actor will gain relatively less from being compatible to a smaller actor than the smaller actor will when being compatible to the larger (Katz & Shapiro 1985). This was supported by the study by Gatignon & Robertson (1989) who described this as an example of factors in the supply-side competitive environment positively influencing adoption behaviour.

As Gatignon & Roberston (1989) concluded other characteristics of the competition in the market influence adoption behaviour. They describe how the degree of price intensity of the competition hinders the innovation adoption potential of the firms in the industry. This coincides with what Tornatzky & Fleischer (1990) suggest. They observed that firms focusing on quality and service improvement as opposed to reduced pricing as a competitive approach tend to be more likely to adopt innovations. In a similar fashion, the Tornatzky & Fleischer (1990) model states that if the market environment is characterized with rapid growth, organizations should be able to adopt innovative activities faster. Additionally, studies such as Mansfield (1968) and Benvignati (1982) provided evidence that firms are most likely to adopt new technologies during the more certain phases of a business cycle.

5.4. Culture and Other Institutional Pressures

The core model by Tornatzky & Fleischer (1990) has been adapted in this paper to include this additional cultural component as there is an increased demand for information system research to include an emphasis on national culture (Ford et al. 2003, Nelson & Clark Jr. 1994, Gallupe & Tan 1999, Shane 1993). Similarly as DiMaggio & Powell (1983) identified mimetic isomorphic change as one of their pillars of institutions, the need to assess the impact of what is culturally legitimized and supported is significant. The following section will discuss the impact of the cultural context on the diffusion of complex information technologies. Straub et al. (2002) furthered information systems research by applying social identity theory and the individual perspective concerning culture. This theory identified that an individual associates themselves in several categories of culture including professional, organizational, ethnic and national. The dimension of culture that will be discussed in terms of the scope of this paper is the national dimension.

Currently the most cited cultural dimensions are the five developed and empirically verified by Hofstede (2003). These dimensions are also frequently used in terms of IS research specifically having been the basis for 24 out of the 36 studies discussed in the review of national culture and information systems research by Myers & Tan (2002). The dimensions are labelled as power distance, uncertainty avoidance, individualism vs. collectivism, masculinity vs. femininity, and long-term vs. short-term orientation. Firstly, power distance is determined by the degree of disparity between the powerful and less powerful, as seen and accepted by the less powerful. Uncertainty avoidance on the other hand is simply the degree at which individuals find comfort in unstructured and ambiguous situations. Individualism refers to the level of social integration an individual has with a group. Individualism as opposed to collectivism suggests that an individual views themselves highly independent of their social network. The fourth dimension or masculinity vs. femininity expresses whether a culture is characterized by either traditional masculine values of ambition, competition and performance or traditional feminine values such as service, caring for others and equality. Lastly, the dimension of long-term vs. short-term orientation asserts the degree a culture is formed to adapt to changes, persist, and place their focus on future possibilities. Short-term orientation places focus on the past and the orthodox.

Hofstede himself understood that while there is a strong relationship between the cultural context and development, the other "harder" variables, such as national income, need to be taken into account in assessments. Many empirical studies exist observing the impact of culture on IT adoption. Some examples of these are Straub (1994), who looked at the adoption of telephone, e-mail and fax in the U.S. and Japan, and Hasan & Ditsa (1999), who examined the impact of culture on IT adoption in West Africa, Middle East and Australia. The most extensive studies on the topic, having assessed culture as a variable in the adoption of IT technologies in a large sample of different countries, were by Bagchi et al. (2004), Van Everdingen & Waarts (2003) and Erumban & de Jong (2006). Bagchi et al. (2004) predicted in their large study cultures influence on the adoption of six different IT technologies. Van Everdingen & Waarts (2003) studied the effect of culture on the adoption of Enterprise Resource Planning software by mid-sized firms in 10 different European countries. Erumban & de Jong (2006) on the other hand observed cultures relationship with the general ICT adoption rate of several countries. A comparison of the three sources and their results is displayed in the table below.

Table 1: Cultural context source comparison

Source	Bagchi, Hart & Peterson, 2004		Van Everdingen & Waarts, 2003		Erumban & de Jong, 2006	
Cultural dimension						
High Power Distance	N	+	N	+	N	+
Individualism	P	+	P	+	P	~
Uncertainty Avoidance	N	–	N	+	N	+
Masculinity	N	~	N	+	N	~
Long-term Orientation			P	+	P	–

P: A positive relationship was found. **N**: A negative relationship was found

+: The results were significant. –: The results were insignificant ~: The results were somewhat significant

(Bagchi et al. 2004, Van Everdingen & Waarts 2003, Erumban & de Jong 2006)

The results of these three studies all agreed on the relationship of each variable with IT adoption, even though significant evidence could not be provided in each case. A synthesis of the three sources identifies high power distance as having a negative relationship, individualism as having a positive relationship, uncertainty avoidance as having a negative relationship, masculinity having a negative relationship and long-term orientation having a positive relationship with the adoption of IT.

6. METHODOLOGY

The methodology of the paper will be to analyze the diffusion of XBRL between 4 target countries using the model established in the previous sections. The empirical data for the different diffusion factors of the will be derived by a combination of interviews, seminar speeches and prior research. The intent of the research was to have a well-targeted sample of local experts. Additionally, I attended two XBRL-related seminars which took place at the Aalto University School of Economics. In both instances, individuals from the XBRL International organization and its different jurisdictions participated in discussing issues and developments related to XBRL.

The semi-structured interviews ranging from 25 to 45 minutes included two participants from the United States, two participants from Sweden, one participant from Italy, and one participant from Denmark. Below are more detailed descriptions of the individuals. These countries were chosen as the targets of this study due to the initial perceptions I acquired when attending the XBRL seminar at the Aalto University School of Economics (XBRL seminar 2011). Here it became clear that Sweden was a market experiencing harsh challenges in the diffusion of XBRL while conversely Italy was experiencing varying forms of success. Naturally these two countries could then provide an interesting comparative analysis. In terms of Denmark, the situation there was undergoing a significant milestone in the midway phase of diffusing XBRL within the market. During the time of the interview, they were about to adopt an XBRL mandate for a segment of their market. In this way Denmark formed the third angle of researching the topic. Lastly the United States with the longest history of XBRL experience was an obvious choice as they had in many ways acted as a forerunner in the diffusion of the standard.

While the sample of interview participants was not large, the study placed larger emphasis on acquiring information from the most knowledgeable and reliable sources. Similar to all qualitative research in social sciences, this case study approach to research has certain limitations.

In the words of Hartley (2004, p.324) "…there will always be too many 'variables' for the number of observations made and so the application of standard experimental or survey designs and criteria is not appropriate." Case studies are however especially successful in capturing rich contextual data (Hartley 2004).

Participant 1 (USA): A senior policy advisor at the Office of Financial Research for the U.S. Department of the Treasury and is a former director of interactive data at the US Securities and Exchange Commission.

Participant 2 (USA): A Professor at Florida Atlantic University. Specialist in accounting information systems and has written academic articles relating to the adoption of XBRL.

Participant 1 (Sweden): A senior advisor at a Swedish company providing electronic financial information solutions. An active member at XBRL International and formerly a senior advisor for XBRL Europe.

Participant 2 (Sweden): A public accountant for a global professional service and accounting firm specializing in financial an IT processes.

Participant 1 (Italy): Accountant, auditor and temporary professor at the University of Macerata. Has written several research articles on XBRL.

Participant 1 (Denmark): A manager at the Danish Bankers Association and current chairman of the board for the XBRL organization in Denmark.

The XBRL-related events that have been used to support the empirical data in this paper are briefly described below.

XBRL seminar (Helsinki, Finland): A seminar held at Aalto University School of Economics, which had speakers from the XBRL International organization discussing the latest developments of XBRL mainly in Europe. (XBRL seminar 2011)

XBRL conference (Helsinki, Finland): A conference held at Aalto University School of Economics, where the XBRL consortium for Finland was established. (Forming the Finnish XBRL consortium 2012)

7. EMPIRICAL STUDY

7.1. Results

In the following section the results of the empirical research uncovered in this paper will be presented according to the four categories established in the main theoretical model. The information gathered concerning technology support infrastructure, government regulation, industry characteristics and market structure, as well as culture and other institutional pressures from each of the targeted countries, including Italy, The United States, Denmark and Sweden will be portrayed.

7.1.1. Case: Italy

Before the XBRL related projects commenced in Italy, the main method for organizations to send financial reports were paper-based and based on PDF files. Therefore the financial information needed to be recaptured manually when received and was not directly reusable.

An XBRL program for filing financial statements was established in 2006, where organizations reporting in terms of the Italian GAAP have been able to voluntarily file to the Italian Business Register of Firms (Camera di Commercio) using XBRL. The organizations using the Italian

GAAP as their accounting standard make up over 99% of the total number of Italian companies. Since 2009, the Italian Business Register of firms has implemented a mandatory filing program for these organizations and for example in 2010 almost 1,000,000 companies were filing financial statements using XBRL (XBRL seminar 2011).

In terms of the diffusion of XBRL, the rate of adoption was insignificant prior to the introduction of a mandatory filing program.

> Participant 1 (Italy):
>
> "Just because I can tell you in Italy, most of the companies has to… its mandatory since 2009"
>
> "All the awareness building programs were developed by our jurisdiction and also by all the chamber of commerce of our single or of our regions."

In this case the regulatory pressure is seen as the main factor involved in spreading the innovation to organizations. Additionally, awareness and knowledge building programs were established either directly by the chambers of commerce themselves or by the XBRL consortiums jurisdiction in Italy which is comprised of businesses, nonprofit organizations, universities, as well as governmental entities.

7.1.2. Case: U.S.A.

The previous financial reporting process in the United States for organizations, prior to the introduction of XBRL, included sending their financial statements in static HTML documents to the U.S. Securities and Exchange Commission (SEC). The infrastructure allowed for communicating the presentation of financial statements to the commission, however the data within the documents were not computer-readable and therefore not directly reusable.

A voluntary filing program was initiated by the SEC in 2004. The program allowed for publically listed companies to voluntarily file their financial reports in XBRL-format to the SEC. The organizations able to participate in this program were ones applying U.S. GAAP accounting standards. Roughly 90 organizations participated in the filing program, which represented only a small portion of the total number of companies in the United States and only a fraction of the companies using U.S. GAAP accounting standards. The SEC began a mandatory filing program in 2009 which would extend to all listed companies filing their financial statements to the commission and use U.S. GAAP accounting standards (U.S. Securities and Exchange Commission 2010). Therefore the diffusion of XBRL in the United States at the moment includes a large adopter population of publicly listed U.S. firms yet does not entail all privately owned companies and companies filing financial statements using IFRS accounting standards. Already by the end of 2011, 8,000 companies were required by SEC to file financial statement data in XBRL (Engel 2012).

> Participant 1 (USA):
>
> "Most of the vendors who participated were vendor solutions or tagging solutions. There was no data to really use. So there was only a couple of players who were putting together analytical software and that pretty much had to wait until there was a mandate. Meaning that there was a promise for there to be enough data to analyze."
>
> "Granted that XBRL is hard to use at this time. The applications are still improving and the data itself is still standardizing but these things do take time."

The respondents expressed the importance of software vendors participating in the market during the voluntary programs. However they viewed that the mandatory programs were necessary to make the software vendors commit to developing solutions and to supply the innovation to potential adopters. Additionally, they see that the software solutions available at the moment are still in the developmental phases. – Ecosystem needs to be build and can then spill over to other countries.

7.1.3. Case: Denmark

Danish organizations currently file their financial statements in a PDF format, which is not directly reusable or computer-readable. The Danish Commerce and Companies Agency has implemented a voluntary XBRL filing program for the small and medium sized companies that file their financial statements with the agency. The program has allowed for the companies reporting in terms of the Danish GAAP accounting standards to file their financial statements in XBRL format. Therefore with this program roughly 200,000 companies have the option of filing in XBRL. The filing program has experience an extremely low number of voluntary filing cases during this program and the diffusion of XBRL has been limited. The Danish regulatory bodies have moved towards a mandatory filing program in 2011. However the impact of this policy is yet to be observed.

> Participant 1 (Denmark):
>
> "The situation in other countries is something that we look very close to and we hope that the development of XBRL in the world especially also in Europe and the Nordic countries of course will develop in the same way as it has in Denmark. That is also an important dimension. To keep in line with all the countries, especially with Europe and Nordic countries of course."

The respondent was keen on emphasizing that Danish multinational firms have experience in XBRL from other countries that have mandated the standard. Additionally, the development of XBRL in other countries is a significant factor in the development of XBRL specifically in Denmark.

7.1.4. Case: Sweden

The financial reporting infrastructure in Sweden is dominated by an open standard for transferring accounting data called the SIE format. While Sweden has employed a voluntary filing program with the Swedish Companies Registration Office (Bolagsverket) for filing financial statements in XBRL format, there have been strikingly few occurrences of filings. Even though these potential adopters represent a large percentage of the companies in Sweden only roughly 100 companies are filing their financial statements in XBRL at the moment. The program applies to all Swedish private companies who utilize the Swedish GAAP accounting standards.

> Participant 2 (Sweden):
>
> "this SIE format is quite unique globally"

The Swedish participants expressed that the Swedish SIE reporting format is a sophisticated and comparatively advanced globally. Currently there is no mandatory filing program for XBRL in Sweden and the role of government in the diffusion of XBRL has been minimal.

> Participant 1 (Sweden):
>
> "The background or story of XBRL and the Swedish market is that we have the perfect infrastructure"
>
> "Financial ministry of Sweden.. they have been so much against external ideas"

The respondents provided evidence to support a cultural resistance to XBRL implementation. They expressed the uniqueness and sophistication of the SIE infrastructure and agreed that this has had a significant hindering impact on the diffusion of XBRL in Sweden.

Participant 2 (Sweden):

"I mean their software developers have not yet really provided good software for this submissions and that is one obstacle"

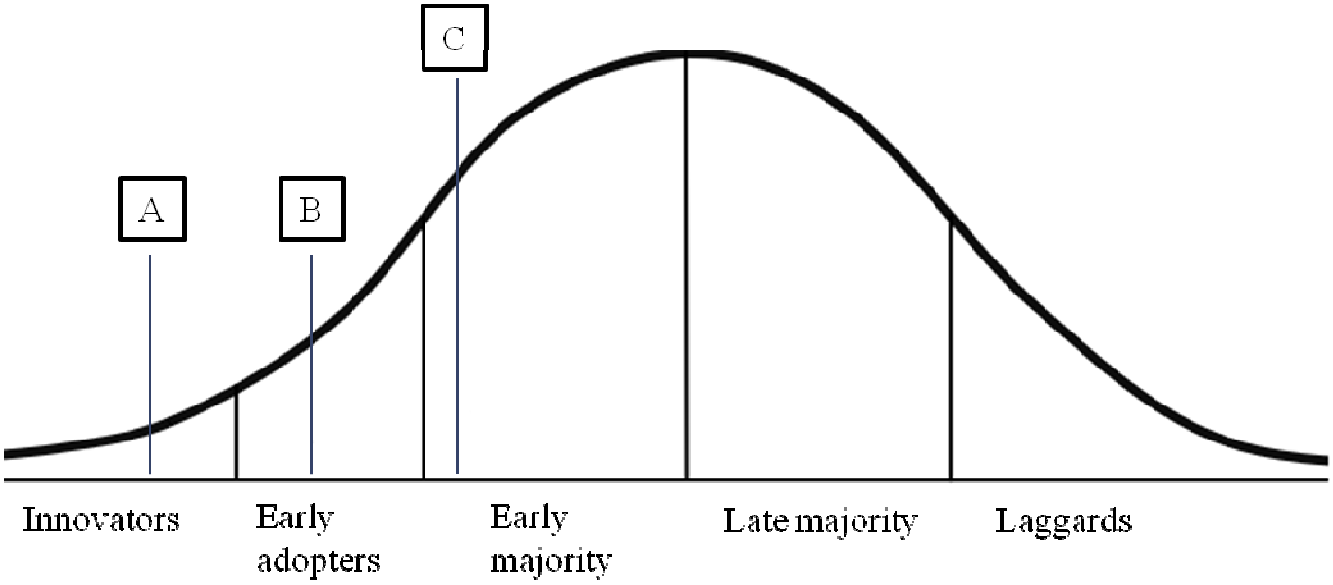
This has also been seen indirectly from the perspective of the role of software vendors. They express the lack of effective software to be a factor in slowing the adoption of XBRL.

7.1.5. Overall results

The financial reporting process, for the majority of companies, before the development of XBRL, involved either PDF-based reporting or the use of proprietary software which did not incorporate a standardized language of communication. Each of the four countries studied in this paper have or have had in the past voluntary filing programs, where organizations can produce their financial reporting information in XBRL format for it to be received by an external party. The two main regulative bodies that have implemented initiatives for promoting XBRL diffusion have been the Business registration offices and securities and exchanges commission.

Figure 11 below depicts the current situation in the diffusion of XBRL within the sample countries. In the figure, A represents the regulatory bodies that have implemented XBRL capabilities. This includes the securities regulators in the United States (SEC), the business registration authorities in Italy, Sweden and Denmark. B represents the handful of U.S. firms that had adopted and reported in XBRL during the voluntary reporting program as well as the extremely small group of companies in Italy, Denmark and Sweden that experimented with XBRL reporting during their voluntary filing programs. C represents the much larger group of organizations that have adopted XBRL during the mandated filing programs implemented in the United States and Italy. This represents roughly 1,000,000 small and medium sized enterprises in Italy reporting to their Business registration authority and the roughly 8,000 listed companies in the U.S. reporting to the U.S. Securities and Exchange Commission.

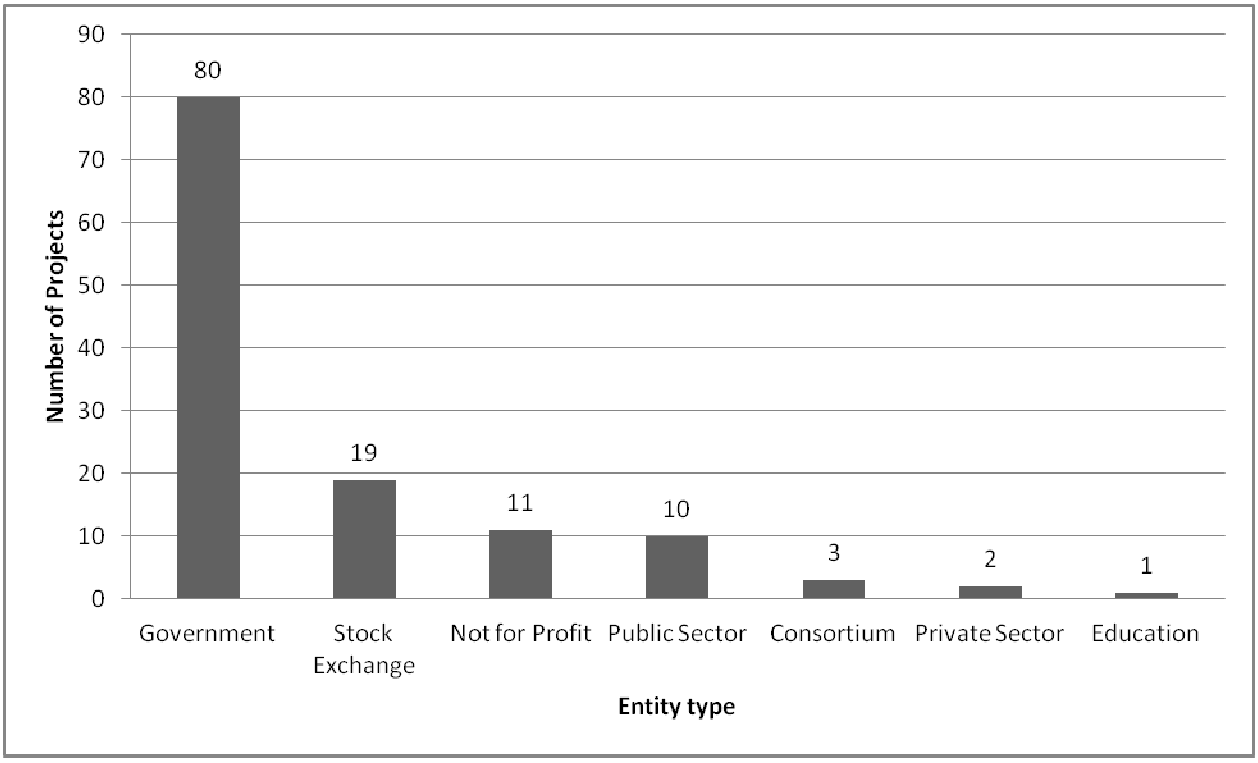
Figure 10: Current situation in the diffusion of XBRL within the sample countries



A: Regulatory bodies using XBRL
B: Voluntary filers
C: Mandated filers

Overall, the majority of XBRL project initiators globally have been government entities and regulatory bodies as can also be observed from the figure below which compares the sources of the projects currently in process. Additionally, the European Union has recently announced that they will be requiring all E.U. countries to apply mandatory filing programs by 2018.

Figure 11: XBRL Projects and Initiators World Wide



(XBRL International 2009)

In conclusion, the most important factor found affecting the diffusion of XBRL are regulatory pressures. Additionally, to a lesser extent the occurrence of path dependencies, the support infrastructure, certain national market characteristics and national cultural resistance have an impact.

In terms of the technology support infrastructure and industry characteristics and market structure, path dependency was seen as having an impact in its broadest definition for the role of regulators in Sweden. The sophistication of the existing infrastructure and the importance of domestic competitiveness in financial reporting ICT prevent regulators from opening the market for XBRL service providers. The situation resembles a state of excess inertia as was described by Farrell & Saloner (1985) where the individuals see the switching costs as too great to start the bandwagon needed to diffuse the innovation.

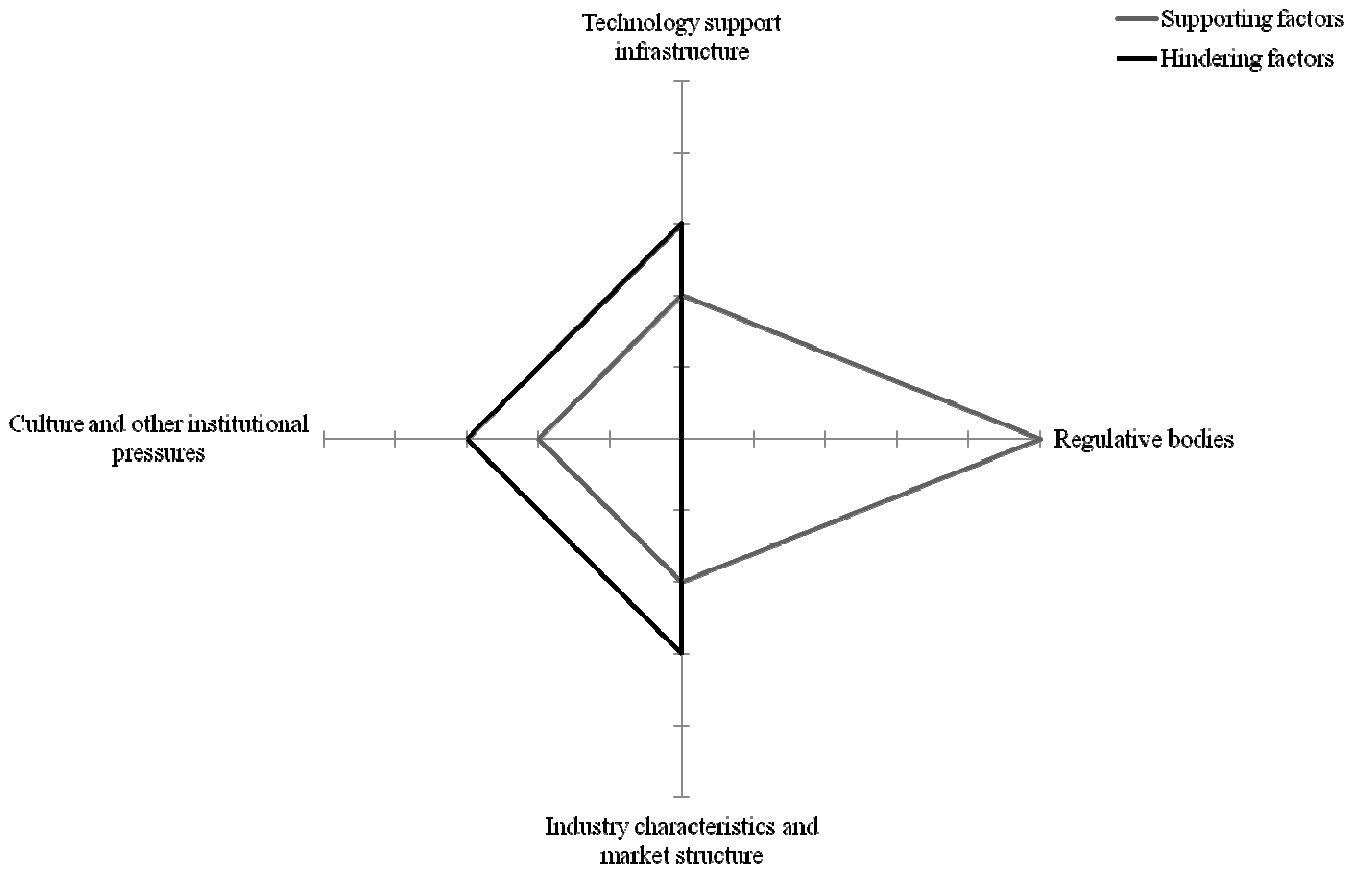
The lack of available software solutions and support infrastructure that has been proven effective hinders the adoption of XBRL. There was no evidence in the case studies for larger firms being more receptive towards adopting XBRL and this can therefore be discounted from the candidates for impacting its diffusion.

From the perspective of government regulation, the empirical data collected from the interview respondents of each country show support for regulative bodies being a crucial factor in promoting XBRL in the environment of organizations. They at the very least implement knowledge building programs up to complete mandatory filing programs. The case studies did not include examples where subsidizing or similar methods of intervention was approached however the governmental bodies investing in the development of the XBRL taxonomy language can be viewed as a form of direct influence in the research and development of the innovation. The results indicated rather clearly that the intervention methods required for accomplishing diffusion needed to include standard setting arrangements. Only when governments and institutions are characterised by passive indifference do they hinder the diffusion programs of digital financial reporting innovations.

Lastly, when considering the cultural and institutional pressures with the case studies there was a suggestion of support leaning toward a cultural resistance towards the innovation diffusion, however this conclusion cannot be made with any significance using the methodology this paper applied. The limitations of the methodology are outlined further in section 8.3.

A summary of these results can be seen in the figure 12 below.

Figure 12: Summary of results (Factors that impact the diffusion of XBRL)



8. DISCUSSION

While the results of the empirical study did not provide obvious differences between the case countries, general conclusions can be made for XBRL overall and a useful discussion can be extrapolated.

As was discussed in section 4.4 concerning the economics of standards, a relatively smaller actor has relatively more to gain from being compatible to a large actor than the large one has being compatible to the smaller actor (Katz & Shapiro, 1985). This same dynamic applies to countries and their coordination policy concerning XBRL. The coordination strategy in Denmark was dependent on the action of other countries. Among the advantages of pushing for the adoption of XBRL in Denmark will be the eventual availability of software solutions from a global array of vendors. Small and open economies will be pushed by forms of mimetic and normative institutional isomorphism from multinational corporations acting in their markets and having experienced XBRL filing abroad. In a similar way the fashion perspective that Abrahamson (1991) described will act as a force of convergence between the countries and smaller open economies will be more easily impacted. This is supported by the statements given by one of the U.S. respondents.

> Participant 1 (USA):
>
> "…we went down a different approach which required a significant investment from the part of us and vendors in terms of improved software and improved taxonomy approaches. I think that those are now available for other countries to use should they choose to go down a similar approach meaning that broader filing requirements and for companies to actually do their own tagging rather than complete forms."

Another interesting extrapolation that can be observed from the results is that specific adopter characteristics were fairly irrelevant in light of the actual adoption path the innovation has ended up following.

According to the latest global information technology report and as seen in table 2, the highest propensity index for ICT innovation exploitation was given to Sweden. This was also the case in the context of the environment subindex (Dutta & Mia 2011). The subindex encompasses an assessment of the countries market environment, political and regulatory environment as well as the infrastructure environment and their impact on ICT innovation diffusion. Conversely Italy

scored far lower than the other countries involved in the analysis according to the networked readiness index with poorer scores throughout all the categories for the environment subindex as well.

Table 2: Networked Readiness Index

	Networked Readiness Index		Environment subindex		
			Market environment	Political and regulatory environment	Infrastructure environment
Country	Rank	Score	Score	Score	Score
Sweden	1	5.6	5.4	6.2	6.1
USA	5	5.3	5.1	5.4	5.7
Denmark	7	5.3	5.1	5.8	5.5
Italy	51	4.0	4.0	4.0	4.1

(Dutta & Mia 2011)

The contrast of these indicators with the actual results derived from the empirical study supports a need for innovation-specific analysis of diffusion factors.

The general research question set for this study was to discover the key dimensions that accelerate or retard the diffusion of an innovation such as XBRL within the context of an organizations environment. The studies success in answering all the aspects of this question was not absolutely ideal yet it was to a greater extent successful. The study uncovered the most influential factors in the diffusion of XBRL and used empirical case study examples to support its argumentation. While the results indicated that one factor had an overwhelmingly significant influence on results, the fact that other factors were relatively insignificant was a unanticipated result as well.

8.1. A call for government intervention

The following section will discuss the reasons why aggressive government intervention has arisen as such a key factor. As Anderson & Tushman (1990) well stated: the era of ferment following a competence-destroying discontinuity is longer than the era of ferment following a competence-enhancing discontinuity. XML standards such as XBRL require significant development and coordination in terms of creating the correct tags and developing the language. In this sense the competencies concerning the innovation need to be developed uniquely and are different to leverage from existing ones. The consequence of this is also that the standardization of the innovation and its initial taxonomy development becomes a necessary component of diffusing XML technologies for financial reporting at all.

The main benefits accredited to XBRL financial reporting have to do with social benefits and positive externalities to external parties, outside of the organization itself. These benefits include an increase in financial transparency and more effective financial regulation. As was explained in the literature review of this paper, when a social benefit is under-provided by a market outcome, it is considered a form of market failure. The fact that markets cannot effectively regulate themselves is the reason why public regulatory bodies exist, in the first place. Paradoxically, adopters do not invest in the innovation due to the lack of proven software and a support infrastructure, where as the solutions providers do not invest in developing proper software and services to a technology that has no market potential. Unlike most organizational ICT innovations discussed in literature, XBRL does not exhibit large network externality implications from the organizations perspective. As XBRL is narrowly defined for only the financial information organizations report, in some instances, to just one external party (the chamber of commerce), the benefit of standardization is not profound. The relationship with the regulatory body is however vital for the organization and the regulator naturally can exert tremendous power over the organization. Therefore two of the three basic principles stated by Swann (2000) that governments require in order to have a role in the standardization process have already been met: 1) There is something unsatisfactory about the market outcome and 2) the government has the potential to change the outcome. The third principle establishing that the government needs to also be politically motivated to interfere in the market is a more complex aspect. For example

in the case of Sweden, the apparent lack of political motivation for a mandatory filing program could be the outcome of the government's strategic goals for Sweden's domestic ICT industry.

8.2. Implications

8.2.1. Possible applications of the findings

The applications of these findings will include stakeholders such as government institutions, software vendors, the XBRL consortium and organizations who have not adopted XBRL-related filing processes. The obvious lesson for software vendors should include the realization that strong environmental pressures are globally pushing the standard to the market and providing software solutions early can be a strong advantage. Institutional bodies can take the other countries such as Italy as examples for the need to use aggressive regulatory efforts to promote the innovation as the standardization process is a vital stage in inhibiting innovation in digital financial reporting. The strategy applied by regulatory bodies that was the most successful included two out of the three components of the framework established by King et al. (1994). These were knowledge building and deployment strategies along with strict standardization policies.

8.2.2. Future direction of XBRL

In terms of the basic principles stated earlier by Swann (2000), governments have shown to have a significant impact on changing the market outcome. The market needs to get used to XBRL and to build the knowledge infrastructure around it which includes the development of support services. Currently the innovation is far too young to have created institutional isomorphism that could accelerate adoption throughout the accounting professionals. In terms of the European Union's intention on setting up mandatory filing programs in each of its member states by 2018,

this goal has had limited initial impact on the strategic approach of the filing programs of countries however it is a signal that reduces any uncertainty concerning the future significance of XBRL in the financial reporting supply-chain.

8.3. Limitations and suggestions for future research

As with all research studies, the limitations involved need to be mentioned. Firstly, since a social science is in question, the observation of each variable in isolation from all the others is virtually impossible. The qualitative nature of the empirical data makes the study susceptible to inaccuracies in interpretation and subjectivity. Therefore the study should be viewed in that light. One of the primary ways of overcoming this limitation and improving research validity is to implement a multi-method approach with additional methods such as observational research and ethnographic research.

This study, as is the case with all diffusion-focused studies, there is a risk of falling victim to a pro-innovation bias which Rogers (1962) mentions in his diffusion of innovations literature. This involves assuming that an innovation should be diffused rapidly and thoroughly without sufficient regard to the characteristics of the innovation. The characteristics could require adjustments in order to accommodate different groups within the target environment and could be technologically deficient.

While the empirical method was highly effective in researching certain variables, the cultural dimension of the study could especially have benefitted from a different approach. This could involve deeper emersion into the target group combined with an observational approach.

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9.2. Conferences

XBRL conference (Helsinki, Finland): at Aalto University 31.03.2011

XBRL seminar (Helsinki, Finland): at Aalto University 21.09.2011

9.3. Interviews

Francesco Campanari, Accountant/auditor/temporary professor, University of Macerata, Phone, 04.06.2011

Lars Berglöf, Senior advisor, eReport, Stockholm, 05.07.2011

Poul Kjaer, Manager and chairman, Danish Bankers Association, Copenhagen, 27.07.2011

Robert Pinsker, Professor and specialist, Florida Atlantic University, Boston, 22.03.2012

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APPENDICES

9.5. Appendix A: The interview structure

National Diffusion Situation

1. What is the diffusion rate of XBRL in your jurisdiction?

- What is the current rate of reports/filings using XBRL?
- How many companies use XBRL at the moment?
- When did you start having filings and how did they develop?

How has XBRL been diffused in each of the following categories of financial reporting participants?

- Large companies and publicly traded corporations
- Small and medium enterprises
- Public institutions and regulators
- Financial publishers & data aggregators
- Investors and analysts

How present and active are software vendors in producing and providing XBRL software in your jurisdiction?

Technology Support Infrastructure

Have XBRL taxonomies been developed in your jurisdiction? At what phase is this development?

What was the financial reporting environment like before XBRL?

- Which method was used in financial reporting? Paper-based processes, PDF, HTML or Proprietary software?
- How sophisticated are the IT skills and knowhow involved in financial reporting?
- How efficient and effective is the current reporting system? or how efficient was the system prior to XBRL?

The situation in terms of the following categories:

- Large companies and publicly traded corporations
- Small and medium enterprises
- Public institutions and regulators
- Financial publishers & data aggregators
- Investors and analysts

Government Regulation

What are some of the supportive techniques?

- How have government regulators influenced the adoption of XBRL?
- Do incentives or subsidies exist for XBRL investments?
- Have public institutions adopted XBRL and exerted pressure on private firms?
- Have there been specific awareness-building programs, conferences or events promoting XBRL?

Industry Characteristics and Market Structure

What is the proportion of SME´s as opposed to large firms in the market structure?

Do large competitive pressures exist and what are the competitive pressures in the market place?

How does the country size and the role of multinational corporations impact the diffusion of XBRL?

Culture and Institutional Pressure

How has the governments, organizations, and institutions willingness to cooperate been?

How open have each group been to ideas?

How has uncertainty impacted the adoption of XBRL?

How dominant are old ideas and old ways of doing things?

9.6. Appendix B: Terminology defined

Innovation diffusion

Rogers (1962) said diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system

Organizations environmental context

The environmental context is the arena in which a firm conducts its business. Specifically this refers to the firms industry, competitors, and interactions with the government (Tornatzky and Fleischer 1990).

Networked readiness index

This index is the World Economic Forums assessment framework for the propensity of countries to exploit the opportunities offered by information and communications technology. New results for the index are published each year by the World Economic Forum, in coordination with the European Institute of Business Administration.

XML (Extensible Markup Language)

XML is a set of rules for encoding documents in a human-readable as well as computer-readable format.