How is the power dynamics or social structure in society influencing the scalability of Electronic-Skin as a global technology

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On my honor as a University Student, I have neither given nor received any unauthorized aid on this assignment

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Introduction

With the rapid advancement of Artificial Intelligence (AI) and the Internet of Things (IoT), electronic skin (e-skin) has emerged as one of the most transformative and promising fields driven by these technologies. E-skin has garnered significant research interest in recent years due to its potential to revolutionize various industries. At this innovation's heart lies responsive, flexible, and stretchable sensors, the core components of wearable electronics and e-skin technologies. These sensors are vital for enabling the development of next-generation electronics, bridging the gap between humans and machines in unprecedented ways. Even with such robust technology for widespread usage, e-skin is often not distributed for the right cause. Its usage is frequently limited to how much it can profit.

The case of digitalization of the healthcare industry often holds key insight into how E-skin could have significantly improved the lives of patients. However, usually, the cost outweighs the social benefits. In addition, digitizing healthcare via E-skin holds immense potential for continuous health monitoring, including measuring vital signs, detecting early symptoms of diseases, and providing real-time feedback for personalized medical treatments. In intelligent robotics, e-skin equips robots with tactile sensitivity, enabling more precise interactions with their environment, such as detecting texture, force, or temperature. There is but a finite or infinite number of ways we can allow for the usage of e-skin. Still, institutional use of e-skin technology is limited because power is often in the hands of few individuals who would weigh their financial aspect rather than the social aspect. For example, the work of law enforcement can be made much more efficient due to e-skin technology.

However, the Department of Justice often faces the hassle of high-level government and corporate bureaucrats with their interests and agendas. To better organize the claim, scholars in social sciences offer the lens of Social Construction of Technology, which suggests that technology is fluid, meaning that technology can change according to society (Klein & Kleinman 2002). Scholars believe it is challenging to talk about the entire domain without going in-depth into the subcategories of SCOT and understanding it case by case. So, to understand E-skin's relationship with society, one needs to understand the power dynamics that prevent technology from reaching the most targeted population. Society constantly changes the definition of harassment. In the initial days, more specifically in the United States, harassment against people of color was perfectly acceptable because it was a common practice. Today, countless laws exist to protect the most vulnerable from adverse experiences in the workplace. However, in many instances, various forms of harassment and inequality persist as society does not deem them worthy of harassment. For example, the ongoing debate between equality and equity highlights the fact that a pregnant woman cannot be treated in the same manner as a non-pregnant woman, and the same applies to women with disabilities.

In many cases, disabled women or pregnant women of color are often overlooked in discussions surrounding women's rights in the workplace. However, they are frequently in greater need of support than their non-disabled peers. Unfortunately, if viewed through the lens of SCOT, society has pretty much evolved into a social hierarchy where benefits are given to those who already come from the privileged cluster of the community. To further summarize, the paper will analyze **how the power dynamics or social structure in society influences the scalability of Electronic Skin as a global technology?**

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Literature Review

There is a wealth of cases that essentially try to tie the role of power dynamics that has been shaping the flexible temperature to best fit the needs of society because in the past E-skin was seen only as an education tool to teach Engineers how materials react to certain tension and compression, but in today's world, E-skin is being defined as a "Smart wearable devices to monitor physiological changes continuously, enabling timely responses to health risks, particularly in high-risk occupations" (Zhang et al., 2022, p. 1). Such technology could alleviate some of the physical or mental health-related problems that come with those who are permanently or temporarily disabled. As the E-skin is being redefined into a more health monitoring device, scholars in social science are keenly interested in the technological evolution in human lives and how it could potentially change so much shortly that there is a likely chance that only a few elites will have the cognitive capabilities to dominate this technological revolution. However, the real question should be asked then and now: How will this elite class of community distribute such technology to the general population, and how will their potential bias interfere with their biases?

To further clarify the paper's remarks, Bhattacharya (2023), a lead medical science researcher in India, noted in *Inequality and the Future of Healthcare*:

> The role of humans as individuals is becoming less and less except for some extraordinary persons or elite groups. Now, the important question is whether elites and governments will continue to value every human being even when it pays no economic dividends. Will the development of mass medicine/primary care continue? Will

> governments/bureaucrats adequately fund the protection of the health of these useless classes merely on humanitarian grounds? (p. 1)

It is hard to predict what type of elites will dominate E-skin technologies—whether the engineers who build them, or big manufacturers, CEOs, or politicians. Nevertheless, it is still vastly predictable from just human nature that the so-called useless class will be entirely perceived by the elites on what they consider useless, which most likely will be decided based on their race, religion, or caste. Zhang's technical claims on the E-skin being transformed as a medical monitoring device give insight into Bhattacharya's question, which is that the future demographics of the healthcare industry will be a key deciding factor on who is considered worth helping or who is considered useless.

Although the arguments made by both Bhattacharya and Zhang about the technological revolution and the E-skin revolution, respectively, are wildly divergent from one another, if we tie the two arguments together, it provides insight into how the future leaders of healthcare will act about distributing the E-skin to individuals that might not be seen as worthy. In all honesty, it will entirely depend on the social stigmatization that could exist in the future and how the healthcare industry leaders will act upon this social stigmatization. This paper will not solely focus on the transformative abilities of the E-skin but will also talk about how the asymmetric distribution of power through the lens of SCOT can make a strong case for how the scalability of the E-skin as a global technology is limited, but at the same time can give some good insight how current biases in not just in authority but the community itself is limiting the technology from reaching its proper potential.

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Conceptual Framework

The Social Construction of Technology (SCOT), developed by Trevor Pinch and Wiebe Bijker, asserts that technology is not shaped solely by technical efficiency but is influenced by social groups, cultural values, and power structures (Klein & Kleinman 2002). Those with more significant economic, political, and social influence determine which technologies receive funding, how they are developed, and who benefits from them. This paper argues that societal power dynamics restrict technological advancements to those already in privileged positions, limiting access for marginalized communities. By applying the SCOT framework, mainly focusing on power relations, the analysis will examine case studies that illustrate how technology often reinforces existing social hierarchies. Through these examples, the paper highlights the need for more inclusive development practices that ensure technology serves a broader and more diverse population.

To further clarify the SCOT framework, Kleinman mentions that one of the four foundational concepts of the SCOT framework is the technological frame, which describes how a particular cluster of societies' interpretations defines a technology (Kleinman 31). The technological frame describes how a particular cluster of societies' interpretations defines a technology. Kleinman dissects the SCOT framework into four different categories, and each chapter focuses on a specific framework. The plan is to focus on the technological frame of the SCOT framework to discuss how only a small group of individuals in the society influences the definition of technology to such a level that it often clusters people based on worthiness rather than humanity.

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Analysis

Not to sound too radical, but to further connect race, technological revolution, more specifically E-skin, and the role of power dynamics into the broader picture, we can investigate how Black women are treated in the workplace relative to their non-colored peers and, as mentioned in this research paper, "Black Pregnant Women 'Get the Most Judgment': A Qualitative Study of the Experiences of Black Women at the Intersection of Race, Gender, and Pregnancy," "racialized pregnancy stigma —in the form of stereotypes stigmatizing Black motherhood that devalued Black pregnancies" (Mehra et al., 2020, p.1). This form of stigmatization is often rooted in those in authority. Usually, it can be seen as an excuse not to help people in need because those in authority would want to spend the resources on those pregnant women who come from a community that might not have the stigma or social biases. Moreover, to further add to the claim, an article on "Extending the Social Construction of Technology (SCOT) Framework to the Digital World" essentially talks about how technology does not revolve around the general society but among those that hold a greater deal of authority and power because, "Societies are structured around power asymmetries (Klein & Kleinmann, 2002, et al., p.4), which give different relevant social groups asymmetric access to (information) resources that are relevant in the construction of technology" (Baalen, Fenema, Loebbecke, et al., p.5).

Even though e-skin addresses some of the core issues related to anti-discrimination and a safe workplace environment, there is still a barrier because society does not address the core fundamental flaw, which is social class. A pregnant black woman might not even receive the privilege of the e-skin because a pregnant black woman does not fit the niche of motherhood

compared to their white counterparts. To further expand on this claim, an article published by the Pew Research Center titled "Power Dynamics Play a Key Role in Problems and Innovation" states, "Some said well-meaning individuals in positions of power do not understand the issues faced by the general public that relies upon digital platforms and systems" (Anderson et al., p.2). Individuals in positions of power who hold influence over the definition of technology will often discriminate against clusters of communities that do not fit their targeted audience. These articles come to the same point: Technology is not shaped by society but by a small niche of individuals. However, the article does not mention that despite the influence of authority in technology rather than society, individuals should have the intelligence to define technology as they see fit. As the paper argues, harassment is subjective, and the definition can change on an individual level, and so is technology on an individual level. Alternatively, it would be unjust to say that only those in power can scale E-skin as a global technology. Still, previous case studies in SCOT, like the adoption of railroads, tell us that despite some controversial policies related to railroads by the U.S. Department of Transportation, people still found a way to challenge those policies by consolidating as a group. In most cases, DEI programs in today's world can be seen as an alternative way to challenge some social biases among those in power.

It would be considered too political and way too radical to say that the concentration of a particular cluster of community in power is preventing the E-skin from achieving its true intention, which is availability to all malice toward none, and if we are to say that DEI programs need to be aggressively implemented to ensure that there is a diverse leadership in the healthcare industry that will provide such stigmatization does not play a massive role in the general decision-making process. However, DEI fails to acknowledge that enforcing diversity will not

just destroy the E-skin as a technology. However, it will destroy any form of technology ever created in this world because those in power are often chosen due to their hard work and achievements. Usually, these people are the best at scaling the E-skin. If there is a large-scale practice where the talent is chosen based on race, there will be large-scale technical consequences for E-skin and any technology because those individuals are not qualified. Moreover, as this article, The Problem with DEI, by Sandosham, mentions, "The whole DEI movement has been poorly conceived. It claims to be evidence-based, but it is anything but. The lack of data-anchored definitions leaves DEI officers grabbing at straws" (Sandosham et al. 4). Even if discrimination will exist due to the clustering of power. However, it is still by far the best approach to scaling E-skin. The only possible way to limit bias and discrimination is by educating those in power and holding everyone accountable.

Conclusion

In conclusion, technology is inherently fluid, and societal structures, especially power dynamics, heavily influence its usage. E-skin represents a transformative technology with the potential to significantly enhance healthcare, law enforcement, and other high-risk occupations by providing real-time health monitoring, transparency, and safety. Despite the incredible potential of e-skin, societal biases, systemic inequalities, and power asymmetries often determine who benefits from new technologies. Marginalized groups, such as pregnant women in lower socioeconomic classes or minority communities, are frequently overlooked despite being among those who could benefit the most. Furthermore, while technology like e-skin can solve long-standing issues such as workplace discrimination, harassment, and police brutality, its

successful implementation requires a conscious effort to distribute it equitably across all societal groups.

The scalability of e-skin should not be reduced to economics or marketability. It should be about impact—how deeply it can touch and improve lives. If we allow a handful of elite voices to dictate the technology's rollout, we risk reinforcing the same inequalities we claim to want to fix. Equity in technology isn't just a noble idea; it's a necessity. E-skin is just one example of how future tech could uplift or exclude, depending on how we handle the politics behind the screen. If we want tech to matter beyond innovation—to have a soul, in a way—we must challenge who holds the blueprint. The technology fight that serves everyone isn't just technical; it's political, ethical, and deeply human.

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