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SUSTAINABLE DIGITAL ECOSYSTEMS IN THE TEXTILE INDUSTRY

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Abstract:

Social audit approaches to sustainable development in the textile industry predominate in worldwide practice. However, research indicates that there are persistent structural non-compliance cases, demonstrating repetitive and harmful patterns and that creating codes of conduct as part of sustainability practices can only marginally improve worker rights on an overall level across industries. Due to these constraints associated with social audits, there's been a rising discourse about moving beyond these audits. In this paper we examine alternative approaches to social auditing to gain understanding, knowledge, collaboration, and empowerment within the value chain of brands, suppliers, and their employees. We target this emerging issue as a challenge for sustainable development of the textile industry. With a qualitative case study of a textile industry value chain as a base, and with the frames of the global sustainable development discourse, and ecosystem thinking, we suggest an alternative digital practice to social auditing in the textile industry, that gives workers a voice to speak with, that empowers the suppliers to take own control and responsibility over social conditions of their employees and that balances the present power takeover of brands. Merging the sustainable development discourse with digital ecosystems thinking when conceptualizing, theorizing or designing information systems (IS), we argue, is a way forward for IS to meet grand societal challenges.

Keywords: Sustainable development, Digital ecosystem, Textile industry value chain, Social audit, Workers

Introduction

As one of the most environmentally and socially detrimental industries globally, the textile industry requires an immediate shift towards sustainability (Boström & Micheletti, 2016; Nikolina, 2019). In spite of a growing awareness of alternative, more sustainable business models and emerging digital technologies that could support them, the textile industry continues to primarily depend on low-cost, linear mass production, and rapid consumption (e.g., Oka et al., 2020). This situation not only leads to higher pollution and energy consumption but also worsens environmental injustices. Additionally, it puts low-wage employees on the fringes of value chains at a higher risk of exploitation and abuse (Onwachukwu et al., 2021). Textile workers constitute a highly vulnerable workforce, predominantly comprised of young, migrant females. They often find themselves in precarious, insecure job market positions, frequently employed on temporary contracts or within the informal work sector (De Neve, 2014).

In the manufacturing industry, social audit is an instrument used by brands to assess and manage social conditions of workers in the factories of their suppliers. These audits can be conducted by the brands themselves or by a third-party organization specialized in social auditing. Social auditing usually means

visits to supplier factories, interviews with factory management and HR and interviews with factory employees. These interventions are then analyzed, and the results are presented in a report about conditions at the factory. Social audits can, for example, address access to toilets and restrooms, evacuation plans near assembly lines, worker ergonomics, overtime levels, and terminations, among other things. It can also cover efforts made to reduce discrimination, sexual harassment, and stress or to promote gender equality and freedom of association. Social audits are often made once in a year, and it is supposed to follow up from last year's audit and report. In general terms and line with Owen (2010) and Gray (2000) social audit can have two purposes: On the one hand, it is an instrument to control and manage codes of conduct with the purpose to manage actors, seeking efficiency opportunities, and managing the brand image. On the other hand, it can be viewed as a tool for more sustainable purposes to understand how organizations can contribute to social welfare. In this way, social audits can be said to be an instrument for control and accountability (Islam et al., 2018).

Social audit approaches to sustainable development in the textile industry predominate in worldwide practice. However, research indicates that there are persistent structural non-compliance cases, demonstrating repetitive and harmful patterns and that creating codes of conduct as part of sustainability practices can only marginally improve worker rights on an overall level across industries (Egels-Zandén & Lindholm, 2015). There are few significant results found for specific worker rights and even rigorous multi-stakeholder factory audits are often unable to identify process rights violations, such as those affecting freedom of association and discrimination, showing that auditing is more fundamentally flawed than previously documented and assumed in research pernicious (Egels-Zandén & Lindholm, 2015).

Due to the constraints associated with social audits, there's been a rising discourse about moving beyond these audits. Instead, the focus is shifting towards enhancing empowerment and communication among organizations within the textile industry's value chain (Schröder, 2019; Lund-Thomsen, 2021). This discussion is gaining traction and becoming increasingly pressing. A prominent issue highlighted in the literature is finding alternative methods for gaining insight, knowledge, collaboration, and empowerment within the value chain of brands, suppliers, and their employees, especially when traditional audit programs are not the solution.

In this paper we target this emerging issue as a challenge for sustainable development of the textile industry. The concept of sustainable development in the global policy discourse has primarily been associated with environmental aspects such as challenges of escalating pollution of water and energy consumption due to industrialization, economic growth, and the growing population of the earth (Sachs et al., 2021). It is only recently the social and economic dimensions of sustainable development have gained equal importance. We can see the same pattern of focus on sustainable development in information systems (IS) research. A steady stream of research focuses on environmental aspects through the literature on green IS/IT. However, that stream of literature includes a marginal focus on aspects such as autonomy, health, or actors with low levels of authority, i.e., social dimensions of sustainable development. It is not until recently that social and economic dimensions have been equally emphasized in the IS literature as vital dimensions of sustainable development (Ågerfalk et al., 2022; Ruggerio, 2021). With that background, there needs to be more integration of different dimensions of sustainable development and a discussion on compromises and trade-offs between environment, social and economic dimensions (Vassilakopoulou & Hustad, 2021). This is important for IS to develop more equal, empowered, and sustainable information systems in all aspects of society and all parts of the world (Kaul et al., 2022). Our paper contributes to that discourse.

We further chose to envision the textile industry value chain as a digital ecosystem to challenge the asymmetric relationships manifested in social auditing and to inspire new practices that can complement or replace existing, mainly analogue, auditing. Digital ecosystem is a stream of literature that sees digital artifacts and users, and systems of humans and IT, as ecosystems where each actor is part of something larger and where focus is on patterns of change rather than on individual activities, hence a systemic approach (Marton, 2021; Star and Ruhleder, 1996). The digital ecosystem analyzed in this paper is the textile industry value chain, in our case limited to garment manufacturing (suppliers), garment manufacturing employees (workers), sales and service (brands) and a digital artifact to support empowerment of all actors (a worker's voice app).

Digital ecosystem thinking is interesting in this case as it helps us to see possible characteristics of a digital practice beyond social auditing. A digital ecosystem practice (rather than analogue social auditing) includes many actors but not one of them is competing with the other, hence they are all part of the ecosystem, and

activities done by one actor will be part of a pattern of change across multiple actors (Martón, 2021). This perspective entails distributed empowerment to everyone in the value chain.

Through a qualitative case study we set the scene for this research and rigorously verify existing supplier and brand perspectives on social auditing and workers reality in a textile factory. The case study is based on a three year close collaboration with the garment factory Sustainable Crafted Clothing (SCC) in South India and the denim brand Nudie Jeans in Sweden.

In this way, with the illustrative case of a textile industry value chain as a base, and with the frames of the global discourse of sustainable development, and ecosystem thinking, we suggest an alternative digital practice to social auditing in the manufacturing industry, that gives workers a voice to speak with, that empowers the suppliers to take own control and responsibility over social conditions of their employees and that balances the present power takeover of brands. Merging the sustainable development discourse with digital ecosystems thinking when conceptualizing, theorizing or designing information systems, we argue, is a way forward for IS to meet grand societal challenges as defined in Agenda 2030. This approach has been emphasized in various research calls within IS (Davison et al. 2023; Masiero, 2023; Aanestad et al., 2021).

Related Research

Social Auditing, Its Risks and Ways Forward

The primary motivation behind social audits was initially to enhance organizations' accountability regarding the societal and cultural impacts of their business activities in the regions and communities they operate in. This involves ensuring transparency across their entire value chain, highlighting both the positive contributions made to organizations, individuals, and the environment, as well as potential adverse effects, including environmental impacts and social exploitations. In that way, social audits are a crucial element of a broader corporate social responsibility framework that encompasses environmental, economic, and social sustainability. Significantly, these audits consider all stakeholders within the value chain, going beyond the company's immediate concerns (Gao and Zhang, 2006). Nevertheless, as discussed above, it's evident that relying solely on social auditing doesn't ensure the health and safety of workers (Egels-Zandén & Lindholm, 2015). The issue appears to be complex and multifaceted.

First, a fundamental concern arises from the brand-centered nature of social auditing. Consumer demand for transparency in the production process has grown, compelling brands to divulge information about how their products are made, enabling customers to make informed purchasing decisions. Consequently, brand image has become increasingly crucial in demonstrating accountability and production responsibility (Abu et al., 2021; Rahimand and Vicario, 2015). Unlike quantitative metrics, responsibility is frequently evaluated through qualitative measures, making these assessments open to debate and interpretation. As a result, the outcomes can be more easily manipulated and influenced in favor of the brand, thus bolstering the brand's reputation.

A second crucial aspect revolves around an excessive reliance on social auditing, which might create a false sense of security by assuming that brands passing an audit are completely devoid of any serious negative impacts. Ironically, this excessive reliance can lead to passive management by both the brand and factory concerning social sustainability matters, effectively transferring significant responsibility and power to the auditing organizations. This problem is exacerbated by the fact that social auditing organizations are not held accountable for the content in their reports, neither by brands, nor by workers or governments (Terwindt and Saage-Maass, 2016). This is primarily due to the limited capacity or motivation of the involved parties to enforce accountability. Suppliers are hesitant to report social issues in factories due to the fear of losing their buyers, and workers lack the authority to report problems identified by the auditing organizations, fearing the risk of endangering their jobs.

The third crucial concern relates to the opaque nature of social auditing. The social auditing process follows a tradition of evaluating, measuring and reporting without empowering actors within the value chain to hold auditing organizations or brands accountable for the content of their reports (Johnson, 2001; Castka, Searcy and Mohr, 2020). Importantly, in most countries worldwide, there is no mandatory requirement to openly publish social auditing reports. Consequently, workers who are presumed beneficiaries of the audits are deprived of any insight into the auditing report or receive no input on how it unfolds. This opacity in

the social auditing hinders full realization of its potential to effectuate positive change and foster genuine accountability within the value chain.

In sum these three issues relates to brand image focus, a false sense of security and opacity but on an overall level on a top down brand centered value chain management model. Research shows that there are discussions and practices that move away from this strict instrumental measuring towards dialogue and collaboration around social responsibility in the value chain (Gao and Zhang, 2006; Terwindt and Armstrong, 2019). For instance, Lund-Thomsen, 2022 argue that corporate responsibility should be seen as a "relational view of negotiating, organizing and implementing responsibilities towards economic, social, technological and environmental issues across organizations/ workplaces, groups and individuals" (p. 5). These responsibilities are thus in a state of flux and depend on the expectations the different actors have about each other. Social responsibilities can be framed "as the division of labor and accountability between and among actors in a particular context embedded within the associated structural conditions when aiming at some wider societal good." (Lund-Thomsen, 2022, p. 5). This means that the responsibility of the actors differs in terms of profitability, growth, and cultivation of norms (Dhar et al., 2022).

However, there is no consensus regarding which norms should comply and govern the commonalities of responsibility in the value chain and we know little about the issue of how to engage those that do not already have a voice in the value chain through bottom-up approaches (Ali & Kaur, 2021).. Moreover global value chains are constantly changing (Abu Zayyad et al., 2021) which additionally increases the complexity of the task to change an established practice such as social auditing. Providing a platform for those currently unheard is crucial, but the methods to facilitate this are constantly evolving. Furthermore, if that can, by extension, lead to empowerment needs to be clarified. Therefore, we will delve into sustainable development and digital ecosystems shortly. However, before doing so, we will first introduce the methodology used in this paper, along with our illustrative case. This case aims to highlight the challenges we address concerning social auditing for the benefit of the readers.

Theoretical Framework

Sustainable development

In 1987, the UN introduced The Brundtland report, the first joint effort to find solutions to the growing development and environmental problem. This report brought sustainable development into mainstream discourse; since then, it has been a vital element in the debate. The Bruntland report (Brundtland, 1987) outlined a new way of targeting environmental problems by focusing not only on the protection of natural resources and the creation of man-made renewable resources that had been the main focus in earlier sustainable development discourses. Instead, it was also a call to action for developing both an economy and a social system that could sustain resources and ultimately prepare all humans for an uncertain future (Hajian & Kashani, 2021). In sustainable development, human needs are central: *"Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (Brundtland, 1987). In 2015, the Brundtland report was extended with the so-called Agenda 2030 and the global sustainable development goals (SDGs) (Brundtland, 2015). The purpose of this extension was to clarify the view of different areas of concern regarding sustainable development, e.g., "Decent work and economic growth" (Goal 8) and what challenges to target in these areas, e.g., "Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment" (Target 8.8). The extension that came with Agenda 2030 outlined at least three new approaches to sustainable development.

First, there was an emphasize that all areas mentioned in the SDGs, i.e., health, education, work, industry, and innovation are all integrated and that progress must be targeted in all areas and in all three dimensions (environment, social, economic). This is concerning as it outlines a systemic approach to sustainable development, including conflicting goals and trade-offs between areas of concern and dimensions. As such, Agenda 2030 presents the first significant shift in the understanding of sustainable development as a holistic concept that must be of respect for all nations and not only for countries in the Global South that had been focused on before. Agenda 2030 makes clear that all nations are responsible for all goals, areas, and dimensions and the SDGs are meant to drive global policy agendas and local action in every country worldwide.

A second major shift in the conceptualization of sustainable development that came with Agenda 2030 was focusing on two basic needs: health and autonomy. The need for health includes subsistence, protection, affection, and leisure, i.e., mental and physical health needed to strive for other needs and goals. The need for autonomy relates to understanding, participation, identity, and freedom. This need involves thinking and deciding for oneself, learning, and creating one's future as one likes. When discussing needs, it is vital to understand the boundedness of sustainable development and that needs are basic requirements for a good, empowered life; they are neither desires nor something that can be compromised, they are needs.

A third major shift relates to the definition of fairness. Sustainable development involves fairness between generations and within generations, between rich and poor nations and within nations. Two different types of fairness are discussed in Agenda 2030: Procedural fairness, which means that the procedure is fair and that established rules are followed, e.g., "everyone with high enough grades is admitted to a course" or "you cannot buy yourself a better position." However, procedural fairness can still lead to unfair outcomes. Therefore, outcome fairness is mostly focused on in the new conceptualization of sustainable development. Human beings should get fair outcomes, although those requirements may not be the same for all.

The three abovementioned major shifts in understanding sustainable development inherently relate to the shift from weak to strong, sustainable development. With weak sustainability, the assumption is that the sum of all social and natural resources together does not decline over time. That means man-made resources can replace natural resources. In this discourse, trust in humans and technology is embedded, and there is a belief that they can substitute destroyed natural resources with man-made ones. That substitution will uphold economic growth that will lead to more efficient use of resources and, thereby less exploitation of resources over time (Carpinelli et al., 2022). In contrast, strong sustainable development requires that neither man-made nor natural resources decline. And humans are part of the natural ecosystem. Economic growth will not lead to the efficiency of resources and reduced exploitation of resources. Rather, the more economic growth, the more population, consumption, and resource exploitation. Sustainable development entails a significant shift in values and behavior in this discourse. Ergo, technology and innovation alone will not lead to sustainable development. According to Agenda 2030, sustainable development is mainly about strong sustainability because we do not know which resources will be needed in the future and what resources can be substituted.

Therefore, natural resources need to be preserved, social resources need to be preserved and developed, and there is a need for an ecosystem approach to upholding the agenda. In an ecosystem approach, all are actors, and all have the responsibility to meet all actor's needs, at present and in the future. Applied to this paper, we focus on those actors who do not already have a voice and are not empowered to be active participants in an ecosystem, i.e., suppliers and workers. Due to that, we inspire by the theoretical framing of digital ecosystems in this paper, presented next.

Digital Ecosystem

Digital ecosystems are highly complex and large-scale systems that expand beyond organizational and other boundaries, with limited central control (Hanseth & Lyytinen, 2016; Henfridsson & Bygstad, 2013; Ruhleder & Star, 1996). There are no outside forces governing and organizing an ecosystem, instead every part of the ecosystem influences processes within the ecosystems (Márton, 2021). As such, there are no competing interests between parts of the ecosystem since each part outlines a necessary part of the whole. Instead, cooperation between parts in digital ecosystems generates value (Kempton, 2022; Ofe & Sandberg, 2022). In such inclusive view "patterns of processes" need to be in focus rather than individual activities or transactions within or between parts (Márton, 2021). Not only one individual part can benefit and profit in an ecosystem. Instead, value is created when parts collaborate and create patterns of interaction and change (DeLanda, 2016; Harries-Jones, 1995, 2002). Being part of an ecosystem and viewing digital and human elements as a "part of" a system is different from standing on the outside and influencing a system from outside of the borders of it, similar to the difference in meaning between: "being stuck in the traffic and being part of the traffic" (Márton, 2021).

Typical for digital ecosystems is that actors and artifacts connect around an organization or digital platform (Moore, 1993). Digital ecosystems that involve digital platforms are not finished by design (Eaton et al., 2015; Henfridsson & Bygstad, 2013; Islind, 2018) but instead these digital ecosystems constantly change organizational dynamics and organizational form (Haki et al., 2022; Winter et al., 2014). A digital ecosystem is in that way wise and resilient as well as highly dynamic, open and emergent. That means,

constellations in an ecosystem differ from previous logics of market-based arrangements, such as vertically integrated value chains and traditional corporate social responsibility, where actors and roles are predetermined and stable (Márton, 2021). Digital ecosystems orchestrate complementary actors and resources to construct highly complex products and services (Alaimo et al., 2020; Haki et al., 2022; Kindermann et al., 2022). Both the design and governance of digital ecosystems requires what Márton (2021) calls 'systemic wisdom', i.e., knowing that every action and relationship in an ecosystem has a consequence for patterns of processes. Systemic wisdom outlines an understanding of how to cultivate resilience of an ecosystem. A resilient ecosystem can change the way it functions in response to changes in the ecosystem and it can learn from previous changes. Robust systems are the opposite to resilient ecosystems (Barns, 2019) which means they are built to resist change with the purpose to be stable. Robust systems cannot be flexible to unforeseen changes in the environment which can be devastating for digital ecosystems, as it needs to be dynamic enough to adjust to demands necessary to meet both present and future generations yet unknown needs.

Like natural ecosystems, digital ecosystems cannot grow unrestrainedly, hence their growth needs to be restricted for the ecosystem to stay healthy (Márton, 2021). In that type of reasoning, there is a need to emphasize eco-economic thinking (i.e., economic system embedded within social systems) rather than neo classical theory of externalities, i.e., that there is an outside of the system, in which some values and costs are not relevant. For example, customers' social costs are understood as a non-market phenomenon. In cases of artificial intelligence (AI) for example, it is the corporation that profits from the use of the AI, not the users of the AI, e.g., people giving away data for improving the AI. Additionally, in the case of streaming services and social media, large corporations profit on social costs such as peoples' time and health, including sleep, mental health, stress, and leisure time. Social costs (e.g., lack of sleep or mental illness) of those who use the system is not viewed as part of the restricted economical activities, hence it is viewed as activities "outside" the scope of the corporations' business model; ergo, outside the digital ecosystem (reference withheld). These systems do not only exploit existing users of their systems through highly addictive services, but they also exploit future generations who will be dependent on digital systems of this sort to have their everyday life working and thus they are not sustainable digital ecosystems.

In summary, digital ecosystems are informed cognitive and digital systems; they outline ecologies of ideas (Ruhleder & Star, 1996). Ideas in digital ecosystems travel along patterns of processes and digital ecosystems are bounded and relational (Márton, 2021). Information creates connections between actors in the digital ecosystem and outlines mutual relationships and connections between humans. Information does not segregate actors, they are the connections in a sense, e.g. children and parents are different and that is what defines their relationship (Ruhleder & Star, 1996). Digital ecosystems thinking therefore builds on ideas from materialism outlining that matter is already alive and informed rather than 'formless' and everything within, is therefore connected to everything (Kallinikos, 2006).

Method

Data Collection

The case study of this research is founded on a three-year extensive partnership involving Sustainable Crafted Clothing (SCC), a garment factory in South India, and Nudie Jeans, a denim brand based in Sweden. We spent three days observation at the factory, SCC, in 2022 and did several shorter visits between 2020-2021. We had several informal meetings with the CEO of SCC and two HR staff during this time. During the visits in the factory, we also spoke to the workers. We conducted 26 semi-structured interviews with factory workers during our visit in 2022 and several additional informal talks during the shorter visits between 2020-2021.

We have also had a three yearlong collaboration with Nudie Jeans. This collaboration involved frequent, engaged, informal meetings with the sustainability department about sustainability issues. In addition, one more formal workshop with the CEO and the sustainability manager at Nudie Jeans was conducted in 2022.

The Digital Artifact: A Workers Voice App

As a complement to excising social auditing practices conducted at SCC we are developing a digital artifact that allows for the gathering of subjective, qualitative information about job satisfaction, well-being, and empowerment of factory workers. This tool digitally maps out the events in a value chain, creating a feedback loop from the shop floor to various actors in the value chain. It manages actionable data flows and

records activities in the value chain. Our vision for this tool is to convert qualitative aspects into data, producing a comprehensive and actionable report on employee conditions at the factory. The information will be displayed visually and will be consistently accessible in a summarized format. This aggregated data from the digital tool will offer an ongoing summary of workers' subjective experiences related to their work environment and overall well-being. It will act as a valuable resource for both factory management and the workers, fostering continuous learning. This data flow is intended to be accessible to all relevant parties in the value chain through a systematic approach. The effectiveness of this process largely relies on how the digital tool, including its data flow, is conceived and utilized, a task in which some actors currently do not have a role within the existing social audit programs.

Ethical considerations

Our team comprises researchers from academic institutions that include diverse ethnicities and institutional affiliations with global north and global south contexts. In addition, we worked with interest organizations and local NGOs in our field to be able to incorporate robust representation in our data. We build on the strengths of our diverse team to help us address ethical concerns of privileged, non-native white scholars researching marginalized communities in global south contexts.

Development projects like ours aiming to raise capacity building among women could challenge existing structures regarding caste, education, skills and wage. There is a possibility of an ethical dilemma regarding the collected worker grievance information through the app, where employee anonymity must be balanced against possible remediation actions. It is also highly important that the organization of how sensitive information flows and who is responsible to take action on grievances.

The data that is and will be generated via the app and in in-depth interviews with factory workers and managers, and observations at the factory is person-related data, such as demography, literacy, use of digital technology and smartphones, attitudes towards the work situation and management, changes in behavior over time, as well as needs and visions related to the own work situation about everyday life. The data is and will also in the future be recorded, stored, and processed for the proposed research and development of the project. The data collected will not include sexual lifestyle, ethnicity, political opinions or religious or philosophical conviction. We will also not collect and process clinical or health data.

Findings

Supplier perspective

Ranga serves as the CEO of SCC, and we have engaged in extensive discussions with him regarding his perspective on the current auditing system, his perceived role as a supplier within the textile value chain, and his strategies for the factory's growth. He holds a critical stance towards the existing social auditing system and says that he doesn’t feel he is a partner to the brands but rather someone who only wants to make money, exploit and cause problems. He emphasizes that suppliers are largely excluded from conversations about social auditing, for example how they feel about social auditing. Moreover, he underscores that suppliers face substantial risks, second only to farmers, and he constantly feels the pressure that brands might withdraw their contracts if factory issues are discovered. He finds it challenging, he says, to guarantee an entirely problem-free environment at all times. Hence, he is highly motivated to explore new initiatives that can assist him in ensuring the well-being of his workers. He is eager to test the app and discover how he can utilize the data to enhance working conditions for his employees.

Brand perspective

The denim brand Nudie Jeans has been outsourcing a portion of its production to SCC since 2020, establishing direct communication with SCC's HR department, a situation that is not always the norm. This factory was chosen due to its dedicated commitment to sustainable practices, both socially and environmentally, as well as its grasp of empowering workers. A significant element of empowerment involves training. Consequently, Nudie Jeans provides substantial support for the training of both workers and managers. Sandya, serving as the sustainability manager at Nudie Jeans, has been instrumental in providing us with valuable insights into Nudie Jeans's approach to social auditing and their strategies for empowering workers. A crucial point raised by Sandy is their perspective on the value of Nudie Jeans' products. According to her, social resources like the workforce and environmental resources like cotton and

water, invested in a garment, should be handled with care and respect. Sandy believes that garments should be utilized for as long as possible and sold at a price that truly reflects their worth.

Sandya differentiates between tangible and invisible structures that Nudie Jeans tries to identify and change if they are problematic. Tangible issues within a value chain, visible to the brand, are more manageable than invisible ones. For instance, strategies related to wages or health and safety measures, like adequate bathrooms or a well-defined fire escape plan, are more concrete and straightforward to put into action compared to plans aimed at empowering workers. Solving these invisible issues, which may be deeply ingrained in the culture and extend beyond the factory's boundaries, proves challenging for both brands and factories. Invisible issues include instances of harassment or discrimination against women, such as the challenges they face in securing supervisory positions. Gathering information directly from workers and quantifying social aspects of work are methods to obtain genuine insights from the factory floor, according to Sandya. She highlights the significant challenges they face, particularly the difficulty of directly assessing the well-being of the workers.

Workers perspective

Each day, we observed a line of approximately twenty to twenty-five people outside the factory gate, inquiring about job opportunities at SCC. One of Ranga's motives for establishing the factory in this rural area near Krishnagiri was not only to tap into the accessible labor pool but also to tackle the issue of gender-specific rural unemployment. The goal was to offer employment options to women and counter the depletion of rural and community life. We observed that workers discussing their limited options did so without expressing gratitude or reverence for SCC. Instead, they were pragmatic and straightforward about why they had to work there. Some individuals mentioned their reliance on SCC for employment without displaying resignation, despair, or frustration; their expressions were matter-of-fact, highlighting the practicality of their situation. Nevertheless, a few workers mentioned that their work at the factory aligned with their aspirations. For instance, some supervisors we interviewed indicated that they had opportunities for growth and skill enhancement at SCC. This enabled them to assume supervisory roles, leading to increased earnings.

We also had conversations with workers about their overall lives and family circumstances. It became evident that their lives were incredibly challenging, particularly for the women. For many of them, their daily struggles seemed to stem from the absence or vulnerability of a significant male figure. Several were single parents, either because their husbands had abandoned them or, in a few cases, because their spouses had sought employment in the city. Others were the primary breadwinners in their families due to their husbands' unemployment, alcoholism, or their fathers' or fathers-in-law's illnesses or passing. Some had experienced abuse and violence from their male partners, often linked to alcoholism. Many women described their daily routines as exhausting: waking up early, getting their children ready for school, commuting to the factory by bus, moped, or bicycle, returning home after work, managing household chores, preparing dinner, and looking after the children.

We also asked the workers about their use of mobile phones. The men often mentioned using their smartphones for gaming and social interactions during their free time. Women on the other hand tended to view their phones primarily as tools for connectivity rather than entertainment, although they used the same apps—WhatsApp and Instagram being the most popular ones. While many brought their phones to work, they were careful not to have them on the shop floor. Instead, they checked their phones during breaks or just before and after their shifts.

Discussion: Characteristics of Sustainable Digital Ecosystems as an Alternative to Social Auditing

In this paper we are discussing how to address one of the worst industries in the world in terms of human and environmental abuse (e.g., Boström & Micheletti, 2016; Nikolina, 2019). We do so by reporting on the results of a case study in an Indian textile factory and by discussing the findings in relation to sustainable development and digital ecosystem. We take point of departure in Agenda 2030 and what it means to be able to meet one's needs both at present and in the future hence, to be healthy and to have the autonomy to take actions to strive for these needs. Applied to textile workers, this means knowing rights at the workplace and learning, reflecting, and taking actions that can improve working conditions and, ultimately, mental and physical health. Applied to textile suppliers, this means moving away from asymmetric relationships

and buyer-centric practices where brands alone rule. As the current social auditing is not enough, this paper focuses beyond brand-governed traditions and suggests a reconfiguration where all actors in the value chain would have a voice. Going beyond social auditing means participating as an engaged actor, in a bounded ecosystem, based on principles of strong sustainable development, i.e., that all actors have a responsibility that needs are met both at present and in the future. And that outcome fairness prevails in the Global West and the Global South and on supply level and on worker level. Below we discuss three themes that we argue illustrate characteristics of sustainable digital ecosystems that can complement or replace existing social auditing.

Continuous development

Ecosystems that involve digital platforms are not finished by design (Eaton et al., 2015; Henfridsson & Bygstad, 2013; Islind, 2018), but instead, these digital ecosystems constantly change organizational dynamics and organizational form (Haki et al., 2022; Winter et al., 2014). Similarly, we argue that the impact made by those participating in the ecosystem value chain are also not finished. More specifically, we lay out the need for continuous engagement and improvements to tailor to the needs of those who have previously not been heard, over time moving from contributions through design to contributions through data. A digital artifact can generate genuine data, collected continuously from those actors that normally are not being heard in social auditing. Existing social auditing practices involve checkups once or twice a year at the factories through interactions between brands and suppliers, driven by brands. A data driven approach instead provides a constant flow of data that can be perpetually designed and used for discussions and development. Sustainable digital ecosystems can in that way be conceptualized as a system of continuous development.

Togetherness

As argued earlier in this paper, digital ecosystems are highly complex and large-scale systems that expand beyond organizational boundaries and other boundaries with limited central control (Hanseth & Lyytinen, 2016; Henfridsson & Bygstad, 2013; Ruhleder & Star, 1996). However, ecosystems are also bounded, in the sense that they cannot grow infinitely (like fast fashion brands tend to do). They also don't have an outside. Hence, everything in an ecosystem is "in" the system, and all actors play in the same team. In that way, it is not possible to talk about social auditing as a practice where brands can positively affect suppliers and workers because no one in an ecosystem can stand outside and affect something inside the system. Instead, all actors in an ecosystem work together and everyone participate in upholding the health of the ecosystem. This approach requires that everyone is empowered to do so and that everyone takes the responsibility to empower everyone to participate. In digital ecosystems, it is the cooperation between parts that generates value (Kempton, 2022; Ofe & Sandberg, 2022). A digital artifact can allow more actors to dare to raise their voice through anonymous data in an aggregated form. The data can be used as a discussion material in workers- and management learning workshops or for analyzes of what improvements can be made. Similar to the notion mentioned earlier, "being stuck in the traffic and being part of the traffic," introduced by Márton (2021), we argue that textile value chains can be seen as sustainable digital ecosystems driven by togetherness.

Collaboration

It is not straightforward how value is - or should be - distributed within the value chain and between actors within an ecosystem (Zeiss et al., 2021). Inherent flaws in the current global textile value chains lead to a situation where textiles must be as cheap and produced as fast as possible. Brand companies are in charge, leading to unequal value distribution within the value chain (Lund-Thomsen, 2022). This perception of the value chain presupposes that ecosystems can grow forever and that social resources put into the products in terms of work effort are seen as non-market phenomena (Márton, 2021). This is especially clear in the fast fashion industry, where brands expand far beyond any control of their value chain and where brands and suppliers are competitors at an arm-length distance rather than collaborators. This creates an unhealthy system where brands and suppliers are de-coupled, leading to a loss of responsibility for all involved actors.

A digital ecosystem instead, there is a focus on relational, dynamic, and negotiating aspects and shared responsibility between actors (cf. Lund-Thomsen, 2022). This approach marries well with the view of the value chain as an ecosystem that is bounded, has limits, and involves actors with a common interest in sustaining a healthy ecosystem and that sees all actors are "part of" the ecosystem (Márton, 2021).

Perceiving oneself and others in the value chain as a joint ecosystem and as 'parts of the whole' rather than as sole players are vital. This is a point also raised by the supplier representative in this study. All this stands in strong contrast to current social auditing that increases the gap between actors and detaches them from each other. Sustainable digital ecosystem, we argue, require collaboration between actors in the system.

Conclusion and critical points

In this paper we make the attempt to marry the global sustainability policy discourse with theory on digital ecosystem to problematize existing social auditing in the textile industry and suggest a novel way of understanding value chains that provides value to all parts. We characterize sustainable digital ecosystems as being systems of continuous development, where togetherness and collaboration create value for all.

Challenges with this attempt are many and here we end this paper with two of them. First, one main area of development and further thought is related to the paradox of scale. On the one hand good business should scale but on the other hand too large-scale growth of business risk to end up in unhealthy ecosystems where transactions are made on arm-length distance. The challenge relates to how sustainable brands and suppliers can strive and survive when the rest of the environment they operate in (e.g. fast fashion brands) make business on completely different premises. Keeping a healthy bounded ecosystem where parts of the ecosystem are collaborating and developing together towards a mutual understanding of the fragility of the ecosystem and the responsibility everyone must act to sustain the ecosystem, is something different from only focusing on fast, cheap production and profit. In the textile and fashion industry this challenge is especially delicate as traditions and structures for design, production and sale are almost exclusively based on fast and low-cost processes (e.g., Oka et al., 2020). In this harsh speedy competitive business landscape of today's textile and fashion industry sustainable brands and suppliers need to rely on a paradigmatic different way of making business where other values but monetary value prevail (Allal-Chérif et al., 2023).

Second, empowering everyone to participate in the development of the value chain has major challenges. An especially difficult challenge is to also empower those who are usually not used to make their voice heard, in this case women. Our research strives to promote gender equality through interventions with different value chain actors, and in the selection of field work in a factory with predominantly female employees. Nearly three-quarters of textile workers worldwide are women, and women are disproportionately affected by violence in the workplace. When discussing gender-based issues in the textile industry, it is mainly about issues affecting women and girls. At the same time, it's vital to note that men are also victims of gender-based violence and harassment in the workplace, especially gender non-conforming men, including those who are perceived to be gay, bisexual or transgender.

While women make up the vast majority of textile workers, they are typically poorly represented in positions of authority such as management or supervisor. Often jobs taken by women pay less than those taken by men, despite the level of skill that might be required. In addition, many workers also report daily discrimination, harassment and violence. A living wage and the right to freedom of association and social dialogue are also closely tied to the fight for gender fair workplaces.

Research has shown that most women employees are unaware of their rights. Women and men are affected and perceived differently by cultural gender norms, for example work outside the home, in factory settings. Their rights include provision of written employee contract, itemized wage slip, minimum wages, non-discrimination of wages based on gender, equal opportunity in promotion, provision of good working conditions, provident fund facilities, medical facilities, maternity facilities, freedom to form and join the union, treatment with dignity and leave facilities.

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