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Research paper

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Abstract

We analyzed secondary data from nine studies including a total of 1962 respondents on what motivates web practitioners such as user experience developers, web designers, and web masters' intention to promote accessibility, and what challenges they encounter during accessibility development. In this exploratory study, we adopt the viewpoint of motivation and challenges and aim to study them from intrinsic and extrinsic viewpoints. We then interpreted intrinsic and extrinsic motivators and intrinsic and extrinsic challenges that should be addressed in the management of accessibility work so that the main accessibility milestones become implemented in the design of information technology artifacts. We retrieved recommendations for top management and superiors to gain and support practitioners' motivation and to address challenges in accessibility development to avoid ethical conflict in accessibility development. These findings strengthen an understanding of possible ethical conflicts in accessibility development and help to act responsibly in the accessibility development of information systems.

Keywords: Web accessibility, Web practitioners, Motivation, Challenges.

1 Introduction

During the development of information systems (IS), practitioners such as user experience (UX) developers, web designers, webmasters, and their superiors make several implicit and explicit assumptions and decisions when creating information technology (IT) artifacts (Hirschheim and Klein, 1989). End-users, however, vary vastly in their abilities and the needs that they have are various kinds. Qualifying the IT artifact for accessibility under limited knowledge, time constraints, and budget is challenging which may raise ethical conflicts: According to Baker (2001: 215)**,** 'ethical conflict occurs when people perceive that their duties toward one group are inconsistent'. Nevertheless, ethical values have been described as a fundamental part of IS practice which indicates that human ethical values are inherently embedded in the design of IT artifacts (Chatterjee *et al.*, 2009). After all, practitioners have an obligation to inscribe desirable values in IT artifacts (Chatterjee *et al.*, 2009), which is driven by the motivation behind the creation (Yesilada *et al.*, 2012).

According to Ryan and Deci (2000), factors in human motivation can be divided either to extrinsic motivation or intrinsic motivation. Self-determination theory (SDT) divides motivation into autonomous and controlled motivation (Deci and Ryan, 2008; Ryan and Deci, 2000). Controlled motivation consists of external and introjected regulation. External regulation relates to rewards or punishments and introjected regulation of actions that has been only partially internalized. Taken autonomous motivation it relates to intrinsic motivation that one has integrated or wants to integrate into their sense of self (Deci and Ryan, 2008). Various kinds of motivations lead to different outcomes (Deci and Ryan, 2008). Autonomous motivation is claimed to entail greater psychological health, long-term persistence in health-related behaviors, and more effective performance than controlled motivation (Deci and Ryan, 2008). To simplify, intrinsic motivation refers to interesting or enjoyable actions and extrinsic motivation to actions that lead to separable outcomes (Ryan and Deci, 2000). Taken SDT we argue that division to intrinsic and extrinsic factors in studying motivations in accessibility development contributes by providing structure in the resulted categorizations. In addition, we also argue that the concepts of motivation and challenge are related to each other: Ryan and Deci (2000, p. 54) state that "To be motivated

means to be moved to do something". There are, however, challenges in doing what we are motivated to do. We also argue that studying challenges from the viewpoint of intrinsic vs. extrinsic might reveal barriers or obstacles that are from within (e.g., lack of skills) or from outside (e.g., business values) of actors of accessibility development.

Underlying motivations and challenges have not been well studied in accessibility research of IT artifacts. Therefore, in this exploratory study, we adopt the viewpoint of motivation and challenges and aim to study them from intrinsic and extrinsic viewpoints. We formulated the following research question (RQ) for this study: What are extrinsic and intrinsic motivations and challenges in accessibility development?

To answer the established RQ, we reviewed prior literature that included practitioners' perceptions of accessibility as a sample and extracted data related to our RQ. We then synthesized our findings to answer our research question. The rest of the paper is structured as follows. In the next section, we elaborate theoretical foundations of accessibility. Following that, we present the methods and the review of selected sample studies. Finally, we present the discussion section and concluding remarks.

2 Theoretical Background

Accessibility is defined as a human right (United Nations, 2006) that describes the extent where users, regardless of their limits on human abilities, can use IT artifacts such as applications, user interfaces, and websites (International Organization for Standardization, 2018). IT practitioners are attempting to achieve this extent by implementing accessibility when they are creating IT artifacts for all people to use. The legal obligations of accessibility such as the European Union (EU) directive on the accessibility requirements for products and services lay out requirements for organizations to comply (Directive 2016/2102, 2016). This concerns mostly non-profit organizations but according to the European Accessibility Act, all digital products established in the EU after the year 2025 are required to comply with accessibility requirements (European Commission, 2015). These requirements include web content accessibility guidelines (WCAG) composed by World Wide Web Consortium that should be followed in IT artifact development. WCAG requirements are set to three levels: A (lowest), AA, and AAA (highest) levels (W3C, 2018). It is also notable that the Code of Ethics of the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS) both state:

> 'Technologies and practices should be as inclusive and as accessible as possible, and scholars and computing professionals should take action to avoid creating systems or technologies that disenfranchise or oppress people.'(Association for Computing Machinery, 2022.; Association for Information Systems, 2022.)

2.1 Accessibility Development

Legislation requires compliance with AA level in its regulations, which leaves practitioners to decide if accessibility has been considered enough. However, the fact is that the guidelines cover only around half of the accessibility problems that for instance blind users encounter on websites (Petrie and Kheir, 2007; Yesilada *et al.*, 2015). Designing IT artifacts that cover a maximum amount of accessibility issues involves a mindset of approaches and practices that include several actions that practitioners are expected to make. For example, practitioners should collaborate and involve users with appropriate methods (e.g., participatory design) in the design and evaluation processes to extract and understand users' actual needs (Gerling *et al.*, 2016; Little *et al.*, 2005; Seaborn *et al.*, 2016; Vollenwyder *et al.*, 2019). Practitioners should also comply with laws and regulations related to accessibility and follow the guidelines beyond these regulations (Cairns *et al.*, 2019; Martins *et al.*, 2017). Design outputs should be evaluated against the guidelines (Brajnik *et al.*, 2011; Santana and Baranauskas, 2015). Then, practitioners should design and evaluate the compatibility of IT artifacts with assistive technology such as screen readers (Newman *et al.*, 2017; Pérez *et al.*, 2019; Pérez-Espinosa *et al.*, 2017). Finally, practitioners should consider company policy, time constraints, and budget, as well as their own capability and motivation to act for accessibility (practitioners' knowledge and expertise).

2.2 Related Studies

Having knowledge of the fact that various kinds of motivations lead to different outcomes (Deci and Ryan, 2008), previous studies have investigated factors related to motivation and challenges. For instance, Brewer *et al.* (2016) managed to identify factors related to engagement, Dil *et al.* (2012) inspected factors related to community, and Bui *et al.* (2018) revealed factors related to society. Abuaddous *et al.* (2016) identified challenges related to the use of WCAG, awareness of accessibility, motivation, a lack of training, and the use of appropriate tools and methods. We know that forcing people to adopt accessibility tools and practices does not engage practitioners to develop accessibility in the long term (Yesilada *et al.*, 2012). Moreover, in practice, techniques undertaking Web accessibility represent a promising strategy to improve usability and UX for all user groups (Aizpurua *et al.*, 2016; Vollenwyder *et al.*, 2019) which also fosters user acceptance of a new IT artifact (Davis, 1993; Davis *et al.*, 1989). Eventually, one of the user expectations is that IT artifacts should be satisfying and to able to be performed (Szajna and Scamell, 1993).

Rogerson *et al.* (2017, p. 89) proposed the following principles that describe an ethos of professionalism within IS. (1) "develop a socially responsible culture within work which nurtures moral individual action"; (2) "consider and support the well-being of all stakeholders"; (3) "account for global common values and local cultural differences"; (4) "recognise social responsibility is beyond legal compliance and effective fiscal management"; (5) "ensure all business processes are considered from a social responsibility perspective"; and (6) "be proactive rather than reactive". They purposed these principles for IS practitioners to balance between "rights and justice and care and empathy" (Rogerson *et al.*, 2017, p. 89) to do the right thing and act responsibly. Therefore, understanding the factors related to motivation and challenges is important in the field of IS because these may interfere with the actions that practitioners take when creating systems or technologies.

3 Research Method

We performed a traditional literature review of the empirical studies (Li and Wang, 2018) and reviewed nine sample studies from the literature. We interpreted secondary data on what web practitioners such as UX developers, web designers, and webmasters report about what influences their motivation to promote accessibility (Vollenwyder *et al.*, 2019), and what are their challenges for doing actions toward the development of web accessibility (Lazar *et al.*, 2004). The performed literature search is not comprehensive in nature but aims to include a sample set of studies that in total provide a broad practical view and enables us to narratively describe the factors influencing motivation and the challenges. Study cases in the sample studies included 1962 respondents from practitioners globally.

We performed the literature review in six stages proposed by Li and Wang (2018): (1) *Defining the problem;* (2) *Searching for the literature;* (3) *Selecting studies;* (4) *Reading the literature;* (5) *Organizing the data; and* (6) *Writing up the review.* In the first stage, we formulated the research question. The second stage included the literature search. We used electronic databases that included domain-general databases (Google Scholar), domain-specific databases in Information Systems (AIS eLibrary and ACM digital library), and databases closely-related disciplines (Web of Science and Scopus). In the third stage, we selected a sample of studies that are relevant to our research question and included practitioners' views on what motivates them to develop accessibility and/or what challenges they perceive (see Table 1). To ensure the study quality, we included peer-reviewed articles which are frequently cited or published in journals or conference proceedings with high quality. In the fourth stage, all authors read the sample studies, which were followed by the fifth stage where we used a discrete organization (Li & Wang, 2018) to organize information about each individual study. In the review's final stage, we reported the results of each sample study presented in Section 4.

Paper ref.	Method	N	Participants
(Bi *et al.*, 2021)	Mixed-Methods	380	Web app developers, mobile app developers (Survey N=365), and accessibility designers (Interviews N=15)
(Inal et al., 2020)	Survey	167	UX professionals.
(Joyner et al., 2022)	Survey and interviews	144	Visualization designers, data scientists, academics/teachers, students, data journalists, and hobbyists.
(Kennedy et al., 2011)	Workshops with participants with intellectual disabilities	31	Web designers; Accessibility usability specialist (Creative) director, Design consultant, Digital content producer, Distributor, Information architect, IT coordinator, IT support, Knowledge transfer associate, Learning materials developer, Learning technology advisor, Lecturer, Product development manager, Technology and information manager, Trainer, and Web assistant.
(Lazar *et al.*, 2004)	Survey	175	Webmasters
(Nahon et al., 2012)	Survey	417	Non-professional practitioners of online content (i.e., producing content via blogs, social networking sites, personal websites, or virtual worlds).
(Vollenwyder *et al.*, 2019)	Survey	342	Web practitioners in functional testing, management, project management, development, product owner, and visual design.
(Wentz *et al.*, 2014)	A usability test and an expert inspection	6	Usability evaluators
(Yesilada, et al., 2015)	Survey	300	Consultants, practitioners, researchers, and managers with an interest in accessibility and specialized in Web accessibility, Human Computer Interaction, Software engineering, Design, Computer science, Business, UX.

Table 1. Overview of Sample Studies (Methods, Number of Participants, and Participants Characteristics).

After the review process, with a qualitative content analysis (Zhang and Wildemuth, 2017), we synthesized the extracted items related to the factors that influence practitioners' motivation to implement accessibility, and the challenges in accessibility development that practitioners have encountered. Through the synthesis, we aimed to reach conclusion rather than inspect studies critically (Li and Wang, 2018) to answer our research question.

4 Findings

Participants in a study by Bi et al. (2021) reported challenges in their technical skills, task identification, and in communication with clients. Incorporation of sufficient accessibility features into a system requires technical skills. Accurate plans for the tasks to include accessibility in projects are hard to make because some of the respondents feel that incorporating accessibility means they have less control over their progress toward target completion. Furthermore, the incorporation of accessibility into a system means more communication with clients. Around 30% of survey respondents agree that interacting with outside stakeholders regarding accessibility is difficult because development teams are not adequately trained in the appropriate techniques required to address accessibility in their roles. However, almost every interviewee mentioned that they applied for and followed a set of standards, preliminary Web Content Accessibility Guidelines (WCAG). Practitioners with direct accessibility work experience agree that accessibility should be included in all projects. However, professionals with indirect accessibility work experience perceive accessibility as time-consuming rather than a core task. Bi et al. (2021) recommend that accessibility design should not be an independent activity but included in many development activities from software requirement elicitation to software testing activities. Secondly, accessibility should not be considered to target people with disabilities but to better support all users.

Inal et al. (2020) find out that UX professionals have main challenges in creating accessible systems with limited work time to address accessibility issues, limited knowledge relates to accessibility guidelines and standards, and limited budget. Generally, UX professionals consider accessibility to be important and organisations apply accessibility practices in their projects. The reasons for not considering accessibility issues are indicated by the lack of management support for accessibility because management is seen to be responsible for work time allocation, training, and budget. Therefore Inal et al. (2020) recommend top management and UX managers integrate accessibility practices in the development process systematically.

Joyner et al. (2022) conducted an online survey and interviews with visualization designers. They found uncertainties that respondents see on a personal level, operational level, and organisational level. On a personal level, respondents encounter significant uncertainty regarding when user needs are met sufficiently. Most of them have at least basic knowledge or an intermediate level of accessibility. However, instead of applying their own knowledge, they often refer to WCAG, the company's guidelines or software that check accessibility issues. Most of the respondents did not have any specific target audience in mind when they consider accessibility but many of them target blind users and people with low vision. Some of the respondents stated that they apply accessibility features for other reasons such as using alt attribute for cases when images on a website are not shown properly. Only 2 % of respondents considered other impairments such as hearing, motor, or cognitive impairments. On the operational level, there is an attitude that accessibility should be considered as a regular design task of creating visualization rather than a problem that should be solved. Respondents are willing to expend time and effort to foster accessibility. However, there is uncertainty on how to use the available tools effectively and what are resource constraints by their organizations and clients. Among all participants, accessibility is commonly applied to provide the message presented in the visualization or just for presenting the basic information but not so much for detailed data values and data relations. One-third of the respondents think that accessibility should be included in every project. However, some think that there is no need to make accessibility adjustments for visualization if the associated text contains the same information, the visualization is too complex, or most of the target audience is sighted. A different understanding of accessibility can lead practitioners just to follow guidelines instead of considering and providing efficient accessibility to the target audience. On an organizational level there is an attitude that accessible visualization is better, more robust, and more understandable than visualizations without accessibility considerations. Some of the respondents consider accessibility essential and have accessibility guidelines in use and are responsible for following them. However, around one-third of the respondents stated that accessibility is not a topic in their workplace. Some of them have accessibility guidelines in use, but they perceive that from the company's perspective it does not matter if they do not always follow them. On an organizational level, there are uncertainties about accessibility expectations, who is responsible, and how much time and resources should be allocated to make visualizations accessible.

Kennedy et al. (2011) recruited thirty-one Web designers and practitioners, as well as twenty-nine people with intellectual disabilities, to explore best practices for building an accessible website for the community of intellectual disabilities. They found several barriers that related to the implementation of the guidelines, but the most significant obstacle was the commitment of stakeholders such as line managers, clients, policymakers, copywriters, and decision-makers. Web designers and practitioners reported that without stakeholders' commitment and support for accessibility, they do not have the power to influence changes to implement accessibility for the benefit of the community of intellectual disabilities.

Lazar et al. (2004) reported Webmasters to have the following challenges in creating accessible systems: technical skills, convincing management, and clients of the need for accessibility, and balancing between good graphical design and accessibility. They indicated that webmasters alone cannot solve accessibility issues and it requires that accessibility be incorporated throughout the system development and maintenance lifecycle. The issues relate to lack of time, lack of training, lack of managerial support, lack of client support, inadequate software tools, and confusing accessibility guidelines. Even though most of the respondents supported the concept of accessibility and would consider accessibility when they update their site, some webmasters felt that accessibility practices interferences their web design which is why they would only make websites accessible if the government forced them to. However, in addition

to the government regulations, knowing that users with disabilities were using their websites seemed to be the greatest incentive for webmasters to make their sites accessible.

Nahon et al. (2012) explored non-professional web practitioners' perceptions of accessibility. They found that community context, attitude, and self-efficacy were the most important predictors of intention to produce accessible content. The community strongly influences the intention of non-professional practitioners to produce accessible content. The community creates an environment that promotes accessibility and the rights of people with disabilities in general, which significantly impacts how its members behave when developing web content. Intrinsic motivation (willingness to produce accessible content) and values were the factors that determine non-professional practitioners' attitudes toward accessibility. This attitude refers to designing acts for others rather than themselves. Values refer to the sense of obligation that individuals have for the creation of accessible web content. The sense of value, however, does not assure that this is later transformed into actions. This study revealed that extrinsic motivation (the belief that accessible online content leads to a valued outcome) does not affect the attitude of non-professional practitioners to produce accessible content. Therefore, the actions that non-professional practitioners take to create accessible web content are motivated by willingness, values, and self-actualization.

Vollenwyder et al. (2019) revealed three main salient beliefs that influenced the motivation of web practitioners' intentions to consider accessibility. These are encouragement by users, self-perceptions as specialists, and increased product quality. To gain practitioners' motivation (Vollenwyder *et al.*, 2019) recommended first involving end users with a diverse range of abilities in the development process to provide accessible solutions. Second, to gain practitioners' self-perception as a specialist, their knowledge and skill of how to effectively work on Web Accessibility should be continuously supported. Third, the advances and benefits of Web Accessibility for all users should be emphasized in the development process as a quality improvement so that practitioners are more likely to consider it.

Wentz et al. (2014) inspected the accessibility of Web-based emergency alert sign-ups from 26 counties and municipalities in Massachusetts, New York, and Maryland. They found accessibility violations in 21 of 26 of the alert sign-up processes. Since most software in the alert registration system is from outside vendors, public procurement processes must be used more efficiently to ensure accessibility. Appropriate training in accessibility should be required of decision-makers in emergency preparedness. Vendors must also receive proper training in implementing technical solutions. Wentz et al. (2014) recommended a state-level enforcement mechanism that provides a financial penalty for municipalities in case their documents or technology violate availability.

A study by Yesilada et al. (2015) reveals that respondents do not believe that accessibility is driven by business goals. To half of the respondents, law enforcement is the main motivator to adopt accessibility. Therefore, training on WCAG is helpful. However, according to respondents with more technical backgrounds, they are not in favor of relying on WCAG alone. Respondents unanimously see accessibility as a subjective quality that can be achieved through a user-centered design process, that is guidelines are not sufficient alone. "Accessibility testing should rely on user testing in order to obtain more valid and reliable results" (Yesilada et al., 2015: 130). Most of the respondents, particularly people with technical backgrounds, see that accessibility benefits not only people with disabilities but all users. It is a subset of UX for all people.

5 Synthesis

Motivators and challenges for developing accessibility can be identified from the sample studies. First, the motivators and challenges that practitioners encounter in accessibility development can be divided into intrinsic motivators and extrinsic motivators (Table 2). Intrinsic motivators are those thoughts and values that practitioners personally have, and which vary depending on the individual. Extrinsic motivators are those which influence practitioners' thoughts and work expectations, and which vary depending on the context (e.g., company policies). Intrinsic challenges are those that practitioners may encounter on a personal level. Extrinsic challenges are those composed or influenced by external factors or behavior.

Intrinsic Motivators		
Name	Examples of Coded Items	Reference
Personal motivation and attitude	"Personal motivation appeared as the most popular reason among the respondents."	(Nahon *et al.*, 2012, p. 1749)
Self-perceptions as a specialists	"Web Accessibility is considered as part of ones role as a web specialist."	(Vollenwyder *et al.*, 2019, p. 354)
Self-efficacy	"...self-efficacy were the most important predictors of intention to produce accessible content."	(Nahon et al.,2012)
Improved product quality	"In turn, the salient beliefs product quality and user advocacy had the strongest influence on attitude."	(Vollenwyder *et al.*, 2019, p. 356)
	"…people consider accessibility as a quality that should be included in the design process…"	(Yesilada *et al.*, 2015, p. 130)
Improved company reputation	"Organization gains good reputation by following ethical and social responsibility principles."	(Inal *et al.*, 2020, p. 7)
Knowing that users with disabilities are using their websites	"Knowing that a significant portion of my user population has visual impairment would be most influential."	(Lazar *et al.*, 2004, p. 281)
Knowing that accessibility benefits not only people with disabilities but all users	"The view that accessibility only benefits people with disabilities is not shared by the majority…"	(Yesilada *et al.*, 2015, p. 129)
Extrinsic Motivators		
Requirements by the law	"…20 respondents indicated that government requirements would influence them the most…"	(Lazar *et al.*, 2004, p. 281)
	"…for half of the respondents law enforcement may be more persuasive than successful business cases."	(Yesilada *et al.*, 2015, p. 131)
Requirements by the company or client	"…outside pressure from management or clients would influence them…"	(Lazar *et al.*, 2004, p. 281)
Influence by internal and/or external community	"The community influences intention to produce accessible content through its apparatuses, symbols, language and narratives."	(Nahon *et al.*, 2012, p. 1754)
Encouragement by users	"User advocacy emerged as the most important salient belief, influencing the formation of attitude as well as subjective norm regarding the consideration of Web Accessibility."	(Vollenwyder *et al.*, 2019, p. 356)
	"There is unanimous view on the fact that accessibility can be achieved through a user-centred design process…"	(Yesilada *et al.*, 2015, p. 130)
Business pressure	"…business pressures were reported by some respondents to motivate practitioners to achieve short-term goals rather than the longer-term or indirectly profitable work of accessibility."	(Bi *et al.*, 2021, p. 13)
Attitude in the organization	"Accessible visualizations are also often described as 'better,' more robust, and understandable for sighted users as well."	(Joyner *et al.*, 2022, p. 16)

Table 2. Intrinsic and Extrinsic Motivators Identified from the Sample Studies.

Intrinsic motivators include *personal motivation and attitude; self-perception as a specialist; self-efficacy; improved product quality; improved company reputation; knowing that the target users included people with disabilities;* and *knowing that accessibility benefits all.* Personal motivation contains the interest and attitude that accessibility is a good thing, and it is something that I want to do (Inal *et al.*,

2020; Nahon *et al.*, 2012). Accessibility can be seen ethically as a human responsibility to support equality (Inal *et al.*, 2020; Joyner *et al.*, 2022). Personal motivation reveals individuals thinking and intentions to implement accessibility. Experience, skills, and knowledge of the practices improve self-efficacy through which practitioners identify themselves as a specialist which motivates them to implement accessibility. Improved product quality, company reputation, and perceived benefits for all include consequentialist thinking to improve product quality by applying accessibility which will have benefits for all users, and will thus reach more people (Bi *et al.*, 2021; Inal *et al.*, 2020; Vollenwyder *et al.*, 2019; Yesilada *et al.*, 2015). These reasons are intentionally aimed for the actions that have a hedonistic consequentialist benefit to the widest number of people regardless of their abilities. There were also ideas that accessibility could be used as a competitive functionality (Bi *et al.*, 2021) which also reveals the thinking that there is a competition that gives input that makes practitioners feel that they have a duty, and they should apply accessibility. Practitioners also think that by applying accessibility the company's reputation will improve responsibility (Inal *et al.*, 2020). Knowing that the target users included people with disabilities is a factor that can be perceived from two ethical perspectives. First, it can be concluded that practitioners feel social pressure from others and therefore consider the inclusion of users as a duty (Inal *et al.*, 2020; Vollenwyder *et al.*, 2019). Second, this factor refers to the extent to which practitioners emphasize users with disabilities (Joyner *et al.*, 2022; Lazar *et al.*, 2004).

Extrinsic motivators include *requirements by the law; requirements by the company or client; influence by internal and/or external community*; *encouragement by users*; *business pressure;* and *attitude in the organization*. Requirements by the legislation such as complying with WCAG guidelines are many times the factor that influences practitioners most (Inal *et al.*, 2020; Lazar *et al.*, 2004; Yesilada *et al.*, 2015). A similar perception is felt when company management or clients state accessibility requirements thus placing pressure (Inal *et al.*, 2020; Lazar *et al.*, 2004). All these factors are caused by certain rules that make practitioners feel that they have a duty and that they should act accordingly. The influence of the internal and/or external community refers to the developer's membership in the community of related topics and how the developer perceives expectations from the community to promote accessibility. This is interpreted as extrinsic input that causes the feeling of duty. This factor is, however, caused by an individual's own choice to join a community and therefore cannot be generalized. Like the influence of company policy, practitioners perceive business pressure that can influence practitioners to target short-term goals rather than the long-term work of accessibility (Bi *et al.*, 2021).

There are also motivators that can be interpreted as intrinsic as well as extrinsic factors because they refer to the role that practitioners feel they have. For example, the sense that accessibility is a part of practitioners' role can be personally perceived by practitioners themselves (Bi *et al.*, 2021; Joyner *et al.*, 2022; Vollenwyder *et al.*, 2019). On the other hand, they may believe that the role and position that they represent include an expectation and responsibility to act toward accessibility which refers to a duty.

Next, we identified a set of intrinsic and extrinsic challenges that practitioners encounter in the development of accessibility (see Table 3.)

Intrinsic Challenges		
Name	Examples of Coded Items	Reference
Lack of technical skills	"Webmasters cited challenges to accessibility such as technical challenges…"	(Lazar *et al.*, 2004, p. 282)
	"…interviewees noted that developing an application incorporating a range of accessibility presents distinct technical challenges."	(Bi *et al.*, 2021, p. 9)
Limited knowledge related to accessibility guidelines and standards such as WCAG	"…the participants had low level of knowledge about accessibility guidelines and standards."	(Inal *et al.*, 2020, p. 8)
	"…confusing accessibility guidelines."	(Lazar *et al.*, 2004, p. 284)
	"In one of the workshops, in response to an ad hoc question about whether participants felt they	(Kennedy *et al.*, 2011, p. 33)

	understood the guidelines, only one participant confirmed that he did."	
How to use available accessibility tools effectively	"…they still face difficulties related to the limitations of the tools they use…"	(Joyner *et al.*, 2022, p. 15)
Balancing between good graphical design and accessibility	"…respondents mentioned the challenge of balancing accessibility and graphical design…"	(Lazar *et al.*, 2004, p. 279)
Task identification	"…it is harder to make an accurate plan for incorporating accessibility into projects…"	(Bi *et al.*, 2021, p. 19)
Supposition that accessibility interferences the web design	"…did not like the interference in ''their'' web design, and would only make web sites accessible if the government forced them to."	(Lazar *et al.*, 2004, p. 284)
Uncertainty when user needs are met sufficiently	"On a personal level, there is significant uncertainty regarding when user needs are met sufficiently."	(Joyner *et al.*, 2022, p. 15)
Extrinsic Challenges		
Convincing management and clients of the need for accessibility	"…respondents mentioned the challenge of convincing clients and management of the importance of accessibility…"	(Lazar *et al.*, 2004, p. 279)
Incorporating accessibility throughout the system development and maintenance lifecycle	"…accessibility is a group goal, that webmasters alone cannot solve the problem, and that accessibility must be incorporated throughout the development and maintenance lifecycle."	(Lazar *et al.*, 2004, p. 282)
Limited work time	"We found that the most reported challenges in creating an accessible system were related to time constraints, lack of training, and cost constraints."	(Inal *et al.*, 2020, p. 10)
Limited budget	same as above	(Inal *et al.*, 2020, p. 10)
Uncertainty of the resource constraints by their organizations and clients	same as above	(Inal *et al.*, 2020, p. 10)
	"On an organizational level, there is often uncertainty on the expectations and responsibilities and the time and resources that can be allocated to making visualizations accessible."	(Joyner *et al.*, 2022, p. 16)
	"…cited roadblocks to accessibility such as lack of time…"	(Lazar *et al.*, 2004, p. 284)
Communication with clients	"…accessibility requirement elicitation is hard due to the vague requests from the clients or vague documentation."	(Bi *et al.*, 2021, p. 11)
Supposition that the company does not care if accessibility guidelines are always followed	"…the respondents said that they do have accessibility guidelines, but it does not matter too much if they do not always follow them."	(Joyner *et al.*, 2022, p. 10)
Uncertainty of the commitment of other stakeholders	"Consequently, it is necessary to engage with a more diverse range of stakeholders—line managers, copywriters, policymakers—to make ID [Intellectual Disability] accessibility a reality."	(Kennedy *et al.*, 2011, p. 38)
Uncertainty of the expectations and responsibilities	"On an organizational level, there is often uncertainty on the expectations…"	(Joyner *et al.*, 2022, p. 16)

Table 3. Intrinsic and Extrinsic Challenges Identified from the Sample Studies.

Intrinsic challenges include *lack of technical skills*, *limited knowledge relates to accessibility guidelines and standards such as WCAG; how to use available accessibility tools effectively; balancing between good graphical design and accessibility; task identification; a supposition that accessibility*

interferences the web design; and *uncertainty when user needs are met sufficiently.* Respondents in sample studies emphasized issues related to a lack of technical skill on how to implement accessibility in practice, how to follow guidelines that the law requires, and how to use available tools effectively (Bi *et al.*, 2021; Inal *et al.*, 2020; Joyner *et al.*, 2022; Kennedy *et al.*, 2011; Lazar *et al.*, 2004; Yesilada *et al.*, 2015). The overall attitude among respondents in sample studies however revealed that practitioners are eager to implement accessibility, but they need support and training for that. We also identified thoughts that accessibility may interfere with the design and some of the practitioners struggle between graphical design and accessibility. These thoughts refer to difficulties in identifying the tasks of what should be done, what are the expectations from the IT artifact, and when user needs are met.

Extrinsic challenges include *convincing management and clients of the need for accessibility; incorporating accessibility throughout the system development and maintenance lifecycle; limited work time; limited budget; communication with clients; uncertainty of the resource constraints by their organizations and clients; supposition that the company does not care if accessibility guidelines are always followed; uncertainty of the commitment of other stakeholders;* and *uncertainty of the expectations and responsibilities.* According to Kennedy *et al.* (2011) and Lazar *et al.* (2004), one of the most significant challenges for practitioners in accessibility development is to convince the importance of accessibility to managers and clients. The development of accessibility is seen as a process that should be covered throughout to system development lifecycle cooperating with other stakeholders. Practitioners also encounter practical challenges that are related to limited time and budget or uncertainties of what available resources exist.

6 Discussion

This paper collates and illustrates the motivators and challenges that influence practitioners' intentions to implement accessibility. The second contribution is that this work collated the main reasons and factors that influence practitioners' intentions to promote accessibility which can be divided into intrinsically and extrinsically influencing motivators. Intrinsic and extrinsic motivators are important to understand because ethical conflict may occur in the relationship between them. If extrinsic factors such as requirements by the law and/or orders by managers, etc., are perceived as inconsistent or inadequate towards one motivator that is prioritized by the intrinsic reasons of the practitioners it may cause an ethical conflict. Third, this study provides recommendations for management to improve and ensure the realization of accessibility in IT development chains.

Based on intrinsic and extrinsic motivators and challenges identified from sample studies, we retrieved the following recommendations for top management and superiors to support practitioners' motivation and address challenges in accessibility development: **(1) To support practitioners' intrinsic motivation** involve end users with a diverse range of abilities in the development process (Lazar *et al.*, 2004; Vollenwyder *et al.*, 2019; Yesilada *et al.*, 2015). **(2) To address practitioners' intrinsic challenges** provide sufficient software tools (Joyner *et al.*, 2022; Lazar *et al.*, 2004; Yesilada *et al.*, 2015), and provide training to improve knowledge and skills to implement accessibility including the following areas (Inal *et al.*, 2020; Lazar *et al.*, 2004; Vollenwyder *et al.*, 2019): Effects of accessibility practices for web design (graphical design and integration) (Lazar *et al.*, 2004); The use of accessibility guidelines and standards (Inal *et al.*, 2020; Joyner *et al.*, 2022; Kennedy *et al.*, 2011; Lazar *et al.*, 2004; Yesilada *et al.*, 2015); Advances, quality improvements, and benefits of accessibility for all users (Bi *et al.*, 2021; Vollenwyder *et al.*, 2019; Yesilada *et al.*, 2015); Technical skills (Bi *et al.*, 2021); Communication skills (with participants in user participatory design, and clients) (Bi *et al.*, 2021); and Task identification (The target of accessibility implementation) (Bi *et al.*, 2021). **(3) To support practitioners' extrinsic motivators,** encourage and support practitioners' participation in accessibility-related communities (Nahon *et al.*, 2012), and integrate accessibility practices in the system development and maintenance lifecycle systematically (Bi *et al.*, 2021; Inal *et al.*, 2020; Lazar *et al.*, 2004). **(4) To address practitioners' extrinsic challenges** allocate but also define resource constraints for work time and budget (Inal *et al.*, 2020; Joyner *et al.*, 2022; Yesilada *et al.*, 2015); Engage stakeholders such as vendors, clients,

policymakers, copywriters, and decision-makers to implement accessibility (Kennedy *et al.*, 2011; Wentz *et al.*, 2014); and Define expectations and responsibilities (Joyner *et al.*, 2022).

Comparing the recommendations proposed in the present study to ethical principles proposed by (Rogerson *et al.*, 2017, p. 89), the following adaptations for accessibility development can be identified. The ethos of IS professionalism can be converted to the ethos of accessibility professionalism with the following adaptions: Involvement of users with and without disabilities in the projects to create not just efficient outcomes but also develop the company's social responsibility to act towards work and products which are not oppressing people (Vollenwyder *et al.*, 2019) - cf. "develop a socially responsible culture within work which nurtures moral individual action" (Rogerson et al., 2017: 89). Supporting of well-being of all stakeholders included in accessibility design processes can be achieved by engaging stakeholders and communicating constraints related to the time and budget transparently (Inal *et al.*, 2020) – cf. "consider and support the well-being of all stakeholders" (Rogerson et al., 2017: 89). Encouragement to account for global common values of human equality and to consider local cultural differences to parallel the covering of user requirements – cf. "account for global common values and local cultural differences" (Rogerson et al., 2017: 89). Compliment with laws and recognizing accessibility as a social responsibility that is beyond legal compliance and effective fiscal management – cf. "recognize social responsibility is beyond legal compliance and effective fiscal management" (Rogerson et al., 2017: 89). Ensure of all accessibility processes, not just design or testing are considered from a social responsibility perspective that is the focus of user groups including all user groups – cf. "ensure all business processes are considered from a social responsibility perspective" (Rogerson et al., 2017: 89).Training and support to complement the knowledge of corresponding actors relating to accessibility practices, collaboration with users, and laws are provided – cf. "be proactive rather than reactive" (Rogerson et al., 2017: 89).

These recommendations take a step towards a hypothetical agreement between society and the persons of the company (social contract) as this agreement addresses expectations and obligations between the parties and aims to avoid ethical conflict in accessibility development. These findings reveal that there could be contradictions between expectations and acts that practitioners are expected to do and what they are willing to do, which indicates the lack of a social contract. Therefore, based on identified motivators and challenges, the need for a social contract can be justified. These motivators and challenges retrieved from the previous studies can be considered as initial building blocks of a social contract that future research should examine empirically with practitioners. We suggest design science research as an approach to consolidate the research knowledge base related to motivators and challenges and practice to develop iteratively principles for a social contract in accessibility development. Therefore, we suggest the following questions for future research: How can a social contract in accessibility development be achieved? (Relate to process), and secondly, which components should be included in the social contract in accessibility development? (Relate to features of the social contract).

7 Conclusions

Practitioners have intrinsic and extrinsic motivators and challenges that influence their intention to implement accessibility. **Intrinsic motivators** include factors such as *personal motivation*; *perceived benefits for all*; *improved product quality and company reputation*; and *knowing that the target users included people with disabilities.* **Extrinsic motivators** include factors such as *requirements by the legislation*; *requirements by company or client*; *influence of external community*; and *business pressure*. **Intrinsic challenges** include factors such as *lack of technical skills*; *limited knowledge relates to accessibility guidelines and standards such as WCAG*; *how to use available accessibility tools effectively*; *balancing between good graphical design and accessibility*; *task identification*; *supposition that accessibility interferences the web design*; and *uncertainty when user needs are met sufficiently.* **Extrinsic challenges** include factors such as *convincing management and clients of the need for accessibility*; *incorporating accessibility throughout the system development and maintenance lifecycle*; *limited work time*; *limited budget*; *communication with clients*; *uncertainty of the resource constraints by their organizations and clients*; *supposition that the company does not care if accessibility guidelines are always*

followed; *uncertainty of the commitment of other stakeholders*; and *uncertainty of the expectations and responsibilities.*

Ethical conflict may occur in the relationship between intrinsic and extrinsic motivators and challenges. This study illustrates practitioners' motivators and challenges in the development of accessibility and proposes recommendations intended for top management and superiors to gain support for practitioners' motivation and to address challenges in accessibility development to avoid ethical conflict. This study argues that there is relevance and a need for consideration to encompass an ethical approach in the management of accessibility so that the main accessibility milestones become implemented in the design.

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