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XBRL technology adoption and consequences: A synthesis of theories and suggestions of future research

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Abstract

Research Question: This study is an appraisal of XBRL existing literature to find out what exists and what is lacking in the literature regarding the incentives of XBRL adoption, and its consequences.

Motivation: The literature has not fully investigated the incentives of XBRL adoption and its consequences for the users of financial statements. The aim of this study is to synthesize current literature on XBRL adoption and its consequences.

Idea: eXtensible Business Reporting Language (XBRL) is revolutionizing financial reporting on a global scale. It has the support of the world's most powerful institutions, including stock exchanges, central banks, standard setters, regulators, and other industry interests. It has attracted the attention of accounting researchers to better understand its influences on accounting and auditing professionals.

Methodology: The current study uses qualitative research methods that includes a review and a synthesis of a variety of archival materials. Papers on XBRL are summarized under two main categories: incentives of XBRL adoption, and its consequences.

Findings: The review suggests that the majority of publications are published in the second decade during 2011-2021 period. This result may imply that researchers try to give more answers for regulators, policy makers and standard-setters about issues related to the concrete implementation of XBRL in different contexts and countries. In addition, the current review notices that most of the previous studies that focus on the determinants of XBRL adoption are exploratory and use the qualitative method through surveys and/or interviews. While these studies extend our knowledge about the motivations that push towards the XBRL adoption, future studies could confirm these results with more objective measures. The current study notices that most prior studies focus on a single country, hence future research may use comparative analysis of XBRL adoption in different countries as it may offer a better

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understanding of the actual use of XBRL in diverse contexts. Further studies should consider emerging countries, and more particularly GCC countries, where XBRL technology adoption is mandatory and take into account the socio-economic culture of these countries. As a future direction, there is a need of investigation on the role of regulation in improving the use of XBRL and the extent of compliance with XBRL IFRS taxonomy. Future studies may also investigate the potential consequences of XBRL technology on financial reporting quality to give answers for standard-setters and policy makers.

Contribution: Our research contributes to the existing literature by creating a foundational knowledge base that will be relevant to different stakeholders including, governments, practitioners, and researchers on the effects of implementing XBRL, as well as the relevance of such theories in explaining XBRL adoption.

Keywords: XBRL; Digital system; Accounting information; Regulation; Financial reporting; Positive accounting theory

JEL Codes: M41; O14; O33

1. Introduction

The most recent twenty years were characterised by crises and financial scandals, for example, WorldCom, Enron, the crises of 1998 in Asia and the crisis of 2008 in the United States of America related to the sub-prime mortgage. Accordingly, transparency of financial reporting has turned into a primary issue for businesses (Ansary *et al.*, 2020). Thus, the foundation and evolution of eXtensible Business Reporting Language (XBRL) is a vital component to increment the financial reporting transparency from and inside organizations and market effectiveness (Gräning *et al.*, 2011; Wagenhofer, 2007). It was positioned in the ten most important technologies in the accounting discipline (Liu, 2013) and it has attracted the attention of accounting researchers to better understand its influences on accounting and auditing professionals (Hsieh *et al.*, 2019).

XBRL adoption is frequently associated with converging to the International Financial Accounting Reporting Standards (IFRS), which has become a worldwide phenomenon. As a result, governments that have mandated the IFRS implementation will ultimately adopt the XBRL.

XBRL is revolutionizing financial reporting on a global scale. It has the support of the world's most powerful institutions, including stock exchanges, central banks, standard setters, regulators, and other industry interests. It allows businesses to submit a single set of data rather than multiple sets of information to a variety of professional organizations and government bodies for various goals (Sinnott & Willis, 2009).

Further, it requires the construction and application of taxonomies, which give uniform information formats and descriptions as well as the ability to tag data (Dhole *et al.*, 2015; Hao *et al.*, 2014). As a result, redundant data and unneeded descriptions are eliminated (Eierle *et al.*, 2014).

Sir Kurt Ramin, the Chairman (Emeritus) XBRL International notes that through its Foundation, the International Accounting Standard Board (IASB) was involved in preparing and creating a taxonomy to stimulate the worldwide adoption of both the International Financial Reporting Standard (IFRS) and XBRL. This powerful combination plays a crucial role in catering to people who, on the one hand, are familiar with accounting standards and, on the other, use technology to organize financial reporting data. He added that the Foundation's XBRL team is a key support function for the IASB's standard-setting process.

Several studies have investigated the XBRL adoption at the micro-level, to gain a better knowledge of the different faced problems, opportunities, and other relevant issues that this adoption raises. This scenario has been occurring for the past two decades, and while actual studies reveal that the use of XBRL has been modest, it is progressing globally. As a result, it is not surprising that XBRL adoption research attracts the interest of academics, regulators and stock exchanges. In fact, more research in this field is expected (Perdana *et al.*, 2015).

Hence, the current study has two purposes: first, to review the theoretical and empirical literature related to XBRL adoption incentives, and second, to review the literature related to XBRL adoption consequences. Our research aims to create a foundational knowledge base that will be relevant to different stakeholders including, governments, practitioners, and researchers on the effects of implementing XBRL, as well as the relevance of such theories in explaining XBRL adoption. The current study uses qualitative research methods that includes a review and a synthesis of a variety of archival materials. Papers on XBRL are summarized under two main categories: incentives of XBRL adoption, and its consequences.

The review suggests that the majority of publications are published in the second decade during 2011-2021 period. This result may imply that researchers try to give more answers for regulators, policy makers and standard-setters about issues related to the concrete implementation of XBRL in different contexts and countries. In addition, the current review notices that most of the previous studies that focus on the determinants of XBRL adoption are exploratory and use the qualitative method through surveys and/or interviews. While these studies extend our knowledge about the motivations that push towards the XBRL adoption, future studies could confirm these results with more objective measures. The current study notices that most prior studies focus on a single country, hence future research may use comparative analysis of XBRL adoption in different countries as it may offer a better understanding of the actual use of XBRL in diverse contexts. Further studies should

consider emerging countries, and more particularly GCC countries, where XBRL technology adoption is mandatory and take into account the socio-economic culture of these countries. As a future direction, there is a need of investigation on the role of regulation in improving the use of XBRL and the extent of compliance with XBRL IFRS taxonomy. Future studies may also investigate the potential consequences of XBRL technology on financial reporting quality to give answers for standard-setters and policy makers.

The present study is important to help different stakeholders understand the usefulness of the several theories that have been used in the accounting literature to explain the adoption and consequences of XBRL technology. More research will contribute to this literature as the themes on XBRL adoption are diverse and varied, and there is more room for investigation and discovery concerning XBRL adoption.

This paper is organized as follows: Section 2 presents benefits and challenges of XBRL adoption. Section 3 reports a synthesis of theories used in XBRL adoption studies. The methodology is presented in Section 4. Section 5 presents the results and discussions. Section 6 concludes the paper and suggests directions for future research.

2. Benefits and challenges of XBRL adoption

As one of the top ten technologies in the field of accounting (Borgi & Tawiah, 2022; Liu, 2013), XBRL has attracted the attention of accounting researchers to have a better understanding of its influences for accounting and auditing professionals (Hsieh *et al.*, 2019). It is considered as a promising and innovative research stream which would foster corporate reports in accounting studies (Lombardi & Secundo, 2020). Till 2018, there are approximately 39 countries that adopt XBRL around the world (Borgi & Tawiah, 2022).

The main feature of XBRL is tagging firm data which permits the specific identification and retrieval of individual items of data from reports such as financial statements. It also allows for “the automatic exchange and reliable extraction of financial information across all software formats and technologies, including the Internet” (Xbrl.org White Paper, 2002, 5).

While there are numerous benefits of adopting XBRL, some studies point out several challenges that firms and countries may face (Ball, 2006; Borgi & Tawiah, 2022; Debreceeny *et al.*, 2010; Dhole *et al.*, 2015; Roohani & Zheng, 2013; Sassi *et al.*, 2021). For instance, XBRL allows firms to create their own taxonomy extensions which could lead to a reduction of the comparability between firms, thus removing one of the main objectives of XBRL (Boritz & No, 2008). In fact, Dhole *et al.* (2015) notice that the financial statement comparability of US firms dropped after the

XBRL mandate. Moreover, Chen *et al.* (2018) mention that XBRL adoption has high costs of development and implementation and a greater information processing cost. This result may imply the crucial role of governments to assess the influences, in terms of costs and benefits, before its adoption on a national scale (Borgi & Tawiah, 2022). In addition, regulators and policymakers need to think about improving technological infrastructure before mandating XBRL adoption (Borgi & Tawiah, 2022).

3. A synthesis of theories used in XBRL adoption studies

The decision of XBRL adoption at the macro-level can be explained by two main theories, which are the Technology Acceptance Model (TAM), and the institutional theory (DiMaggio & Powell, 1991). At the micro-level, studies usually refer to the Technological-Organisational-Environmental (TOE) framework.

3.1 The technology acceptance model

Early studies on XBRL typically use TAM (Davis, 1989) as a useful tool to predict the intention to use this new Information Technology (IT). It suggests that there are two main attributes describing whether a new IT will be accepted by potential users: the perceived benefit and the perceived ease of use. So that, the number of users can be anticipated, explained, and increased (Davis, 1989; Papa *et al.*, 2020). Studies dealing with XBRL adoption and referring to the TAM model indicate that both variables are necessary to determine the drivers required for establishing XBRL adoption successfully.

3.2 The institutional theory

Studies on the XBRL generally refer to the institutional theory to explain the drivers and challenges of XBRL adoption in various settings. DiMaggio and Powell (1983) suggest three types of pressures that jurisdictions may face in their institutional environment to explain why they have similar practices:

- The first type is the coercive isomorphism, which refers to the tendency of nations/organisations to exert formal and informal pressures on other nations/organisations to endorse their practices (e.g., in our context, to adopt XBRL). These kinds of pressures may be used by investors, lobby groups, regulators, stock exchanges, accounting standard setters, the World Bank, the International Monetary Fund (IMF), among others;
- The second type is the mimetic isomorphism, which refers to the tendency to imitate other nations/organisations viewed as successful. This type of isomorphism occurs when nations/organisations have the tendency to implement practices and/or systems of other similar and/or more successful nations/organisations;

- Finally, the third type is the normative isomorphism, which refers to the collective values and beliefs that lead to the conformity of thought within institutional environments (DiMaggio & Powell 1983). This type of isomorphism stems primarily from professionalization (e.g., from local and international professional organisations, including the accounting profession) and the level education attainment of a country.

The choice of adopting new technologies such as XBRL is a complex process affected by different drivers. Using other theories may be useful to a better understanding of the drivers that affect the choice of adopting XBRL.

3.3 The technological-organisational-environmental framework

The TOE framework is a valuable tool to analyse the drivers of XBRL adoption at the micro-level. It is developed by DePietro *et al.* (1990) for analysing the reasons behind the adoption of information technology at the micro-level. This framework includes three components of a firm's that may influence the choice of adopting XBRL (Chen, 2012); technological, organisational and environmental factors that affect the decision of the firm of adopting innovation or not (DePietro *et al.*, 1990):

- Technological factors emphasize how perceived features of the technology affect its adoption within entities (e.g., advantages vs costs of adoption);
- Organisational factors define the firm characteristics that may affect the decision of adoption, such as size, structure etc.;
- Environmental factors focus on the surroundings in which the entity operates that may influence the choice of adopting, such as the environmental context and the interaction between government and competitors.

According to Henderson *et al.* (2012), this framework has been continuously utilized to study the decision of technology/innovation adoption in different fields such as open systems adoption (Chau & Tam, 1997), the adoption of e-business (Zhu *et al.*, 2003), the adoption of electronic signature (Chang *et al.*, 2007) and the use of the internet (Mishra *et al.*, 2007). In the XBRL context, Doolin and Troshani (2007) and Henderson *et al.* (2012) refer to the TOE framework to study the drivers of XBRL adoption, and they confirm that it is an adequate and useful basis to examine technological innovation adoption.

4. Research methodology

The current study uses qualitative research methods, which include a review and a synthesis of a variety of archival materials. Papers on XBRL are summarized under two main categories: incentives of XBRL adoption, and its consequences.

I begin by collecting and reviewing relevant academic literature on XBRL adoption with attention to its drivers and consequences. Then, I analyse findings from literature to explain why firms and/or countries decide to adopt XBRL, and what the potential consequences of that adoption are.

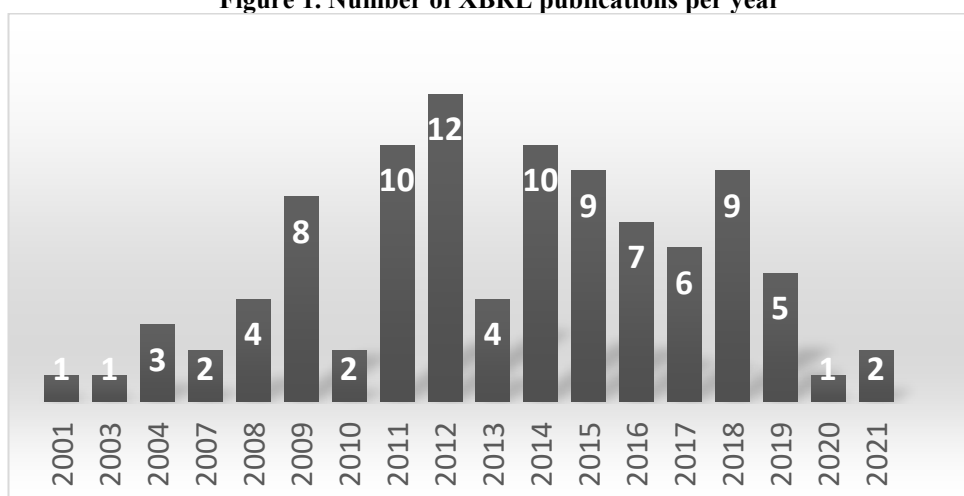
The first search suggests that there are more than 300 research papers on XBRL and this makes it hard to review all allied papers on XBRL. However, as the main goal is to focus on the incentives of adoption and its consequences, I narrow the search to papers that cover these two-stream researches between 2001 and 2022 to include a large sample of XBRL studies. Therefore, I selected papers related to these two topics from Australian ABDC and SCOPUS-ranked accounting journals, as they are the most common used in previous literature review papers (Tawiah, 2019). Following Helden and Uddin (2016) and Tawiah (2019), I enlarge our search through the reference list of selected articles. In fact, I also include papers that includes topics about XBRL adoption.

Following prior literature review studies (Helden & Uddin, 2016; Lombardi & Secundo, 2020; Tawiah, 2019), I review and summarise selected papers focusing on the main findings. After reviewing both research papers, I provide interpretation that forms the basis of my discussions in the next sections.

5. Results and discussions

The present section presents results and discussion about studies that deal with XBRL adoption. Figure 1 reports the sample of the studies that are reviewed.

Figure 1. Number of XBRL publications per year



The sample includes a total publication of 97 papers that explicitly deal with XBRL. Figure 1 shows that the majority of publications are published in the second decade during 2011-2021 period (75 publications which represents 78% of the total sample). This result may imply that researchers try to give more answers for regulators, policy makers and standard-setters about issues related to the concrete implementation of XBRL in different contexts and countries. From this sample, I exclude papers that do not deal with the two main research streams that will be discussed in this study (23 theoretical papers and 4 case studies).

5.1 Incentives of XBRL adoption

From the sampled papers, 28 publications deal with incentives of XBRL adoption at the firm-level (Bartley *et al.*, 2011; Callaghan & Nehmer, 2009; Cordery *et al.*, 2011; Fradeani *et al.*, 2016; Zhou, 2020) or at the country-level (Henderson *et al.*, 2012) or at individual-level (Nel & Steenkamp, 2008). Figure 2 reports the number of publications per journal.

Figure 2. Number of publications of XBRL drivers per journal

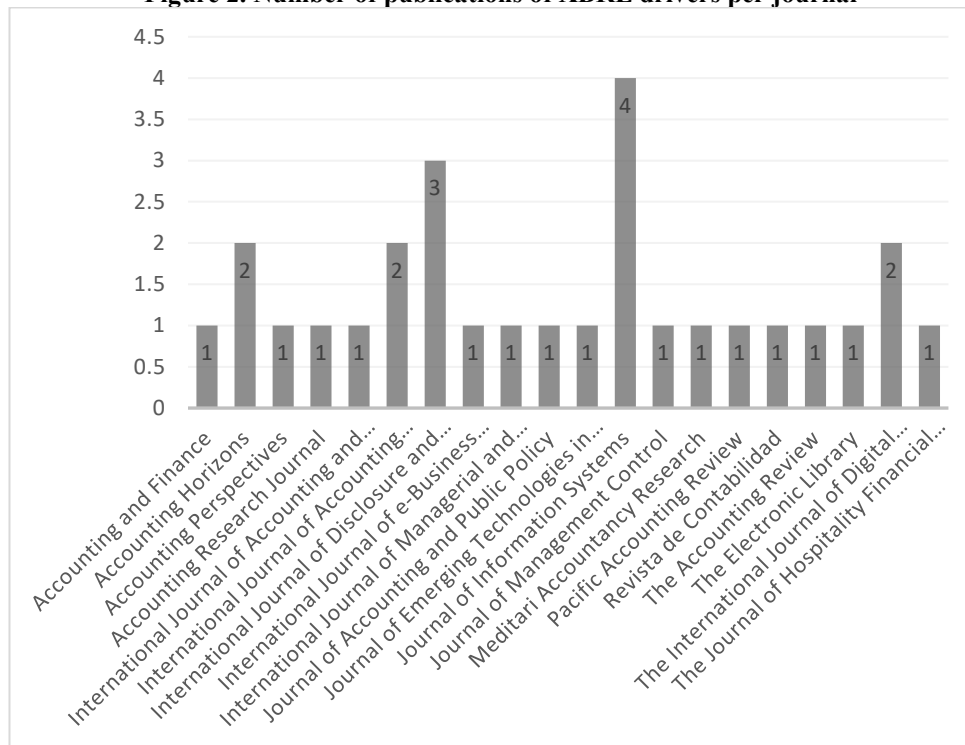


Figure 2 shows that journals related to the accounting field are the most common journals that researchers tend to publish their studies. The content analysis of these

studies suggests that empirical studies that explicitly deal with the determinants of XBRL technology adoption often refer to the theories cited above and use a qualitative research approach, through surveys and/or the use of interviews. For instance, Doolin and Troshani (2007) examine the incentives for adopting XBRL using semi-structured interviews, such as the relative expenditures versus benefits of XBRL adoption, aspects constraining the XBRL adoption, and involvement of the different participants in the spreading of this technology. Participants recognized some traits in line with TOE framework, such as environmental factors and organizational factors. Moreover, Troshani and Rao (2007) examine the factors that affect the XBRL adoption in Australia based on the TOE framework and using a convergent interviewing technique. Their outcomes show that environmental factors (and more particularly, government mandates) and organisational factors (and especially, education and training) influence the adoption of XBRL. The authors also show that technological factors are significant inhibitors to XBRL adoption.

When interviewing senior management, Pinsker and Li (2008) find that adopting XBRL may lead to getting numerous potential benefits such as getting a competitive advantage, having the ability to demonstrate high organizational commitment to innovation, improving the financial reporting transparency, and helping to be more compliant with the requirements of regulators. However, the authors notice that the risks associated with adopting a new technology along with the uncertainty associated with the specification and the regulatory requirements, negatively influence adoption decisions. Pinsker (2008) examines the effect of perceived usefulness and attitude along with absorptive aptitude to affect intention to adopt XBRL. His findings show that intention to use XBRL is positively influenced by perceived usefulness and absorptive capacity. Felden (2011) shows that the support of top management and social groups represent the key determinants of XBRL's adoption in the German context.

At the country-level, Henderson *et al.* (2012) investigate the XBRL adoption using institutional theory through a questionnaire. The authors have 65 participants from 11 countries. The measurement of the different variables is self-reported measures. Their findings show that the determinants of inter-organizational adoption and internal adoption are different from each other. In fact, the relative advantage, considered as a technological variable, is positively associated with XBRL adoption for internal purposes, but not for inter-organizational purposes. Further, normative pressures, considered as an environmental variable is positively related to XBRL adoption for inter-organizational purposes, but not for internal purposes.

Pinsker and Felden (2016) focus on incentives of the voluntary intentions of XBRL adoption in Germany. Their results suggest that professional roles and normative pressures, measured by social networks, are positively linked to the intention of adopting XBRL.

Overall, these studies present common incentives for XBRL technology adoption that are mainly linked to perceptions and expectations related to better financial reporting transparency (Kim *et al.* (2012); better consistency, reliability, accuracy, comparability, and availability of data (Hao *et al.* (2014); higher level of compliance with regulation and less production of misleading reports (Baldwin and trickle, 2011).

While these studies extend our knowledge about the motivations that push towards XBRL adoption, future research may consider the use of more objective measures (Borgi and Tawiah, 2022). In fact, empirical evidence using measures that are more objective is limited such as Premuroso and Bhattacharya (2008) and Borgi and Tawiah (2022). Premuroso and Bhattacharya (2008) investigate entities that voluntarily adopt XBRL and use the Compustat database and annual audited financial statements in the United States of America. They find that XBRL adoption is significantly related to entity's size, corporate governance, and liquidity. Borgi and Tawiah (2022) refer to a larger sample of 175 developed and developing countries over 14 years. They collected data from the World Development Indicators, the Reports on the Observance of Standards and Codes (ROSC) website and the Quality of Government database. Their findings show the important role of the coercive, mimetic and normative pressures in terms of ROSC reports, the extent of accounting globalisation and education. In their additional analysis, they find that coercive pressure is more pronounced in developing countries. However, mimetic pressure is a key driver for all countries regardless of their status as developed or developing.

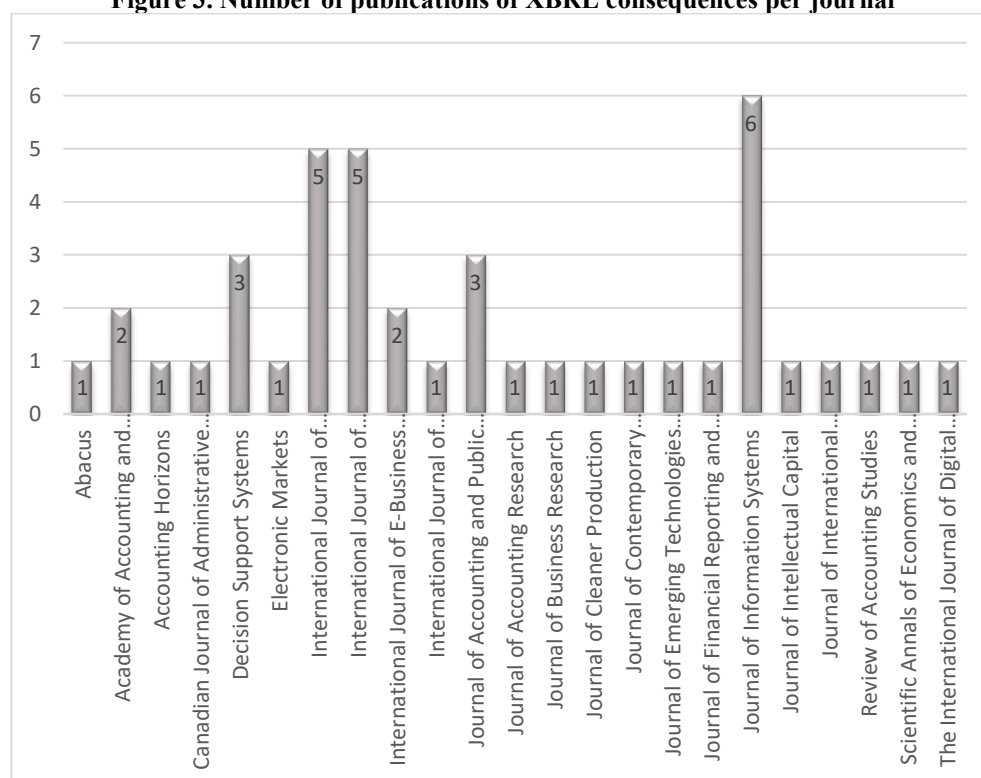
All empirical evidence that explicitly identifies the drivers of XBRL technology adoption focuses on a single-country context, except Borgi and Tawiah (2022) and Henderson *et al.* (2012). Future studies may validate their findings using data from other sources.

5.2 Empirical evidence on the consequences of XBRL adoption

Figure 3 reports the number of publications per journal. It shows that journals related to the accounting field are the most common journals that researchers tend to publish their studies. The content analysis of these studies suggests that empirical studies that explicitly deal with the consequences of XBRL technology adoption often ignore referring to theories and directly measure the potential effects of XBRL technology adoption. For instance, some studies examine the association between XBRL adoption and information asymmetry, such as Yoon *et al.* (2011) who compare the period before and after the mandatory adoption of XBRL in Korea, from December 2006 to August 2007 and from December 2007 to August 2008. Their results show that XBRL reduces information asymmetry in the capital market. In another context, Blankespoor *et al.* (2014) suggest that XBRL adoption may not

reduce information asymmetry during the initial year. In addition, their results show that there is higher abnormal bid–ask spreads, lower abnormal liquidity, and lower abnormal trading volumes for XBRL firms than for others in the United States of America. Further analysis shows that the decline in abnormal trading volume is greater for smaller traders. More recently, Bani-Khalid *et al.* (2021) investigate whether the use of XBRL reduces information symmetry in the presence of knowledge management as a mediating variable In Jordan. The authors use a questionnaire and diffuse it to all employees working at the Jordan Securities Commission (JSC). Their results indicate that the XBRL had significant positive direct effects on knowledge management and information symmetry. They show that there is a partially mediating significant effect of knowledge management between the XBRL and information symmetry.

Figure 3. Number of publications of XBRL consequences per journal



Some other studies investigate the effect of XBRL adoption on firm liquidity and information asymmetry, such as Liu *et al.* (2017) who find that the XBRL adoption is associated with a significant increase in liquidity and a decrease in information asymmetry during the period 2005–2010 in Belgium. More recently, Sassi *et al.* (2021) examine the firm's stock liquidity as a potential positive consequence of the mandatory XBRL adoption through a cross-country study that includes 980 firms

across 13 countries. They show that the mandatory XBRL adoption increases the firm's liquidity and they confirm the advantage of using XBRL. In addition, they provide evidence that the positive effect of XBRL on a firm's stock liquidity is more pronounced in civil law countries than common law countries.

Du and Wu (2018) focus on another line of research that deals with the potential impact of the XBRL mandate on the timeliness of financial reporting in the United States of America. They investigate the 10-K and 10-Q filings from 2007 to 2014 and they find that the SEC's XBRL mandate enhances the timeliness, by a day or two, only for large accelerated and accelerated filers. They do not notice any impact among the smaller ones. Zhou (2020) also confirms that results with reference to 10-K filings from 2007 to 2016. In fact, the researcher finds that the lag decreases for the two types of filers but significantly increases for smaller reporting firms (with considerable growth of the probability of late filing).

Some studies examine the relationship between XBRL adoption and earnings management, such as Kim *et al.* (2012) who investigate whether the use of XBRL reduces earnings management during the period of XBRL implementation by the SEC in the United States of America. They use a sample of mandated XBRL filers and they compare the magnitude of absolute discretionary accruals in the time of applying XBRL. Their findings indicate that absolute discretionary accruals decrease significantly from the pre- to post-XBRL period. This result means that XBRL adoption constrains earnings management via discretionary accrual choices.

To the best of the author's knowledge, all empirical evidence that explicitly examines the potential consequences of XBRL technology adoption focuses on a single-country context except Sassi *et al.* (2021) who focus firm liquidity as a potential positive consequence of the mandatory XBRL adoption through a cross-country study that includes 980 firms across 13 countries. Future studies are needed to validate their findings. Future studies may also investigate the potential consequences of XBRL technology on financial reporting quality to give answers for standard-setters and policy makers. In addition, most of the studies cited above focus on the United States of America and then, developed countries. Future Research may consider other contexts such as emerging countries, and more particularly GCC countries, where XBRL technology adoption is mandatory and taking into account the socioeconomic culture of these countries.

6. Conclusion and directions for future research

The present review of academic literature on XBRL adoption has indicated two main research topics that deal with adopting XBRL technology. These topics include the drivers of XBRL adoption and its potential consequences.

For the first topic that deals with the determinants of XBRL adoption, the decision of XBRL adoption at the macro-level can be mainly justified by two common theories, which are the technology acceptance model (TAM), and the institutional theory (DiMaggio & Powell, 1991). At the micro-level, studies usually refer to the technological-organisational-environmental (TOE) framework.

Most of the previous studies that focus on the determinants of XBRL adoption are exploratory and use the qualitative method. More particularly, they use surveys and/or interviews. While these studies extend our knowledge about the motivations that push towards the XBRL adoption, future studies could confirm these results with more objective measures (Borgi & Tawiah, 2022), such as the use of quantitative information disclosure scores at the firm level rather than surveys and interviews to reduce subjectivity.

As most prior studies focus on a single country, future research may use comparative analysis of XBRL adoption in different countries as it may offer a better understanding of the actual use of XBRL in diverse contexts. The comparative analysis should be promoted as there is a need to know why some jurisdictions have chosen to make it mandatory.

Therefore, future studies may investigate the incentives of XBRL technology at a more macro-level to extend knowledge about the drivers of XBRL adoption across countries. Further studies should consider emerging countries, and more particularly GCC countries, where XBRL technology adoption is mandatory and take into account the socio-economic culture of these countries.

Empirical studies on the role of regulation in improving the use of XBRL and the extent of compliance with XBRL IFRS taxonomy is not studied yet. In fact, the mandatory adoption of XBRL does not promise the corporate compliance level with the requirements. The mechanism for enforcing XBRL has a key role to enhance compliance in practice and the reduction of errors, which will lead to the increase of accuracy and reliability of the disclosed information. I also suggest that researchers focus on the enforcement of XBRL in a specific context to discover how best to ensure compliance.

Overall, the two main streams remain under researched in emerging countries especially in GCC countries, where there is a mandatory XBRL adoption. Therefore, future research should investigate these topics in emerging countries to inform different stakeholders such as regulators, practitioners, and capital markets about the consequences of adopting XBRL and their relevance. Future studies may also investigate the potential consequences of XBRL technology on financial reporting quality to give answers for standard-setters and policy makers.

Further, researchers should use new theories to explain the XBRL adoption and its consequences in different countries and consider the socioeconomic culture of these

contexts. As the topics on XBRL adoption are varied and wide, there is more room for examination and discovery about XBRL adoption, so I expect that more studies will contribute to this literature.

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