An Analysis of the Actors of the Internet: The Push for a Coordinated System to Create a More Accessible Web

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Introduction

Internet access was amended as a human right into Article 19 of the United Nation's Universal Declaration of Human Rights (UN Human Rights Council, 2016). The internet is a commodity whose use is only growing as it becomes increasingly integrated into everyday life (Palmer & Palmer, 2018, p. 399; U.S. Census Bureau, 2018, p. 3). However, accessibility to the internet is limited by many factors like geographical location, socioeconomic status, or even age demographics (U.S. Census Bureau, 2018, pp. 7-8). An often overlooked factor that keeps people from internet access is disability status. According to a report by the U.S. Census Bureau (2018) about internet and computer usage:

> Households in which at least one member had a … disability owned any sort of computer device about 84 percent of the time, while households with no members who had a disability owned some sort of computer device about 94 percent of the time. (p. 7)

Furthermore, even should those with disabilities have access to the internet, the web—the content on the internet—lacks accessibility. In a report commissioned by the United Nations, Nomensa (2006) found that "[o]f the 100 homepages evaluated during the audit, just three websites achieved Single-A accessibility status under [the Web Content Accessibility Guidelines (WCAG)]" (p. 7). Single-A refers to the is the minimum level of conformance for accessibility according to the WCAG, which will be elaborated on later in this paper (World Wide Web Consortium, 2018, sec. 5.2.1). This statistic has not improved 15 years later. An examination by WebAIM (2021) of the million most popular websites found that 97.4% had some detected failure. Not only are households with an individual that has a disability 10% less likely to have a computer, should they use it, it is likely that they will encounter design barriers. This problem of a lack of accessibility will only grow as internet usage rises (U.S. Census Bureau, 2018, p. 3).

Individuals with disabilities will be barred from both critical and non-critical services such as medical services or educational resources (Alajarmeh, 2021; Erikson et al., 2013).

This paper examines the system surrounding web accessibility. I analyze the system using actor-network theory and the power in translation model to derive the motivation and barriers for the actors. This analysis highlights the shortcomings and lack of coordination within the system which has led to the current state of web accessibility. In this paper, I argue that the actors in the problem domain of web accessibility are in suboptimal roles which inhibit the goal of the system to foster accessibility in the web.

Part I: Who is Responsible for the Internet

The internet is not the creation of a single person, or even the creation of a single organization. There are multiple actors that contribute to the growth, development, and use of the internet. It is the action of these actors that shape and build the web. I believe the most important contributors to the internet are: law making bodies, regulatory bodies, companies, web developers, internal technology, external technology, and individuals with disabilities. Table 1 provides a summary of the current roles, obstacles, and motivations for these actors that contribute to the web.

Actor	Role	Primary Obstacle	Motivation
Law Making Bodies	Make disability legislation	Law is too broad to be specific	Protect the interests of the people
Regulatory Bodies	Make disability regulation	Do not have legal power	Make a more accessible web
Companies	Provide good/ service	Products are not accessible	Money
Web Developers	Develop company products	Conflict in priorities in development	Money
Internal Technology	Aid web developers	Lack of consistent use	Aid web development
External Technology	Aid accessibility	Inconsistency	Make things more accessible
People with Disabilities	None	Ignored	Accessible web

Table 1: A overview of the roles, primary obstacles, and motivations of the actors that contribute to the web. (created by author).

- **Law Making Bodies**: I am specifically referring to the United States (US) government. The US government makes laws to protect the rights and freedoms of its citizens, this includes legislation that expresses the need for goods and services to be accessible for those with disabilities (Moroney, 2021; p. 1585; Palmer & Palmer, 2018, pp. 403-405; UN Human Rights Council, 2016). In relation to web accessibility, Section 508 of the Rehabilitation Act is the amendment to the Rehabilitation Act that "mandates the use of accessible technologies and accessible online materials by federal agencies" (Palmer & Palmer, 2018, p. 404). However, there are shortcomings. Section 508 only applies on the federal level meaning it has no power against non-federal, domestic websites (Palmer & Palmer, 2018, p. 404). Legislation is also made by lawmakers with limited input from those which the legislation seeks to benefit (Moroney, 2021, p. 1584). Specific sweeping legislation is near impossible to make due to the diversity in needs to accommodate

different disabilities, some of these accommodations may also be contradictory (Ellcessor, 2010, p. 302; Erikson et al., 2013, p. 875). For example, in participant feedback from a study conducted by Erikson et al. (2013) found that:

> [D]esign solutions considered useful or helpful for one participant group are not necessarily helpful for all groups. . . . Opinions about what constitutes a good site also varied within user groups. Features that some users with learning disabilities found beneficial were not considered beneficial by others (p. 875).

- **Regulatory Bodies**: I am specifically referring to the World Wide Web Consortium (W3C). The W3C is an international organization that has created the Web Content Accessibility Guidelines (WCAG) which "defines how to make Web content more accessible to people with disabilities" (W3C, 2018, sec. 0.1). In other words, the WCAG gives clear guidance for best design and coding practices in order to make more accessible systems (W3C, 2018). As stated in the introduction, the WCAG also outlines these best practices on a scale of accessibility conformance ranging from Level A to Level AAA (W3C, 2018, sec. 5.2.1). Unlike law making bodies, due to it simply being regulation, it has no legal power by itself, at least in the US (Moroney, 2018, p. 1589).
- **Companies**: The term "companies" is referring to any sort of organization that has and maintains some sort of web presence like a school website or online shopping service. They oversee production of the product and seek to protect their image. Corporate social responsibility (CSR) is "the notion that organizations behave in a socially responsible manner to benefit the community" (Katerattanakul et al., 2014, p. 164). A study conducted by Katerattanakul et al. (2014) about what effect web accessibility certification would have on CSR, found that "recognition of the web accessibility certification marks

posted on websites can lead to more positive perceptions of companies' CSR" (p. 170).

This means that a company that promotes an accessible website leads to more positive

perceptions about its CSR and, as a result, the company itself. Not just that it would

benefit their image, but it could also better protect them legally. Due to not having strict

accessibility legislation, determining the accessibility of a company' website is a legal

headache for companies to navigate (Moroney, 2021, pp. 1598-1599).

- **Web Developers**: They are the creators of content seen on the web. They have the ethical
  standard of "consider[ing] whether the results of their efforts will … be broadly
  accessible" that they have to upload as members of the profession and themselves as
  professionals (Association for Computing Machinery, 2018, sec. 1.1). However,
  accessibility is often overlooked for other factors deemed higher priority. This goes back
  to myths in early web development that have been perpetuated to give the impression that
  accessibility is something able to be overlooked (Ellcessor, 2014, 452). These myths are
  that web accessibility is something that compromises the aesthetics of a website, is too
  costly, and does not benefit a significant number of people to be worth the effort
  (Ellcessor, 2014, pp. 453-545). Whether consciously or not, web developers have been
  operating under these myths which has impacted their agency for accessible design.

- **Internal Technology**: These are web development languages, software, or features built
  into existing languages or software used to enhance web development and may include
  features to foster accessibility. Internal technologies include things such as HyperText
  Markup Language (HTML) which defines the structure of a website, it is what the web
  browser interprets to correctly display the webpage (W3C, 2018). There are features of
  HTML designed to make a webpage more accessible like alt text which is text that is

displayed when the picture cannot be seen (W3C, 2018, sec. 1.1). These features are often not utilized to their full capacity either due to negligence or unawareness (Erikson et al., 2013, pp. 869-870).

- **External Technology**: These are stand-alone technologies to foster accessibility. Technologies like screen readers—software that reads out the content of the screen which are used by the visually impaired—and accessibility validators—software that looks at the underlying code and compares it to accessibility standards, most commonly the WCAG—are examples of external technologies (Michalska et al., 2014). External technologies, particularly screen readers, lack standardization, so designing to accommodate screen reading technology is difficult without knowing how it may interpret the code (Michalska et al., 2014, p. 997). External technologies also suffer because they can only look at the underlying code and make binary judgements, this is a particular problem with validators (Michalska et al., 2014). Ambiguous situations might be judged incorrectly due to technology simply not having the discerning eye of a person (Erikson et al., 2013, p. 874). Figure 1 displays ANDI, an automated testing application, making note of an ambiguous situation that it cannot verify.
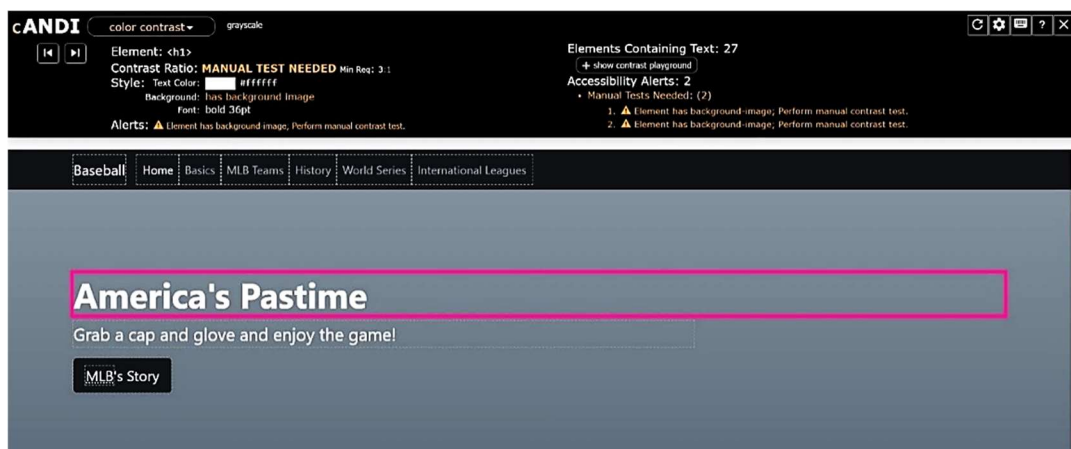

Figure 1: A screenshot showing ANDI, an automated testing tool, judging the color contrast between the text "America's Pastime" and the background. The header at the top says "MANUAL TEST NEEDED" meaning that ANDI cannot make an accurate judgement (created by author).

- **Individuals with Disabilities**: These are the people who bear the burden of other actors'

  shortcomings. They are both the most important and least powerful actor of the system.

The system, as it is, is not working at full capacity. There are flaws both inherent with the

actors and with the roles they are positioned to play. Examining the actors through the lens of

actor-network theory and the power in translation model can highlight the shortcomings in the

system. Furthermore, by knowing the weak points of the system, where the best spots for

improvement are will be made clear as well.

Part II: Stanforth, Actor Network Theory, and Power in Translation to Analyze the System

Surrounding the Internet

Stanforth (2006) provides an analysis of the sociotechnical system surrounding the

implementation of e-government in developing countries through the lens of actor-network

theory (ANT) and the power in translation model. Stanforth does this to garner a deeper

understanding about why systems fail and what might be done to prevent failure (Stanforth,

2006). This framework is effective at determining how to find and remediate points of failure of

a sociotechnical system in order to make a more robust network.

What is actor-network theory?

Actor-network theory (ANT) captures the interplay between the human and non-human

actors in a network. Developed by Michel Callon, Bruno Latour, and John Law, ANT was

unique in how it treated technical artifacts not as a product of technological determinism and

independent from the network, but like any other actor (Stanforth, 2006, p. 38). The actors in a

network are neither static constituents nor wholly products of the network; rather, actors are both

shape and are shaped by the network in which they exist. ANT makes no assumption about

inherent concrete structure for networks (Stanforth, 2006, p. 39). The nature of networks is one

of a fluid process that undergoes iteration and remediation as the network grows and power shifts between actors.

What is power in translation?

Power, in relation to ANT, is relative. To simply have power but not do anything with it makes one powerless; it is when one exerts power over others causing them to act that one has power (Latour, 1986, as cited in Stanforth, 2006, p. 39). Power is the consequence of collective action by multiple actors. However, power is attributed to one actor rather than the collective.

The translation model of power holds that power is not the property of a single actor but as a result of the many actors who shape it to their objectives. The powerful are not those who hold power, but those who can bring structure to the network (Callon, 1986, as cited in Stanforth, 2006). The translation of model power also describes how the few are able to represent the many silent actors in a system; the few have organized the network to their will and, as such, they have established themselves as the voice of the network. Stanforth (2006) examines Callon's (1986) paper on how researchers implemented conservation efforts in Saint Brieuc Bay's scallop fishing industry by becoming principal actors in the network. The process involved four moments; Figure 2 displays the impact of these moments of translation:

- **Problematization**: The principal actors (the researchers) assert their importance in the network by defining the problem and finding mutual agreement on a path of progress (their research program). The researchers also divided the other actors (fisherman, scallops, and the scientific community) into global networks—facilitate the operations of the local networks—and local networks—implementors of the projects.

- **Interessement**: The researchers place themselves as an obligatory point of passage (OPP) between the global and local networks. This means that the researchers oversee interaction between the local and global networks.

- **Enrollment**: the researchers defined roles the in the network and assign actors to play them. The researchers also define the relationships between actors in their roles within the local and global networks.

- **Mobilization**: The researchers used force of allies to step into the role of spokesperson for the network.

Having a principal actor to structure the network and an OOP that mobilizes the global and local networks is crucial to the success of the system. Without such, the actors in the system are prone to becoming uncoordinated and disjoint from one another.

Figure 2: A visual summary of translation in action from Callon's work with the Saint Brieuc Bay's scallop fishing industry. The researchers are shown as the principal actor and obligatory point of passage in the network. Presented are the actors, their obstacles, and their goals as defined by the principal actor (Callon 1986, as cited in Stanforth, 2006, p. 40).

Applying the power in translation model to web accessibility

The framework is well suited to the problem domain of web accessibility due to the eclectic nature of the actors within the network. In Part I, the actors of the network were

identified: law making bodies, regulatory bodies, companies, web developers, internal

technologies, external technologies, and people with disabilities. From this, the power in

translation model can be applied in order to bring structure to the network and, in theory, lead to

a more effective system at fostering accessibility in the web.

- **Problematization**: I will be acting as the principal actor for the system. As discussed in

    the introduction, the problem is that the web inaccessible for individuals with disabilities.

    While elaborated on in depth later, the assumed agreed upon plan forward is to get actors

    to envision themselves as part of a system to produce accessibility rather than it being a

    consequence of their existing actions. I have divided the actors into the global and local

    networks. The global network consists of law making bodies, regulatory bodies,

    companies. The local network consists of web developers and both types of technology.

    Figure 3 summarizes the identification and classification of actors into the global and
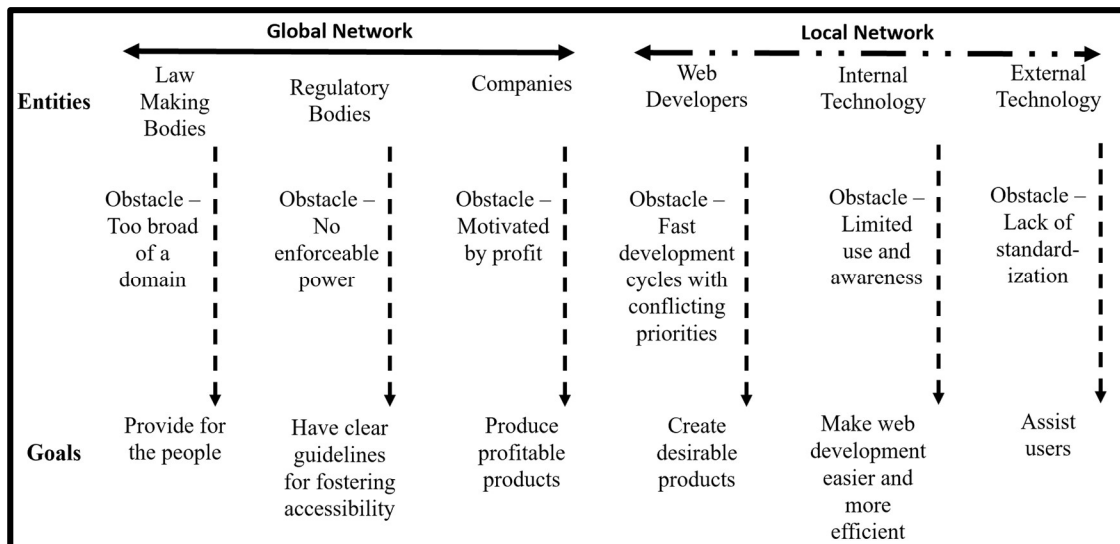
    local networks.

	Global Network			Local Network		
Entities	Law Making Bodies	Regulatory Bodies	Companies	Web Developers	Internal Technology	External Technology
	Obstacle – Too broad of a domain	Obstacle – No enforceable power	Obstacle – Motivated by profit	Obstacle – Fast development cycles with conflicting priorities	Obstacle – Limited use and awareness	Obstacle – Lack of standard-ization
Goals	Provide for the people	Have clear guidelines for fostering accessibility	Produce profitable products	Create desirable products	Make web development easier and more efficient	Assist users

Figure 3: A visual summary of problematization in addition to identifying goals and obstacles for the actors within the system. (created by author, adapted from Callon 1986, as cited in Stanforth, 2006).

- **Interessement**: An OOP is essential for the system. The principal actor or some other

    separate governing authority may act as the OOP for this system.

- **Enrollment**: The role of the global network is disconnected and need not concern itself with the details while the local network need only to concern itself with its work. Defining the roles of the networks and delegating actors to each network limits an individual actor's specific problem domain to better focus efforts. The roles of the global and local networks as well as each actor will be elaborated on in depth in the next section.

- **Mobilization**: Both able-bodied individuals and those with disabilities should speak out about the need for accessibility in the web.

By applying the power in translation model, structure can be derived and places for improvement can be highlighted.

Part III: How Do We Fix What Does Not Exist

The system is not operating as a cohesive system. The lack of a coordinating principal actor to keep everyone else in line is definitely a detrimental shortcoming for the system. However, it is the lack of power in the system that is the most harmful. As stated prior, power without action is meaningless; the actors in the network do not exert power over one another. Authority is deferred, power is not being exerted, and none of the actors are taking initiative so the system lays stagnant. But, this is not to say that the actors do not want accessibility; rather, the actors have no organized way of fostering accessibility.

What the system desperately needs is a change in the way that it views accessibility and how actors view themselves. Actors need to envision themselves as part of a system that will produce accessibility in the web rather than viewing accessibility as its own individual project. Furthermore, accessibility should be seen as a desirable outcome rather than something to be done out of obligation. Action needs to be taken, responsibility should be delegated, and power exerted. Actors should not continue operating as if they do the minimum, then the problem will

be resolved by the other actors. Actors need coordination, clear roles and responsibilities they are best suited to play in order to best foster accessibility.

As discussed in the methods, actors were divided into a global and local network. The system as it is now has a rough hierarchy that the government oversees the companies who oversee the web developers, but this chain of command is not strict or very effective when it comes to fostering accessibility. By dividing the actors, problem domains can be set. The global network consists of actors more detached from the problem; they are involved in fostering accessibility in the web but they are not the implementers. The local network consists of actors involved directly with creating accessibility. The local networks actors' responsibility is to implement accessibility within the web while the global network actors are responsible for ensuring that the local network can succeed in their goal. Limiting scope will help to narrow necessary action from all actors involved. Global network actors do not have to concern themselves with how the local network goes about implementing accessibility. Meanwhile, local network actors do not have to concern themselves with the responsibility of coordinating other local actors' actions.

Call to action

Everyone has their role to play in this system. As stated previously, roles that the actors are playing are not the roles in which they can be most effective. Table 2 summarizes the proposed roles, how to overcome their obstacles, and motivations for the actors that contribute to the web.

Actor	Role	Overcoming Obstacle	Motivation
Law Making Bodies	Maintain specific disability legislation	Rely on regulatory bodies for regulation	Protect the interests of the people
Regulatory Bodies	Make disability regulation	Rely on law for enforcing regulation	Make a more accessible web
Companies	Provide good/ service	Take responsibility for what is produced	Positive company image
Web Developers	Develop company products	Take responsibility for what is developed	Ethical responsibility
Internal Technology	Aid web developers	Habitual use by developers	Aid web development
External Technology	Aid accessibility	Standardization	Make things more accessible
People with Disabilities	Look to for guidance	Increased input	Accessible web

Table 2: Summarizing the new roles, how to overcome obstacles, and motivations of the actors that contribute to the web. (created by author).

- **Law Making and Regulatory Bodies**: Law making bodies and regulatory bodies would be most effective operating as a joined body; regulatory and law making bodies would be the "brains" and "brawn" respectively of a joint unit. The law making bodies should not try and be specific with regulation, but set a clear definition about what is considered accessible, for example saying that a site is accessible if it meets Level A compliance with the WCAG. This relationship can already be seen in the Section 508 of the Rehabilitation Act where accessibility is compared to WCAG standards rather than trying to define its own specific regulations. However, as stated prior, Section 508 only applies to federal websites but should be expanded to include all domestic websites to hold websites accountable to accessibility. On the other side, regulatory bodies should be reliant on law making bodies as the enforcement of the regulations. As stated prior, the

W3C is an international organization and does not have the authority to enforce

regulation, thus it should be able to outline regulation and be able to rely on law making

bodies to enforce them.

- **Companies**: Companies, like web developers, operate under the myths of web

  accessibility, particularly that it is costly and does not benefit enough people to justify the

  costs. While contesting these faulty ideas would be ideal, companies also need to

  embrace their roles as producers. Consumers are looking at what companies produce;

  CSR is an increasing important factor for companies to consider. Positive image is a

  desirable factor for a company; to do good and be perceived as good is killing two birds

  with one stone. Companies should take responsibility for what they produce and be

  producers of accessible products. In doing so, not only are companies contributing to

  their own good, they are bolstering their own reputations.

- **Web Developers**: Web developers have the greatest need for a change of mind. Fast

  development cycles in conjunction with harmful myths about accessibility have all but

  cemented it as a low priority item in web development. Additionally, there is the common

  human error of not accounting for what is not thought about; if web developers do not

  consider the idea of accessibility, it is unlikely that they will implement accessible

  features. An analogous problem was seen with cybersecurity. Early web development did

  not see cybersecurity as an important issue, now it is a large industry in itself. When

  perceptions about cybersecurity changed, its importance was highlighted; a similar

  change needs to be seen with web accessibility in order to highlight its importance.

- **Internal Technology**: The role of internal technologies does not need to change. The

  way internal technologies are utilized, or rather not utilized, needs to change. They exist

for the purpose of aiding software development and fostering accessibility in the web. Web developers need to get into the habit of utilizing them. This may create a positive feedback loop. Increased use of internal technology will bring more attention to them which may lead to internal technologies. Increased attention may lead to improved internal technologies to improve the web development process. Easier web development may lead to increased use of internal technology.

- **External Technology**: External technologies also do not need a role change. However, they do need to change, specifically they need to be standardized. As addressed in part I, external technology like screen readers lack standardization. Standardization of assistive technologies allows designers to better know what they are designing for and how they can best build their systems to interact with these assistive technologies. Knowing how code is going to be interpreted will Users of assistive technology may also find benefit in knowing that the system was designed to fit their needs rather than having to adjust to accommodate. With regards to external technologies like HTML validators, standardization is also beneficial. Rather than designing to simply pass validation, designers would be aware of where HTML validators fail or cannot make accurate judgements. This can allow designers to be assured in design choices that can be accurately judged by an HTML validator while being allowed to focus their time on manually verifying features that need human judgement.

- **Individuals with Disabilities**: The role for people with disabilities is whatever they want their role to be. When applying the model, they were given the role of spokesperson. They should be advocators for web accessibility, but this role also falls to all people regardless of ability status. Where people with disabilities stand in this system is

ultimately up to them. However, it should fall on the other actors to seek input from this group to ensure that they are designing for the needs of the people.

With clear roles defined, actors know their place in the system. Having actors reliant on other actors, rather than acting as independent agents, will help keep them coordinated with one another. This may result in a structured system to better foster accessibility in the web that currently exists.

Conclusion

The internet has an accessibility issue. This problem is perpetuated by the disjoint system surrounding the web. ANT and the power in translation model provide a way to view systems as coordinated efforts working for some overall goal. By highlighting the shortcomings of the system when viewing it through ANT and the power in translation model, the needs of the system are made clear. The actors in the system can be more effective agents at fostering web accessibility by changing their views about accessibility as a goal in itself and reframing the relationships between themselves and the other actors.

Granted, these findings are limited in the fact that none of the results have been verified. Suggested improvements are derived from observation. There is a need for organization and clear roles for the actors in the system; however, the roles suggested in this paper may be ill-suited. Furthermore, long term impact of the suggested changes is also a prediction since changes would take time to take effect.

If implementation of suggested improvements is successful, I anticipate the greatest impact would be having a more accessible web. I am assuming, though this fact is unconfirmed, that a reason why households that have a member with a disability are less likely to have a computer device may be due to a hostile web that deters engagement and results in no need for a

computer device. Assuming the prior statement is true, a more accessible web would make for

easier engagement with the internet for people with disabilities. Increased engagement with the

web which would decrease the disparity in computer ownership for households with and without

a member with a disability.

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