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Socially aware design of interactive systems to combat gender-based violence in low-resource settings

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ABSTRACT

In this paper, we examine the socio-cultural, technical, and organisational contexts surrounding Gender-Based Violence (GBV) prevention and response as a basis for designing interactive digital systems that facilitate multi-agency collaboration and strengthen GBV service delivery in resource-constrained environments. We address two research questions: (i) What socio-technical factors shape the design of digital systems that support multi-agency collaboration and GBV service delivery? and (ii) What design solutions can be developed from these factors to strengthen coordination and interaction among GBV service providers? We draw on the Socially Aware Design (SAwD) framework to conceptualise and situate the study within Human Computer Interaction (HCI) research. Using SAwD, we examine design both as a process of developing interactive systems and as a means of advancing social and developmental goals in GBV prevention and response. Empirical data from the socio-technical research are analysed at three levels – informal, formal, and technical information levels – as conceptualised in the SAwD framework. Based on this analysis, we identify design requirements, co-develop design mock-ups, and conduct stakeholder reviews along with research participants. Our findings show that integrating situated informal and formal design contexts with technical information in HCI research increases the likelihood of designing systems that support effective human-technology interaction and potentially generate meaningful social impact. Overall, the study highlights the importance of aligning design principles with the potential developmental impact of interactive systems for multi-agency collaboration, addressing a gap in existing research that has focused primarily on survivors or perpetrators.

1. Introduction

Human computer interaction research on gender-based violence is growing, with a predominant emphasis on examining technology-facilitated abuse (e.g., Flynn et al., 2024; Henry et al., 2020) and designing systems to support prevention and response efforts (e.g., Bellini, 2024; Gini et al., 2024). GBV is a pervasive human-rights violation that disproportionately affects women and girls and has lasting impacts on health and social well-being (Airaoje et al., 2025; Hayes, 2014; Khan, 2011). GBV takes many intersecting forms—from intimate partner and sexual violence to forced marriage, grooming, hate crimes and verbal, psychological and socio-economic abuses such as denial of education, work, services, and full civic participation (Denney and Ibrahim, 2012; EIGE, 2021).

Given the significant health and long-term societal impacts of GBV, two predominant strands of HCI research have emerged. First, as digital technologies become increasingly woven into everyday life, scholars argue that they amplify existing forms of GBV and facilitate new kinds of abuse against women and girls (Elias and Gurbanova, 2018; Henry et al., 2020; Hinson et al., 2018; Maas et al., 2019; Temple et al., 2016). This body of work underscores how technology can facilitate GBV, such as online stalking, threat and harassment, invasion of privacy and identity theft, revenge porn (including sharing of nude photos/videos without consent), exploitation and sexist hate speech (Dekeseredy, 2019; Makinde et al., 2021; Megarry, 2014; Henry and Powell, 2018). From this perspective, GBV is framed as driven by harmful and aggressive individual behaviours based on the intentional use of technologies to perpetrate abuse (Clarke et al., 2013; Henry and Powell, 2018).

The second strand of research focuses on the critical role that technology plays in the response and prevention of GBV (e.g. Dragiewicz et al., 2018). A growing body of HCI research from this strand shows that when digital technologies such as mobile and web-based

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applications, social media platforms, games and chatbots are properly designed and implemented, they can aid in the prevention and response to GBV and empower survivors in dealing with abuse (Henry et al., 2024; Park and Lee, 2020). This body of research has contributed to GBV response and prevention efforts through digital interventions in social settings of the victims and survivors. Contributions include interactive technologies for GBV campaign and advocacy (Ndjibu et al., 2017), gender web forms for accessing GBV information and services (Scheuerman et al., 2021), conversation agents for supporting GBV victims and survivors (Maeng and Lee, 2022; Park and Lee, 2020), crowd mapping application to report sexual harassment (Grove, 2015) and a make-up support system for transgender practices and needs (Chong et al., 2021). More recently, HCI researchers in this strand have also begun to contribute digital systems aimed at changing the perpetrators' abusive behaviours (Bellini et al., 2020; Gini et al., 2024).

Altogether, these HCI research strands highlight technology's ambivalent role, as it both facilitates abuse and provides crucial tools for prevention and support. Notably, the existing work focuses primarily on individual victims, survivors or perpetrators who collectively constitute what we call the "receiving" side of GBV prevention and response efforts. One related but less explored area in HCI concerns coordinating multi-agency service providers for GBV prevention and response – also referred to as the "supply" side of GBV. Evidence suggests that such coordination is best achieved when effective communication infrastructures, shared data-management practices and mechanisms for information and knowledge exchange are established (Garcia-Moreno et al., 2015; Parkes et al., 2017). This perspective underscores the need to design digital technologies that enhance multi-agency coordination as part of how HCI can contribute to GBV prevention and response. However, limited HCI scholarship remains regarding how these tools are designed and used by various stakeholders to interact, organise, and work towards collective goals for effective GBV interventions (Saha et al., 2023).

Our current work in Sierra Leone contributes to this gap. We explore how an interactive technology support system might be properly designed to assist multi-agency providers in combating GBV. GBV is identified as a major challenge undermining development efforts and deterring many women and girls from maintaining the physical and mental well-being they need to participate equitably in inclusive community and livelihood development (Martin et al., 2021). GBV, particularly sexual harassment and violence, is widespread in Sierra Leone. Almost 70 percent of women report experiencing violence in their lifetime (Sam and Koroma, 2019). The adverse health, social and psychological consequences of GBV have a serious impact on not only women and girls' livelihood, but the broader national development agenda.

Efforts to respond to and prevent GBV in Sierra Leone involve the coordination among several multi-agency service providers – such as policymakers, GBV organisations and healthcare providers – who often work separately to deliver referral services and supportive care to victims and survivors (Amisi et al., 2024; Garcia-Moreno et al., 2015; Parkes et al., 2017; WHO, 2020). This current approach presents not only resource challenges but also limits effective coordination and the sharing of critical data and information needed for the timely delivery of effective GBV services. Our aim with this paper is to present the findings from a sociotechnical study, along with the co-design and stakeholder review of interactive technology mock-ups. The goal is to understand how different multi-agency providers might use digital technologies to interact and coordinate to pursue collective goals for effective GBV response and prevention (e.g. Saha et al., 2023). To this end, we answer two questions:

I. What socio-technical factors shape the design of digital systems that can support multi-agency collaboration and GBV service delivery in resource-constrained environments?

II. What design solutions, based on these factors, can be developed to strengthen multi-agency providers' capacity to interact and coordinate in preventing and responding to GBV?

We respond to the two questions through a socio-technical approach that combines participatory stakeholder involvement and policy and institutional dialogues. We frame the study within a Socially Aware Design lens (Baranauskas, 2021; Baranauskas et al., 2024), which emphasises the influence and impact of socio-cultural factors in technology design (Baranauskas and de Almeida Neris, 2007; Pereira & Baranauskas, 2015). We argue that conceiving and introducing a new technology in this way requires understanding diverse perceptions of the problem across stakeholders and considering how the technology under development is expected to contribute positive social change (Baranauskas et al., 2024; Baranauskas, 2014; Pereira and Baranauskas, 2015). We begin with a review of related work and then discuss the research framework developed through a socially aware design approach, which is rooted in organisational semiotic theory (Liu, 2000). Following this, we describe the research methodology, analyse results, and propose design mock-ups. We finally discuss the study's findings and outline potential directions for future research.

This paper contributes a detailed account of the socio-technical context and of engagement with multi-agency providers in Sierra Leone, to better understand their work settings in a resource-constrained environment. It also proposes design mock-ups for supporting their collaboration and data sharing in mediating GBV response and prevention. The research extends the application of the SAwD framework by using it to guide the context-sensitive design of interactive systems that support GBV service coordination, addressing a gap in existing HCI interventions that focused on survivors or perpetrators. In applying SAwD, we emphasise the importance of centring multi-agency providers and considering the social, economic, technological and cultural factors that shape their contexts when designing interactive systems that are both usable and useful (Baranauskas et al., 2024; Dell & Kumar, 2019; Mkude and Wimmer, 2019; Poppe et al., 2007). We argue that explicitly focusing on these factors, along with enabling relevant stakeholders to influence the design process, can foster ownership, sustained use, and positive impact (Saha et al., 2023). We analyse the outcomes and implications of involving real users in the co-design and stakeholder review of context-sensitive, multi-agency collaboration technologies in resource-constrained settings. In doing so, we aim to open new discussions on an underexplored yet relevant HCI area: the ways technology can support and enhance creative practices in mediating information sharing and communication to support effective multi-agency collaboration in GBV prevention and response.

2. Related work

In this section, we begin by discussing HCI research into gender-based violence. We provide a brief account of the ambivalent role of technology, which both facilitates GBV and mediates its prevention and response. From this perspective, we discuss two strands of research: the first focuses on technology-facilitated violence (TFGBV), and the second on the interactive design of digital systems to support victims and survivors of GBV. As the focus of this paper, we then review emerging research that examines how technologies are designed and used to help multi-agency service providers collaborate, share information, and communicate for GBV prevention and response. We also conceptualise the Socially Aware Design framework as the theoretical lens of the study, arguing that designing effective technology systems for service providers requires integrating informal, formal, and technical aspects of their context into the design.

2.1. Technology-facilitated gender-based violence

Technology-facilitated gender-based violence refers to a range of

sexual and harmful behaviours perpetrated through digital and communication technologies, including cyberstalking, sextortion, trolling, networked harassment, image-based abuse, online grooming and hate speech – facilitated by communication technologies both virtually and face-to-face (Flynn et al., 2024; Henry et al., 2020; Henry et al., 2018; Makinde et al., 2021). The perpetration of TFGBV can lead to significant harm and extensive consequences ranging from psychological distress, social behaviour, physical health, economic, sense of safety and security, and in some cases can lead to death (Brown et al., 2022; Fiolet et al., 2021; Rogers et al., 2023).

Previous HCI research within this strand has examined how perpetrators exploit technologies to facilitate GBV, including social media abuse (Freed et al., 2018), phone-mediated abuse (Havard and Lefevre, 2020), image-based sexual abuse (Henry & Flynn, 2020; Ruvalcaba and Eaton, 2020), and online sexual abuse (Henry and Powell, 2018). Researchers have also explored how victim-survivors resist TFGBV. For instance, Douglas et al. (2019) show that victim-survivors in Australia use technologies such as mobile phones to document harmful behaviours, install home cameras for security, and wear GPS-enabled wearable devices to alert police when in danger. The authors further report that some participants block perpetrators' contacts on mobile phones, disconnect from social media and report TFGBV incidents to police, while family members monitor children's phones for harmful apps used to perpetrate abuse. With regard to impact, studies have documented the consequences of TFGBV in various domains, including financial harms (Douglas et al., 2019), mental health impacts (Bond and Tyrrell, 2021; Ruvalcaba and Eaton, 2020), social impacts (Henry and Powell, 2018) and sense of perpetrators' omnipresence (Douglas et al., 2019; Havard and Lefevre, 2020). Overall, this body of research shares a common focus on how technology affects GBV victims-survivors.

2.2. Technology designs and gender-based violence

HCI research in this strand focuses on designing interactive systems – such as safety applications, conversational agents and remote technology systems – to mitigate risks and support services for victim-survivors (Bellini, 2024; Gini et al., 2024; Kim et al., 2022; Maeng and Lee, 2022; Slupska and Brown, 2022; Tseng et al., 2021; Park and Lee, 2020). For instance, Maeng and Lee (2022) develop and analyse a hybrid chatbot to determine its effectiveness for delivering relevant information and emotional support to GBV survivors. By analysing common design elements and users' experience, the authors show that the hybrid chatbot provides better-tailored information to survivors compared to an internet search. In addition, the participants felt that the chatbot excels in delivering emotional supportive messages to survivors subjected to GBV abuse (Ibid, 2022). Similarly, Butterby and Lombard (2024) show that a chatbot offers a better option for supporting victim-survivors with relevant information on GBV abuse and social support and emergency services and capturing critical evidence for legal purposes. In another study, Clarke et al. (2013) assessed a digital photo-sharing practice to help victim-survivors from abusive relationships rebuild their lives through the reconstruction of themselves and new relationships. Kim et al. (2022) implement a dialogue-based information system to provide personalised information to victim-survivors.

Recently, studies have also begun to examine the use of a range of interactive digital technologies to change perpetrators' behaviour and reduce abusive actions. For example, Bellini et al. (2021) design and evaluate digitally mediated peer support networks aimed at changing perpetrators' harmful behaviours. Other studies combine cognitive behavioural technology systems with GBV perpetrator programmes to enact a positive behaviour change (Bellini et al., 2020; Tseng et al., 2020). Researchers have also used interactive digital technologies and web-based systems to build awareness among perpetrators who claim ignorance of GBV behaviours and their effects on victim-survivors (Bellini et al., 2020, 2019; Boduszek et al., 2019; Ndjibu et al., 2017). The authors argue these systems can provoke the cultural shifts needed to alter perpetrators' perspectives through interactive digital storytelling, embodied learning, and role-play. While such interventions offer opportunities for deeper understanding to drive the required behaviour change in perpetrators, they can also produce opposite or unintended outcomes if users' agency is not reflected in the system design (Bellini et al., 2020).

Research in this strand focuses on designing and evaluating interactive systems to reduce abusive actions against victim-survivors and change perpetrators' behaviour. In our study, we examine interactive design technologies as experienced by GBV service providers, highlight related challenges and opportunities, and propose design mock-ups to support multi-agency collaboration.

2.3. Technology for GBV for multi-agency collaboration

An emerging body of HCI Research has identified interactive technologies as part of a wider sociotechnical infrastructure, embedded in the complex relationships between service providers and supporting effective communication and information sharing (Bellini et al., 2019; Butterby and Lombard, 2024). In this work, GBV is seen as an 'ecology of provision' rather than a set of isolated service providers. For instance, Bellini et al.'s (2019) work demonstrates how an online directory for domestic violence services in the UK must be understood as a critical technology tool for mediating the relationships between charities, local authorities, refuges, and justice agencies, with uneven digital capacities and contested responsibilities for maintaining information. Similarly, Freed et al. (2018) analyse technology-facilitated abuse across ecosystems involving survivors, advocates, law enforcement, and courts, arguing that effective digital interventions must support coordination and information flow across these stakeholders, not only individual survivors and perpetrators.

Freed et al. 's (2018) work underscores the need for research to design interactive technologies that support multi-agency service providers in developing collaborative responses to GBV. Emerging research from this perspective has emphasised data-sharing and visualisation tools to support multi-agency decision-making (e.g., Gityamwi et al., 2025; Taylor et al., 2021; Tseng et al., 2024). For example, Taylor et al. (2021) assess the effectiveness of COVID-19-driven digital transformation in UK domestic abuse services and call for improvements in data infrastructure and governance to address the problems of incompatible case management systems. Gityamwi et al. (2025) evaluate data-sharing and visualisation platform co-developed with police, health, social care, and other local partners, highlighting challenges of data quality, governance, and organisational capacity. Similarly, Tseng et al.'s (2024) analysis of participatory data stewardship in clinical computer-security services for GBV survivors emphasises similar issues around consent, access control, and survivor agency in cross-organisation data use. All three studies shared a consensus on the need to address long-standing problems of fragmented data sharing and case management practices across providers and statutory agencies, which often undermine data quality and delay timely delivery of services (Taylor et al., 2021).

Our study builds on this small but growing body of HCI research that focuses on interactive technologies to support GBV multi-agency collaboration. We examine a socio-technical context of multi-agency providers and propose design mock-ups of interactive technology support systems in a non-Western African setting, a region that has been significantly underrepresented in HCI research on GBV (Ngũnjiri et al., 2023; Olalere, 2022). Within this work, we position technologies for GBV response not as standalone apps but as sociotechnical infrastructures that must be co-designed with multi-agency providers, embedding accountability, trust, safety, and survivor agency into their operation.

2.4. Research framework: socially aware design

Socially Aware Design situates the understanding and practice of system and technology design as a 'social phenomenon' that involves the socio-cultural and technical contexts in which humans operate to influence technology design and impacts on society (Baranauskas, 2021; Pereira and Baranauskas, 2015). Conceiving and introducing a new technology in the context of SAwD requires understanding different perceptions of the problem through the lenses of diverse stakeholders and how the technology under construction is expected to impact society (Baranauskas, 2009, 2014; Baranauskas and de Almeida Neris, 2007; Pereira and Baranauskas, 2015). This differs from traditional views of software development, which focus on the technical aspects such as identifying and defining functional and non-functional requirements (da Silva et al., 2016).

The SAwD framework is inspired by Organisational Semiotics (OS) theory, which views an organisation as a layered set of informal, formal, and technical systems (Stamper, 1993; Liu, 2000). The informal system involves organisational culture and members' beliefs and habits, the formal consists of established conventions, norms and laws, and the technical level includes highly formalised aspects that can be addressed and supported by technical means (Stamper, 1993; da Silva et al., 2016). Together, these layers form what Stamper (1993) calls `*organisational onion*', illustrating how technology design is embedded within informal, formal, and technical aspects. The SAwD framework extends this theorisation by presenting design as a dynamic, three-layer process that originates in society, first engaging with the informal aspects (e.g., people's values and beliefs), then with the formal aspects (e.g., regulation) towards the construction of technical systems. The technical design layer, on the other hand, impacts the formal and informal layers alike and can influence society. We illustrate this in the adapted figure below from Baranauskas' (2014) work, which frames the interactive design process as the coexistence of informal, formal, and technical information levels nested within a social context (Stamper, 1993; da Silva et al., 2016) (Fig. 1).

SAwD has been applied both as a theoretical and methodological framework in the design of interactive systems and technologies that involve active user participation in their social context. This includes the design of interactive TV (Buchdid et al., 2014), healthy behaviour change games (Ferrari et al., 2020), early design support tools (da Silva et al., 2016), and e-citizenship artefacts (Baranauskas et al., 2024).

In this present study, SAwD is the theoretical and methodological framework to understand design contexts and to co-create interactive technology solutions that support effective multi-agency collaboration and communication. We argue that innovation can fail if it is treated only as a technical matter and not aligned with people's perceptions, practices, and existing regulations (Baranauskas et al., 2024; Baranauskas and de Almeida Neris, 2007). Therefore, we use the SAwD framework to bring together key stakeholders and a socio-technical team to explore the informal, formal, and technical knowledge layers and their interdependencies, to define design problems and propose solutions to support GBV multi-service providers (da Silva et al., 2016). In this approach, real, embodied people (or groups) with diverse skills, histories, worldviews, and cultural values participate as interested parties in the technology codesign process to improve GBV prevention and response using HCI.

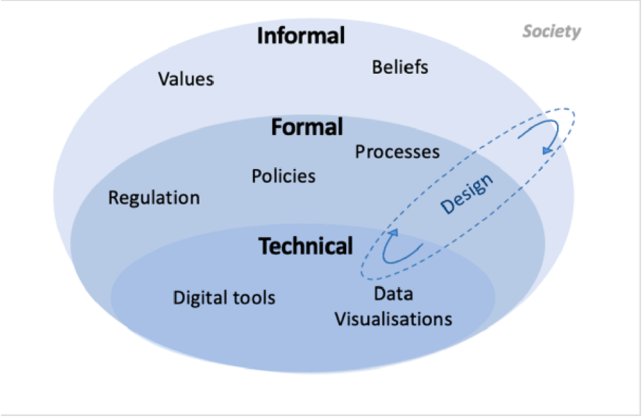

Fig. 1. Three layers in the socially aware design, based on Baranauskas (2014).

3. Research methodology

3.1. Study context

This paper reports on a study that aimed to design user-centred interactive technology systems to support efforts to combat GBV by improving evidence gathering, communication, data sharing and coordination among healthcare providers, the police and support service organisations. In Sierra Leone, current efforts to address GBV have included the enactment of several legal frameworks (e.g., the Domestic Violence Act, Child Rights Act, Customary Marriages and Divorces Act and Sexual Violence Act), which have underpinned extensive outreach activities, awareness campaigns and the delivery of GBV healthcare and support services (Martin et al., 2021; Teale, 2009). Despite these measures, deeply rooted social norms and weak multi-agency coordination continue to hinder effective GBV response and prevention.

Delivering GBV services in Sierra Leone requires timely, coordinated action among multi-agency stakeholders, including policymakers, the police, social support organisations, family support units, and healthcare providers (Parks et al., 2020; WHO, 2020). Coordination is further complicated by a complex, manual referral pathway for GBV cases (Fig. 2). Therefore, the project focused on developing appropriate technology solutions to improve and strengthen the referral system and the multi-agency processes involved in addressing GBV.

The study was guided by the premise that well-informed collaboration among the health sector, police, justice system, and other relevant sectors can help prevent GBV or enable a more effective response after abuse occurs (Parks et al., 2020). It also draws on evidence that multi-agency coordination works best when robust communication channels, shared data-management systems, and effective information and knowledge-sharing mechanisms are in place (García-Moreno et al., 2015). The study brought together potential users and a trans-disciplinary team spanning web and mobile technologies, human-computer interaction, technology for development, and women-centred organisation to collaboratively research and design solutions.

3.2. Study design

In applying Socially Aware Design in this study, we positioned the research within participatory design in HCI. Research shows that a participatory approach in HCI reveals the complexity of design problems and solutions through engaging with different stakeholders (da Silva et al., 2016). Capturing the complex, situated experiences and contexts of the stakeholders through collaborative engagement in the design environment can generate meaningful knowledge, inform design solutions, and reveal the impacts of the technological systems (Bredies et al., 2010). This aligns with Krippendorff's (1996) notion of 'second-order understanding' in the design process, which posits that if technologies are to be useful, usable, and understandable, design should be grounded in the context of users.

We operationalised a participatory approach through co-design. By co-design, we mean a participatory sense-making process in which multi-agency providers and researchers jointly developed shared understandings and collaboratively designed interactive GBV systems (Baranauskas et al., 2024). We combined both socio-technical research

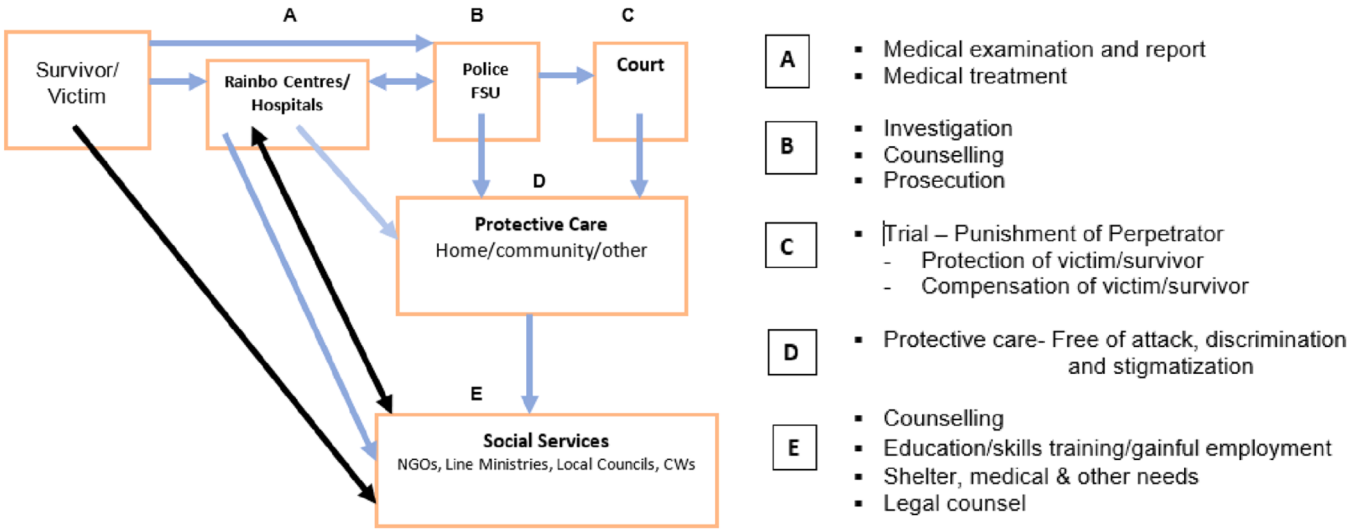

Fig. 2. Sierra Leone GBV Referral Pathway.

and participatory workshops to generate data and define design problems and solutions grounded in the informal, formal, and technical knowledge shared by GBV multi-agency providers.

3.2.1. *Sociotechnical research*

The socio-technical research aimed to explore the social (people's beliefs, practices, organisations, laws, norms) and technical (systems, digital tools, infrastructure) as inseparable dimensions for the design of interactive systems (Baxter and Sommerville, 2011; da Silva et al., 2016). We adopted the socio-technical research design as a social inquiry approach because it helps bridge the gap between users' contexts and the designed systems, thereby delivering a better impact to users (Baxter and Sommerville, 2011). In other words, socio-technical research design makes systems more usable, useful, and adopted in practice, as underscored by Krippendorff (1996) and further emphasised in Baranauskas et al.'s (2024) work on the application of SAwD in HCI research. The socio-technical research in our study employed a combination of qualitative interviews and quantitative surveys to generate complementary data, enabling a deeper understanding of the context and informing the co-design of the mock-ups.

3.2.1.1. Qualitative interview. We conducted semi-structured interviews with seven participants from GBV organisations. We purposefully selected the seven participants as key informants from organisations that lead GBV response and prevention efforts. We did not include GBV survivors or victims, as the study focused on co-designing interactive technology systems for multi-agency providers. Consistent with methodological guidance that qualitative sample size should be judged in terms of information depth and data adequacy rather than fixed numerical rules (Malterud et al., 2016; Vasileiou et al., 2018), we considered the seven interviews with highly specialised GBV stakeholders sufficient to address the focused research aim.

The interviews aimed to generate first-hand insights into GBV contexts and digital infrastructure and assess the need for interactive technology solutions to support multi-service providers. We focused on generating data on stakeholders' experience of GBV response and prevention (e.g., reporting, referrals, and data management), socio-technical contexts, challenges, technology needs, and facilitators. Each interview asked detailed questions of organisational practices, service delivery, communication patterns, challenges, and technology needs. Interviews were conducted face-to-face, mostly in participants' offices. Each interview lasted 1 to 2.5 h. All interviews were audio-recorded, translated, and transcribed for analysis.

During analysis, we observed substantial overlap among the themes that emerged, suggesting that additional interviews were unlikely to generate significantly new insights. This aligns with prior research showing that key themes in homogeneous samples can be identified within a small number of interviews (Guest et al., 2006; Hennink et al., 2017). Our analysis similarly showed recurring issues across participants, indicating sufficient depth and richness in the data for this study (see also Braun and Clarke, 2021). Given the sensitive nature of GBV work and the intensive, semi-structured interview format, a small but information-rich sample was sufficient to meet the study objectives.

3.2.1.2. Quantitative survey. The aim of the qualitative interview phase was analytic rather than statistical generalisation—that is, to provide rich, contextualised insights that readers can judge for applicability to their own settings, rather than to make population-level claims (Lincoln and Guba, 1985; Miles, Huberman, and Saldaña, 2014; Polit and Beck, 2010). Thus, because our qualitative phase involved only seven participants, the findings cannot be statistically generalised to all GBV service providers in Sierra Leone. The small, non-probability sample limits representativeness and prevents robust estimation of prevalence or distribution of views. To address this limitation in terms of wider generalisability, we complemented the qualitative work with a quantitative survey administered to a larger sample, allowing more conventional population-level inferences about selected patterns.

A total of 70 participants responded to the survey questions out of 100 participants invited from multi-agency providers, including the family support unit (FSU), Non-Governmental organisations (NGOs), UN Agencies, Legal Sector, and the line Ministries. The survey confirmed issues arising from the interviews and provided additional evidence of patterns within the target audience to inform the design of the interactive technology system. The survey questionnaires were administered via the Jisc Online Survey. It included several multi-answer items to capture the range of tools used, challenges experienced and support needed, allowing respondents to select more than one option.

We used a purposeful sampling approach targeting relevant stakeholders operating across all districts in Sierra Leone, as depicted in Table 1 below.

As shown in Table 1, most respondents (89.9%) were primarily affiliated with a single sector, while 10.3% reported affiliations with more than one sector. The NGO sector accounted for the largest share of affiliations (61.8%), followed by healthcare (16.2%), education (14.7%), and government (13.2%). In terms of geographic distribution, 14.7% of organisations operated across all districts in Sierra Leone. Most operated in the Eastern Province (45.6%), while activity in the Southern (7.4%) and Northern (11.8%) Provinces was lowest. Activities were

Table 1
Demographic distribution of organisations and institutions surveyed.

	Frequency	Percentage
Affiliated Sector		
Government	9	13.20%
Law enforcement	5	7.40%
NGO	42	61.80%
Legal	4	5.90%
Healthcare	11	16.20%
Education	10	14.70%
Community and Religious Groups	7	10.30%
Other	1	1.50%
Affiliated with more than one sector	7	10.30%
Operation Districts		
Western Rural	15	22.10%
Western Urban	16	23.50%
Eastern Province	31	45.60%
Southern Province	5	7.40%
Northern Province	8	11.80%
All of the above	10	14.70%
Most Active Areas		
Rural Areas	37	54.40%
Peri-Urban areas	26	38.20%
Urban areas	12	17.60%
All of the above	14	20.60%
Others	1	1.50%

Note: Questions are multiple choice, hence, 100% would represent that all this question's respondents chose that option.

concentrated in rural areas (54.4%), followed by peri-urban (38.20%) and urban (17.6%) areas. Around 20% of organisations operated across all three area types, and 1.5% operated in other areas bordering communities.

We acknowledged that the demographic and professional profile of the respondents affects how broadly the findings can be generalised. As such, our sample reflected those organisations that chose to participate and had access to the online survey, which may over-represent certain regions, organisation types, or roles within GBV service provision. Consequently, the data provided a useful snapshot of these stakeholders' perspectives, but they did not constitute a statistically representative profile of all GBV service providers in Sierra Leone. In line with guidance on external validity in applied research, the results should therefore be viewed as contextually grounded insights that may or may not transfer to different organisational or national settings (Rudolph et al., 2023; Polit and Beck, 2010).

Furthermore, because the survey relied on self-report, we were mindful of potential response bias. Questions focused on sensitive issues around GBV work, organisational practices, and technology use, all of which may encourage socially desirable responding or under-reporting of problems. For example, participants might downplay gaps in service provision or overstate compliance with best practices. We sought to minimise these effects by assuring confidentiality, using neutral wording, and allowing participants to skip questions. Nonetheless, some degree of response bias is likely, and reported patterns should be interpreted with this in mind (Bogner and Landrock, 2016; Tellis and Chandrasekaran, 2010).

Finally, the inclusion of several multi-answer items has limitations; the reported presentations, percentages, and frequencies should therefore be interpreted accordingly. Respondents may "satisfy" by selecting only the first few options that resonate with them rather than systematically considering each option, which can lead to under-reporting of later-listed or less relevant categories and introduce order effects (Pew Research Center, 2019). Multi-answer questions also complicate comparison across items, as the likelihood of endorsement is influenced by both the response format and the number of options presented. These factors may mean that some needs or practices are underestimated in our data, and the frequencies reported for multi-answer items should be treated as indicative rather than precise estimates of prevalence.

3.2.2. *Participatory design workshop*

We used the interview and survey findings as a deliberate bridge into the participatory design workshops so that the co-designed mock-ups were grounded in the realities of multi-agency GBV work rather than in abstract "ideas about technology." In developing these sessions, we drew on participatory sensemaking by bringing together diverse stakeholders to deliberate and co-construct the design mock-ups (da Silva et al., 2016). The aim was to facilitate intersubjective engagement among participants and to ensure a workable design process through informal, formal, and technical layers along the design lifecycle (Baranauskas et al., 2024, p.4).

First, we thematically analysed the qualitative interviews to map the design space across the informal, formal and technology layers, as illustrated in Fig. 3.

The analysis helped us understand the sociocultural, organisational, and technical contexts and challenges, as well as stakeholders' own suggestions and expectations for technology to support multi-agency providers. From the analysis, we derived key design requirements and scenarios (for example, safe referral pathway management, services data integration, and cross-organisation information sharing with privacy safeguards). These themes directly informed the initial agenda and materials for the workshops (personas, journey maps, example workflows and "problem cards" used as prompts).

Second, we used the survey to validate and prioritise what emerged from the interviews. Items in the questionnaire were developed from the interview themes, allowing us to: (i) quantify how widespread challenges and practices were, (ii) identify which needs were most frequently reported or rated as most critical; (iii) see differences across sectors (NGO, healthcare, education, government, and regions. These quantitative patterns then shaped both who we invited to the workshops and what we asked them to work on. For example, we used the demographic and sectoral distribution from the survey to ensure that workshop participants included representatives from the main provider types and regions identified, rather than over-relying on a single sector. We also selected and combined design prompts around challenges that were both (a) strongly emphasised in interviews and (b) highly prevalent in the survey (e.g., breakdowns in referral pathways, fragmented record-keeping, difficulties accessing or sharing case information safely).

In the design workshops, insights from the interviews and survey were translated into concrete design tasks. Participants worked with realistic scenarios, user journeys and constraints drawn from the earlier phases and used them to sketch interfaces, data flows, and interaction patterns for interactive mock-ups. In this way, the workshops functioned as a synthesis stage: qualitative data provided depth and context, the survey added breadth and prioritisation, and together they supported

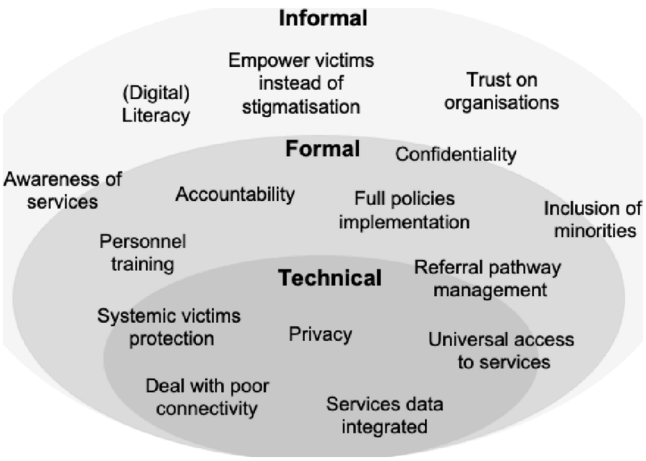

Fig. 3. Informal, formal and technical factors to address GBV in Sierra Leone.

the co-design process in the everyday practices, constraints, and needs of multi-agency GBV providers.

We ran three two-hour sessions. In the first, we presented the research findings and invited participants to discuss them through questions and answers and perform scenario walkthroughs and user journey activities. This was followed by group discussions to identify design requirements. The aim was to confirm that the findings reflected participants' experiences, generate missing or new insights and refine the design requirements. The second session focused on design tasks, including exploring alternative design scenarios and sketching ideas using screen-based sketching tools. In the final session, we held an open dialogue in which participants reflected on and refined the mock-ups, explored opportunities for public–private partnerships, and outlined a plan for their implementation.

3.2.3. Data analysis

We combined Braun and Clarke's (2006) thematic analytical approach with a socially aware design framework, which enabled us to address different but complementary aspects of the analysis. Thematic analysis provided a reflexive process (familiarisation, coding, theme development, review, refinement, and reporting) for making sense of the data and generating and organising codes into themes (Braun and Clarke, 2006). The Socially Aware Design framework, in turn, offered a conceptual lens for socio-technical interpretation, allowing us to establish the relationship between people and society, as explicitly attending to sociocultural values, power relations and contextual constraints in interactive system designs (Baranauskas, 2009; Baranauskas et al., 2024; da Silva et al., 2016).

In practice, we used thematic analysis as the analytic procedure and SAwD as a theory-driven guide for organising and interpreting themes. To apply thematic analysis, we followed Braun and Clarke's (2006) phases. We started by manually analysing the interviews and open-ended questions of the survey, working exclusively from the participant experiences. Two researchers initially read and re-read the dataset to familiarise themselves with it and get the dataset in a consistent and organised format for analysis in NVivo 12 – a Qualitative Data Analysis (QDA) software by QSR International. In NVivo, we systematically analysed and coded each dataset. As the analysis progressed, a table of the emergent codes was developed and refined. Each new transcript led to codes being further expanded or adjusted. Once all the dataset were analysed, researchers refined each code to identify any duplicate coding or emerging patterns. Upon completing this, the themes were developed, refined, and named.

While coding was conducted following Braun and Clarke's phases, the socially aware design framework shaped a deductive reading of the data by sensitising us to how experiences, challenges, and design ideas related to sociocultural practices (informal layer), organisational rules and roles (formal layer) and digital infrastructures and tools (technical layer). This combination allowed us to produce themes that were both empirically grounded and directly actionable for the co-design of interactive systems with multiservice GBV providers. Fig. 3 above illustrates the relationship between the emerging themes and subthemes from the dataset. It shows how we structured the themes across the informal, formal, and technical layers to inform socially responsive, value-oriented design of the interactive systems. Furthermore, along with the qualitative data analysis, we also analysed the questionnaire survey data using a simple descriptive statistics approach through JISC. We analysed and made inferences from the data.

3.3. Ethical considerations

We obtained ethical approval from the university ethics committee, and the study was conducted in line with institutional and legal ethical requirements. Participants received an information sheet and consent form, and participation was entirely voluntary, with the option to withdraw at any time up to the point of data analysis. Given the sensitivity of GBV, data management complied with the Data Protection Act, General Data Protection Regulation and the university's data storage and management policies. With participants' explicit consent, data were collected in audio and written formats (interview recordings and survey questionnaires). All potentially identifying or sensitive information was fully anonymised. Field data were stored temporarily on a password-protected project laptop and backed up to a password-protected external hard drive. After fieldwork, audio data were transcribed, and all personal identifiers were removed or replaced with unique codes.

4. Results

4.1. Socio-technical factors

In this section, we present the results of the qualitative and quantitative analysis of the socio-technical factors, comprising three themes: informal cultural values and belief systems, formal contextual and policy factors, and technical and data management practices. Within each theme, we analyse in detail how contexts and practices characterised by participants' experience provide the basis for co-creating interactive technology solutions for effective multi-agency collaboration and communication.

4.1.1. Informal – value and belief systems

4.1.1.1. Cultural patriarchal beliefs, normalisation and stigmatisation of GBV. In Sierra Leone and many other parts of Africa, entrenched patriarchal cultural beliefs and norms can be seen to perpetuate GBV and reinforce girls and women's subordinate role in their communities. Operating within this profound cultural system, it is common for GBV to be normalised. Alongside a variety of reasons, normalisation characterises how society envisions men, women, and children's role in GBV both as victims and perpetrators. To this end, participants explain that men have been reported to be taken less serious when attempting to report GBV compared to women, as organisation 4 echoes.

> "Reporting on the men's side of GBV is at a low level. Given the Sierra Leone society viewpoint, a man going to report his wife that he has been violated, for most of us, people see that as a funny thing, and sometimes you are not being taken seriously. But that does not mean it will not happen. So, we need to address the issue holistically irrespective of your gender. That is why our services are not gender biased. We provide services to men, youths, and LGBT" (Organisation 4).

From this, we learn that while men and women can experience GBV, the cultural norms and beliefs can be seen to recognise men predominantly as perpetrators rather than victims of GBV. As a result, it is uncommon for men to report as GBV victims. Thus, as the participant reports, adopting a holistic approach and a safe reporting system for both genders is critical for addressing bias in the GBV prevention and response efforts.

The culture of normalisation embedded within the patriarchal norms also extends to how social relations of power are negotiated and exemplified in the culture of 'blame game' and 'social support withdrawal.' The results show that women who attempted to report GBV incidents risk experiencing community backlash, and to some extent, lost social and economic support from family members such as their husbands. Organisation 4 explains:

> "Sometimes even when some women are violated and you tell them to go and report, they will say he is my husband, and we have kids already. If I report now and he decides to leave me, my kids will leave me too."

This implies that women relegated and oppressed by traditional

customary beliefs are blamed by the community and family when they pursue their rights, especially against perpetrators of close relations/spouses. Participants report that a practice of such nature has instilled fear in women to report. For example, as mentioned by organisation 4, 'some women will tell you how a friend of theirs is experiencing GBV in a marital status or intimate partner relationship, but they will not report, and that is the bigger challenge'.

The result offers further insights into the extent to which GBV is entrenched within the patriarchal norms where women and girls are culturally oppressed and subjugated to negative social gender and sexual roles. A participant from organisation 3 explained that part of this negative gender role involves the objectification of girls as sex objects:

> "Men and boys often view women and girls primarily as sexual objects. In some cultures, this is deeply rooted in tradition. For example, during marriage ceremonies, people may say that a daughter is being "given" to a husband for sex. Messages like this reinforce the idea that women exist mainly for men's sexual use. As a result, many men grow up thinking about women and girls in a sexual way, and these attitudes become entrenched in social norms…"

This participant made it clear that sexual objectification shapes social gender roles and reinforces harmful gender stereotypes that normalise GBV against women and girls. It is within this context that we must evaluate how GBV organisations use digital technologies to challenge dominant cultural practices and to support innovation, multi-agency coordination, communication, and information sharing.

Another core feature of the cultural norms that GBV organisation staff confront is the stigmatisation of women survivors by community members, who tend to assume that GBV is often triggered by women's behaviour. According to the participants, stigmatisation impacts the honour and respect of the family victims, and it is identified as a norm that erodes the motivation of family and victims to report GBV assaults. Understanding what it looks like for organisations to operate in this socio-cultural context provides insights into what technology systems to deploy to mitigate the cultural practices and improve GBV reporting and response.

4.1.1.2. Low level of literacy. We found that the deployment of interactive technology systems for GBV prevention and response requires at least a basic level of functional and digital literacy. Much of the information used for awareness-raising, as well as policies, regulations, and guidelines on GBV rights, reporting and service delivery, is written in English, which most victims/survivors do not fully understand. In addition, 24 organisations (35 percent), as reported in the quantitative survey, indicated that they use digital technologies (e.g., mobile applications, Primero) and social media platforms such as Facebook and WhatsApp to deliver GBV services. This implies that GBV victims/survivors who lack digital literacy are missing out on critical GBV services. One participant explains, *"It depends on the categories you want to enquire and the services to deliver, you have women who are out of schools, they are not lettered to the extent of those who are lettered"* (Org 7). The concern about literacy was also echoed by several participants, who explained that low general literacy levels, and particularly low digital literacy, make it difficult for victims to obtain information about their rights and available support while navigating complex, male-dominated socio-cultural structures. In this regard, Organisation 7 further emphasised the importance of considering non-literate women in the design and implementation of digital systems, as they are particularly likely to be excluded or adversely affected:

> "So, for me, when we are using technology, how do we also consider those who are not literate – how will they use the services? It seems designed only for those who can read and write, yet most of those affected are the ones who cannot read and write." (Organisation 7)

While the focus of the study is on multi-agency collaboration, the result implies that for organisations to work effectively and deliver equitable and accessible services, the design must be useful to GBV victims and those at risk of experiencing GBV.

4.1.1.3. Organisational trust, belief and perception of digital technology. The survey results show that different organisations work at different national and community levels to deliver GBV services. Participants report that it is important for these organisations to trust each other and for victims to trust in the enforcement of GBV laws and delivery of services by these organisations. To build trust and deliver GBV services, many organisational participants viewed digital technologies as important tools for facilitating service provision. As Organisation 7 explained:

> "I think for me digital technology is very helpful because, given the dynamics now, it is often very difficult to access communities directly. So, having digital technology is easy for immediate reporting, flow of information, access to services and even coordination of response."

Some participants demonstrated a clear understanding of the technologies needed to support effective GBV service delivery, particularly in improving communication, information management, and organisational record-keeping. As Organisation 5 explained:

> "Except for the phone, the internet is particularly useful because it keeps records. Once you send an email, there is a retrieval system. It does not matter how long ago it was sent…when it becomes necessary, you can track your information, and you have evidence to show what happened and the steps you took."

Another participant believed that the use of technology can improve work efficiency and time management.

> "Technology helps reduce the time spent on tasks at the Centres and makes data available in real-time. It also simplifies the work of, for example, the executive director. If there is an emergency meeting at short notice, they can simply access the dashboard and quickly prepare their input" (Organisation 6)

Although the participant did not specify the type of technology used, the findings indicate a growing emphasis on the use of technology in GBV-related activities. However, a further analysis of the survey data provides a more diverse perception and use of digital technology with social media applications (75%) and WhatsApp (68%) emerging as the most dominant tools, along with traditional radio and TV (58%) by organisations.

A further analysis of the interview data reveals that while some participants were optimistic about the perceived use of digital technology, they also identified problems of accessibility. Their ability to deploy the technology depends on the likelihood of accessing and using the technology effectively. One participant explained: "*With technology, if everybody has access to that technology and is within the understanding and knowledge, do you have access to it? I think it will be helpful"* (Organisation 1). Some were also sceptical about the cultural barriers and negative perception that the technology may be used to monitor them. As a result, despite the perceived usefulness of technology, the cultural and behavioural practices may impact the adoption and use.

> "Technology is something culturally, in our community, people are afraid to use. People just believe that no sooner you use the technology they track you. And so, for that many people are afraid. People just believe it is about monitoring me, so even if you put a case management system at the FSU for them to believe that, this system is to make our work easy and to provide services they think you are going there to monitor what they are doing (…) So if you want to develop a software you have to look at the cultural perceptions and behaviours of people and develop it in a context that really

accept the norms and practices, (even if not all - It is difficult to accept all) but to see how you influence it and people change" (Organisation 2).

Indeed, some participants suggested that in order to embed technology in this deep-rooted cultural and social context, the design and deployment of any systems should be inclusive and focus on addressing the scepticisms and negative beliefs and perceptions of the users that could militate against adoption and usage.

4.1.2. Formal

4.1.2.1. Inclusive policy, confidentiality and accountability. The participants recognised GBV as an extremely sensitive social problem that requires organisations to be confidential and accountable in operationalising prevention and response efforts. The analysis of both the qualitative and quantitative socio-technical data reveals that confidentiality and accountability can improve the protection of victims and increase the propensity for GBV reporting. When victims/survivors feel protected, they are likely to report incidents and seek the necessary support. As a result, the participants reinforce the importance of data confidentiality and accountability as critical in the response and prevention of GBV, but not all organisations have the appropriate information control systems in place to maintain data confidentiality. Organisation 5 expressed it succinctly: "*Confidentiality should be key in the transfer of information in these situations. However, most service providers lack an information control system as a preventive measure*." The quantitative data showed similar concerns around confidentiality. Approximately, 62% (45 participants) identified data confidentiality as a key priority for developing a new GBV digital case management system.

The concerns surrounding confidentiality and accountability result partly in the limitation or resistance by some organisations to share GBV data. One organisation stated, "*For us we do not really share; child data on GBV is sensitive, so we do not share that because we do not provide direct services. We only collect information related to child protection and the assigned safeguarding person of the child*" (Organisation 3). Another organisation mentioned that they first examine the appropriateness of the information and the designated organisations before sharing to ensure confidentiality and accountability.

> "We need to assess the appropriateness of the information we hold—who it should be shared with and the relevance of the institution receiving it. Sharing data is not something we do lightly; it must be purposeful and directed toward those who genuinely need it and for a clearly defined reason" (Organisation 4).

According to the quantitative data, current sharing arrangements exist between GBV organisations and government agencies, including the essential line ministries such as the Ministries of Gender, Health and Education, the Sierra Leone police, community stakeholders, and international NGOs. Considering the sensitive nature of GBV information, organisations share only limited critical information related to GBV prevention and response. At the time of conducting this research, the participants reported sharing information and data on GBV case progress reports (72%), referred cases (52%), the number of GBV perpetrators (50%), gender policies and regulations (42%) and referral procedures (40%). The current data and information-sharing arrangements for GBV organisations focus primarily on compliance with the referral protocols outlined in the Sierra Leone Government's GBV strategy. However, they fall short of facilitating multi-agency collaboration for effective data sharing, and they fail to support the timely, demand-driven delivery of services that are essential for addressing the critical needs of GBV survivors and victims. Thus, the results suggest that, while confidentiality is important in preventing and responding to GBV, limited control over data sharing affects its flow. The limitation or lack of data sharing can lead to decentralisation of GBV data, potentially increasing the risk of managing sensitive data by organisations with weak and insecure data management systems.

The development of sound data privacy policies emerges in the research data as one of the approaches to address the issues of accountability and confidentiality in GBV prevention and response. However, the participants reported that a significant gap exists in policies tailored specifically to addressing issues of confidentiality, coordination, and legal procedures. Even when policies are in place, they are not always fully implemented as Organisation 2 explained: "*GBV in Sierra Leone is still endemic, and the existing laws and policies are not fully implemented due to several perennial challenges"*. The analysis also highlights that the absence of policies regulating access to the confidential information of victims and survivors receiving support care often leads to gossip and negative stereotypes within the community. "*The lack of confidentiality as, informally, people within communities spread gossip and defamation about GBV cases*" (Organisation 4). Collectively, the results suggest the critical need for combined data privacy and security policy and technology interventions to address the problems of data sharing confidentiality, coordination and safety both at the community and organisational levels. The analysis reveals that adopting this approach can enhance confidence in GBV incidents reporting, promote accountability of cases and services provided and accelerate evidence-based decision-making processes among all stakeholders, including community leaders and policymakers.

4.1.2.2. Awareness, personnel training and capacity building. The research found that limited awareness exists among some organisations regarding technology use and services delivered by multiple institutions in the GBV domain. The lack of awareness results in the duplication of services and reinforces the challenges of allocating limited available resources to critical GBV response and prevention efforts. Others expressed that the use of digital technology to facilitate multi-agency collaboration could bridge the gap between organisations in terms of knowledge sharing and services. However, some participants felt that the use of digital systems could further widen the gap between organisations. One set of concerns was rooted in the belief that organisations with limited knowledge and technical resources could experience more challenges to build awareness: "*The lack of awareness regarding digital technology and services delivered by other institutions is greater especially by GBV organisations working in the rural areas with limited technical resources*" (Organisation 6).

The analysis of survey data shows 63% of the participants identified raising awareness through training as one critical way to build the organisations' capacity in terms of both multi-agency collaboration, service delivery awareness, and relevant digital skill development. "*To build appropriate awareness, we need to train personnel dealing with GBV on systemic services and procedures and digital skills. This includes police forces, court members, councillors, and governmental agents" (Organisation 3)*.

Some organisations reported having begun building this awareness through approaches such as community mobilisation, training, and networking:

> "Community mobilisation through awareness raising around issues of change of behaviour, rape, FGM, GBV and other harmful practices against women. Establishing networks that effectively monitors and seeks out referrals to the institutions concerned. We train male advocates and peer educators (MAPEs) to act as change agents to ensure change is permanent in the communities. We also establish husband schools where men are taught on how to be exemplary fathers." (Organisation 4)

> "We have raised a lot of awareness in the communities in which we work and therefore people can report because we raise awareness, we have trained people on the referral pathways they know where to go, and that what we do (We do that through the radio discussions, through our community engagement, through our meetings because

apart from us doing GBV, we also work on what we called safe guarding, and for safe guarding, those are all the issues that are in there because you should ensure that your project participant are safe). So, we work with those as well" (Organisation 5)

In hindsight, the findings suggest that, within the context of this research, enhancing services delivered through technology requires a shift in the mindset of personnel involved in GBV service delivery. This can be achieved by raising awareness and empowering GBV sector staff to use innovative digital technologies to support their work.

Fig. 4a shows the current technologies used to empower stakeholders and support GBV-related service provision in Sierra Leone, including awareness raising, data collection and reporting, training and knowledge sharing, evidence gathering and reporting (see Fig. 4b). WhatsApp is the most used digital platform, followed by radio and television, and other social media platforms such as X and Instagram.

These technologies are essential tools for supporting GBV organisations in strengthening evidence gathering, communication, data sharing, and services delivery coordination, particularly in resource-constrained settings. However, given the increasing demands for privacy, protection, confidentiality, and accountability—alongside the need for effective service delivery to achieve large-scale impact—some participants expressed the need for a more robust and comprehensive technical system.

4.1.3. Technical

4.1.3.1. Centralised referral pathway management. The empirical data provides insights into how different GBV organisations report, refer and manage GBV incidents. Essentially, the existing GBV referral pathway mentioned earlier offers a protocol and framework to guide organisations in the response to GBV. According to the referral pathway, when an incident occurs, the victim or survivor should report the abuse to designated organisations or centres, such as the Rainbo Centres. These organisations or centres will then refer the incident to other relevant institutions within the GBV prevention and response ecosystem, such as the police, family support unit, court, hospital, and social care. One participant explains, "*We use the government referral pathways to direct the cases to the FSU and the court and leave the person on his or her own. When we receive GBV abuse reports from the communities where we work, we also inform our headquarters and FSU*" (Organisation 2). Another participant continues saying, *"we use the referral system as a process of sharing from survivors and other organisations and assessment of GBV incidents, which also form part of the referral protocol"* (Organisation 4). Ideally, the referral pathway offers a structural protocol to report incidents to the appropriate authorities, so the victims or those at risk of experiencing GBV can seek justice and receive the necessary health care, and psychosocial support and protection that they need. However, these quotes, along with other information from the participants, suggest that GBV reporting is predominantly seen as the 'end goal' rather than as 'means to an end' – that is, as a means for the victims to receive the necessary support, care, and justice.

The limitations of GBV reporting are further compounded by the manual nature of the referral pathway protocol, which some participants have described as either weak or unworkable in practice.

> "…we have a whole national referral pathway system but the effectiveness and efficiency of that referral system when it comes to practical reality is not something that I think is still working adequately" (Organisation 2).

> "We have a referral pathway, but it is weak. If I report to the FSU, they are supposed to accompany me, as a victim, to the health centre, but most of the time, what happens when you report they just give you a paper and say go to Rainbo. According to the referral system that we have, the organisations are supposed to go with the victims to the police, but they are not doing that (…). Even with the one-stop centres, because they are not fully equipped, they still ask the victims to go to FSU" (Organisation 3).

These quotes suggest that many victims or survivors are unlikely to progress beyond the initial reporting stage, due to the manual nature of the reporting process and the resources required to navigate between different service providers. Some participants reported that the manual handling of GBV cases could sometimes take months as they move through different institutions. Thus, the manual process may reduce the likelihood of capturing critical evidence required to prosecute the perpetrators and for the victims to receive timely care and support.

To address the limitations in the existing referral protocol, some organisations have developed alternative referral systems to help facilitate reporting processes at the community level.

> "…we have a referral strengthening process through our volunteers within the community. When there are cases of abuse of GBV, the volunteers directly work with the survivor and refer them to access services available within their local communities, if referral centres are not established across districts where we operate" (Organisation 7).

> "…we have trained people on the referral pathways, so they know what we do and where to go. We do that through the radio discussions, our community engagement, and our meetings…" (Organisation 5).

The use of the alternative approaches is currently limited to a few communities where specific organisations operate. The approaches may also be problematic when dealing with sensitive cases and data, creating a risk of breaching privacy. However, given the widespread nature of GBV issues in the country, the participants emphasised the need for a robust national system that can deliver timely reporting and

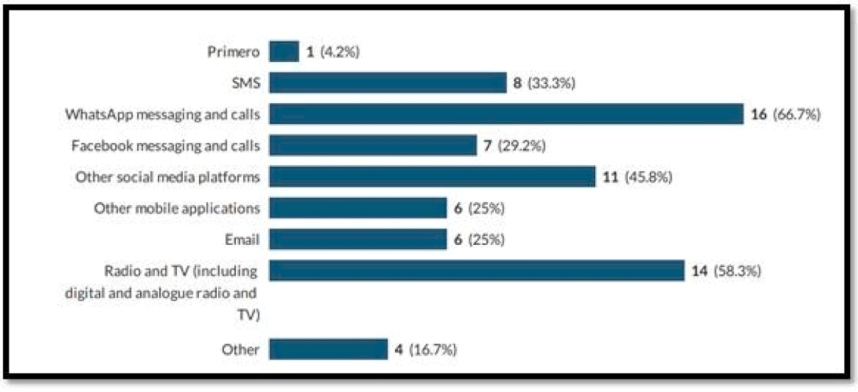

Fig. 4a. Existing technologies and media.

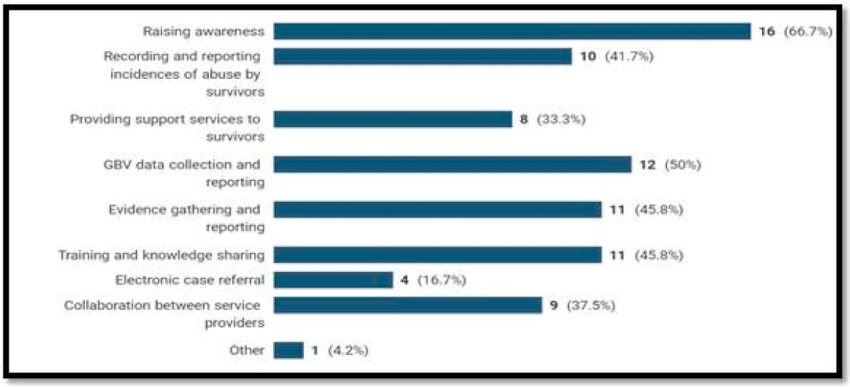

Fig. 4b. GBV services delivered.

collaborative multi-agency service delivery. To this end, some participants suggested developing a comprehensive system that can streamline processes, track cases, and facilitate timely reporting and data management.

> "…there should be a system to track cases, so if I report a case and I want to know where the case is, I can (…) track it just like the ASECUDA – you can track where your container is…" (Organisation 3)

> "There has not been any constructive and comprehensive referral system, although we have the national referral pathway that shows how to refer cases from one sector to another sector…However, when it comes to practical reality, it is not something that I think is still working adequately" (Organisation 2).

In all, participants revealed the need for a centralised, technology-enabled referral pathway management system, where different organisations and service providers—such as medical, legal, social, and psychological support services—can collaborate, access up-to-date information on each GBV case and deliver timely services.

The need for, and expected features of, such a digitally referral pathway emerged from both the survey and interview data. For instance, Fig. 5 depicts the expected features and functions of the system.

Analysis of the qualitative data sheds further light on the expected requirements of the new system, such as user-friendliness, comprehensive functionality, and integrated features including GBV incident reporting, local demographic information, and access to relevant resources. Organisation 1 clearly articulates:

> "I want to see the different types of cases that have been inputted in the database, I want to see the incident, I want to see the locations where these cases are coming from across the country, I would like to see the gender, the age range of the victims or survivors or whatever information, yeah. I also want to see resource materials that they think will also be helpful to reference to get more knowledge or understanding about GBV issues, especially in relation to our country, Sierra Leone."

The findings highlight participants' strong emphasis on improved referral pathways to enable effective, secure case and information sharing. Given the sensitivity of GBV, it is unsurprising that they stressed the value of secure systems to expedite referrals.

4.1.3.2. Data privacy and protection. Data collected from GBV reporting is sensitive, and participants emphasised the need for it to be stored, shared and used carefully to ensure both the privacy and protection of the victims. Participants maintained that collecting, storing, and sharing GBV data has its own inherent challenges, particularly in the context where GBV organisations independently collect and manage their own data in different forms. From the survey data, 52% of the participants reported to use an electronic database, 46% rely on printed documents and 38% store data in filing cabinets.

The diversity of collected data, combined with individual organisational ownership, complicates data sharing, with many participants expressing concerns about data security, privacy, and confidentiality. For instance, 37% noted that the request for data is not always clear; while 27% believed that if shared, the data could be misused, pointing to the sensitivity of the issue around GBV. To address the challenges of GBV data privacy and protection, most discussions with participants emphasised the importance of safeguarding the privacy of reports and personal data, as well as ensuring encrypted transactions between stakeholders.

Both survey and interview data revealed that the absence of a secure, centralised data management system accessible remotely by all relevant

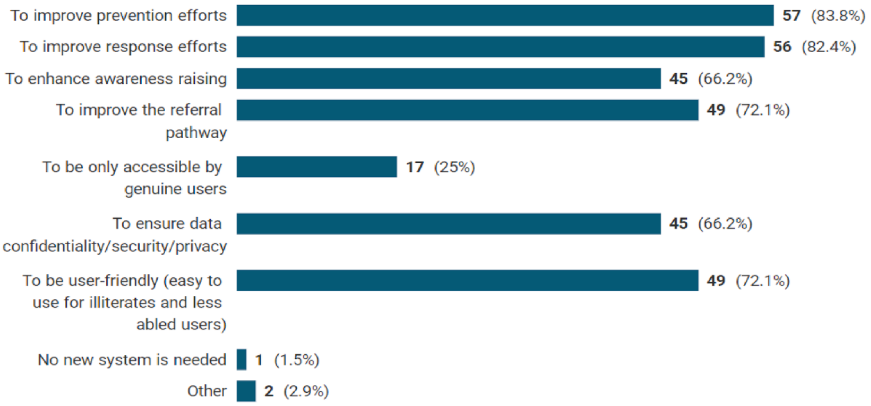

Fig. 5. Features the new system should provide.

multi-agency organisations contributes to privacy and safeguarding concerns. As a result, most of the participants in both the survey and interview expressed greater interest in effective online data management systems that can protect the privacy and security of victims and streamline improved access to protective care, social services, counselling, and financial support. For instance, Organisation 7 suggested an integrated data management system.

> "I suggested we have a central data management system that integrates all GBV cases. The system should aggregate data by age, sex, gender and disability, and it should be accessed to services at the regional and district levels. If we have a comprehensive data management system that indicates cases reported from specific locations, such as Kenema district or particular chiefdoms, it will help identify areas with high case reports and determine the necessary interventions."

The data further revealed participants' awareness and perceived understanding of the essential features the data management system should have to ensure user-friendliness and maintain confidentiality and data security. From the survey, 57% expect the system to have a dashboard that could disaggregate data for easy analysis. Additional suggested features include an audio functionality to assist illiterate or visually impaired users, as well as case reporting, processing, and resource management capabilities. When asked who should host and manage the proposed system, 32% of participants preferred a local NGO compared to 15% who favoured the national government.

4.1.3.3. Universal, transparent and customised access/systems. In Sierra Leone and many parts of Africa, GBV interventions primarily focus on women and girls. As explained earlier, this approach is based on the argument that GBV disproportionately affects women and girls in predominantly patriarchal societies, where men often feel entitled to sex with women. On the contrary, our research revealed that services available to victims and survivors, be they digital or not, should not be exclusively dedicated to women and girls. Universal and customised access is required to include an adequate way for all, including men and people with disabilities, illiterate, youth groups, and children. The idea of inclusivity and universal access resonated particularly with how technology systems should be designed and implemented to address GBV effectively. One organisation explains: "*if everybody has access to that technology and is within the understanding and knowledge of them, I think it will be helpful.*" (Organisation 1)

Further discussions by the participants around the universal access and transparency of digital systems also emphasised the importance of community inclusion. Results reveal that any technology that promotes accessibility also requires the support or inclusion of community stakeholders. Often, as reported earlier, GBV organisations struggle to develop and implement meaningful interventions owing to the lack of support from community stakeholders. Organisation 4 confirms, "*You need the support of the community people, particularly the heads, leaders in communities, like chiefs. If they are not supportive, the fight might not be won because they have their constituency* (i.e., *people) that listens to them" (Organisation* 4). Thus, it was reinforced that including community stakeholders and their perceptions into the design, implementation and use of digital systems could engender a sense of ownership, transparency and maximise usage impact. On transparency, the participants believed that involving community stakeholders could deal with technology resistance emanating from the community's negative perception of technology as a tracking and monitoring tool that might jeopardise or threaten their socio-cultural existence.

4.1.3.4. Poor connectivity and reliable energy supply. The results indicate that any digital system designed to address GBV must be equipped to address a wide range of socio-technical challenges that affect its access and usage in Sierra Leone. More broadly, limited internet connectivity and unreliable energy supply remain persistent challenges affecting the use of digital technologies. One organisation explained:

> "One of the biggest challenges service providers face is the lack of reliable internet services in their operational areas. This makes it difficult to send information online, leaving phone calls as the only viable communication option…"(Organisation 4).

The problem of internet connectivity is evident in the limited use of Primero, an open-source software platform for information management facilitated by the Sierra Leone government. Most of the participants explained that they are unable to access and use the system due to either the lack of internet service or poor connectivity. For instance, Organisation 7 mentioned,

> "…primero has to be used when there is internet connectivity. (…) if you go to areas where there is no Internet, it will be useless. About 60% of most of our communities do not have internet services".

Along with the internet connectivity issues, survey data indicate that the lack of technical expertise (66%), lack of hardware or software (64%), and high systems development costs (62%) emerged as other top barriers limiting the use of digital technologies. Only 34% of the participants reported having used some form of digital technologies in their service delivery. Overall, the findings highlight the importance of understanding contextual technical challenges when developing digital technologies in Sierra Leone.

4.2. System mock-up design

4.2.1. Sociotechnical requirement analysis

The requirement analysis of the mock-up designs is derived from the social-technical problems discussed in the Result Sections, which is understood within the context of the Socially Aware Design framework as an information system (Baranauskas et al., 2024). Within this framework, information is interpreted as signs that operate across distinct levels, including the social, pragmatics, semantics, syntactic, empirics and physical levels (Liu, 2000; Stamper, 1993). Based on these levels, we synthesise the socio-technical research data into the following requirements to create the mock-up designs that include informal, formal, and technical contextual factors analysed earlier. We mapped each level onto the results sections analysed above.

4.2.2. Design mock-up

The challenges and requirements highlighted in the results sections and Table 2 are consolidated into four critical areas of focus where digital technologies can be utilised to mediate multi-agency collaboration and promote effective and efficient response and prevention of GBV in the Sierra Leone context. This includes empowerment and awareness raising, accountability, training, and referral management (Fig. 6).

The four design mock-ups were co-designed with stakeholders through a co-design workshop, as described earlier. Additional information and recommendations from the stakeholders were integrated into the design mock-ups, which are systematically presented in the sections below.

4.2.2.1. Empowerment and awareness raising. The analysis in Section 4.1.2 indicates that technology-enabled empowerment in the GBV domain provides a pathway to maximise the benefits of robust digital systems for raising awareness, supporting service delivery, and mediating resources and information within and across multi-agency organisations. Building on the socio-technical data and requirements analysis, we therefore propose conversational agents–enabled design mock-ups (Fig. 7). The conversational agent mock-up integrates several privacy and discreet features that empower GBV victims to report incidents anonymously, access help discreetly without fear of judgment or exposure, and receive supportive messages and coping strategies for

Table 2
List of sociotechnical requirements and design dimensions.

Level	Descriptions, Design Challenges and Requirements
Social Section 4.1.1	The social dimension concerns the social effects of signs, beliefs, expectations, culture, norms, and social conventions. The socio-technical challenges and requirements as analysed in Sections 4.1.1 include the following: • Train users (end-users and stakeholders) to build trust, confidence and understanding of technology use for GBV prevention and response. • Raise organisations' awareness of their rights and support for using technologies to record, store and share sensitive data securely. • Facilitate collaboration between organisations. • Promote successful stories to strengthen trust and confidence in digital technologies. • Consider cultural barriers and negative perception through awareness raising and education. • Victims and survivors should be able to trust that their data privacy and confidentiality are fully protected when using digital technologies.
Pragmatics Section 4.1.2	The pragmatics dimension deals with the intentions, negotiations, and the persuasive power of signs that underpin the information system design. Key challenges and requirements include: • Provide up-to-date data privacy and accountability for local and national policymakers. • Share accountability with communities and relevant stakeholders. • Provide timely information for decision makers (advocacy, service providers) • Comply with legal protocols and coordinate referral pathways (medical, counselling, police, legal). • Coordinate response, avoiding duplicating responsibilities. • Evaluate the appropriateness and limitations for sharing information with multi-agency and other relevant stakeholders.
Semantics Sections 4.1.1, 4.1.2 and 4.1.3	Semantics dimension focuses on how the stakeholders make sense of signs, their meaning, propositions, and denotations. Major challenges and requirements include: • Accessible to illiterate users with limited or no digital skills. • An intuitive and user-friendly interface system that allows multi-agency and victim-survivors to interact with it seamlessly without the need for prior training. • Anonymous reporting with contact. • Quality assurance of user-generated reports.
Syntactic Sections 4.1.2 and 4.1.3	The syntactic dimension level concerns the language and formal structures of signal representation. Key design challenges and requirements include: • Collect, store, track cases and facilitate timely reporting of GBV organisations and other key stakeholders (healthcare, legal and FSU). • Collect and manage data securely in centralised data management systems – to protect the privacy and safety of victim-survivors. • Balance between confidentiality and accountability. • Use photos as evidence. • Feature category of incidents and the location where the incidents happened. • Feature report directory and demographics of victims.
Empirics Section 4.1.3	Concerns patterns, efficiency of signs, channel capacity, and other measures of communication. Key design challenges and requirements include: • Keep the privacy of data that circulates across organisations. • Support joint data collection and sharing with centralised referral pathway management systems. • Integrate databases securely with other institutions. • Ensure interoperability between platforms.
Physical Sections 4.1.1 and 4.1.3	Deals with physical properties of the signals, such as size, format, media, etc. Key design challenges and requirements include: • Deal with poor connectivity. • Available offline for users without an internet connection. • Accessible on low-bandwidth internet connections. • Allow information to be visualised or accessed offline. • USSD/SMS-based system for non-smartphone users.

managing crises. Drawing on the socio-technical data, we also suggest features that allow the delivery of tailored awareness messages in local languages, which can increase usability and address socio-cultural barriers such as language and literacy that prevent the use of digital technology in Sierra Leone (Fig. 8).

Based on the requirement analysis from the organisational perspective, we integrate features that allow GBV organisations to capture secure anonymised case data (Fig. 9), collaborate and coordinate responses, streamline communication (Fig. 10), track GBV trends (Fig. 11) and referrals between service providers (Fig. 12).

Overall, the conversational agent is directed at challenging the negative perception and limited use of digital technology, positioning it as a tool to raise awareness and education efforts, risks, and methods to combat GBV.

4.2.2.2. Learning and development. We design a mock-up aimed at training and strengthening staff capacity in digital literacy and the effective delivery of GBV services (Fig. 8). The delivery of GBV services in Sierra Leone involves a wide range of actors, including the FSU, NGOs, community stakeholders, policymakers, healthcare providers, and psychosocial experts. The training system allows these diverse organisations to build their capacity and critical skillset needed to effectively deliver GBV services. Thus, we aim the learning system to become essential for the GBV domain, delivering a wide range of courses such as legal systems, data privacy, referral pathways, and digital literacy through synchronous and asynchronous learning. To ensure the effective use of the tool, we approach the design as a socio-technical system embedded within complex, resource-constrained social and economic contexts. Its success depends on the availability of appropriate and affordable ICT infrastructure—such as mobile devices, computers, and internet access—to enable connection to the system. Additionally, we envisaged that both technical and social support are essential for GBV organisations and learners, alongside the value the tool provides for both synchronous and asynchronous learning experiences.

4.2.2.3. Accountability. We design a data management dashboard mock-up (Fig. 11) to be integrated into the technology support system. The dashboard aims to promote accountability and transparency through providing increased access to contextual data by local and national policymakers and critical GBV organisations. Through the dashboard, we aim to streamline secure data collection and management, with a strong focus on overcoming challenges related to data privacy and confidentiality, key barriers that often limit organisations' willingness to share data.

As depicted in the mock-up, the dashboard can capture and display diverse datasets in graphical and numerical forms, providing organisations with simple and easy-to-use contextual data related to GBV reporting, referrals, resource distributions, and services delivered within and across the country. The design mock-up responds to the participants' request, where most of them (57%) expect the system to have a dashboard that could disaggregate data for easy analysis.

4.2.2.4. Referral management. Drawing on the socio-technical insights and design requirements outlined in Sections 5.1.3 and 5.2.1, we extend the traditional manual referral pathway by designing a mock-up digital referral management system (Fig. 12). This referral pathway forms part of an interactive technology system that closely follows participants' recommendations from the analysis and requirements stages. Our aim is to ensure that the design is grounded in context and genuinely reflects

Fig. 6. Flowchart showing the design mock-ups.

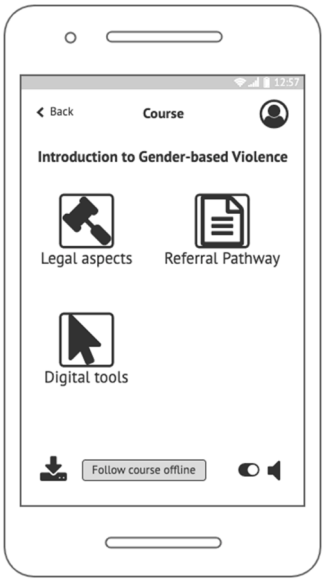

Fig. 7. Conversational agent.

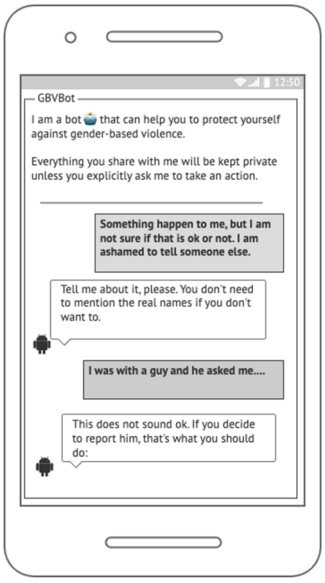

Fig. 8. Course interface.

users' needs and everyday practices.

Fig. 12 illustrates the referral system interface, showing the priority levels and the actions (accept or reject) that organisations can take when they receive a referral. To create a referral, organisations click Create referral to open the form (Fig. 13), complete it, and submit it.

In all, the referral management system integrates features that support secure data collection and sharing, ensure privacy and confidentiality, enable unified data centre management, and facilitate multi-agency communication and collaboration.

5. Discussion

We reflect on this work through the lens of the Socially Aware Design framework, as conceptualised by Baranauskas (2014), addressing a gap in earlier HCI interventions that focused primarily on survivors or perpetrators. Using this framework, we discuss the study's findings by framing design as the coexistence of informal, formal, and technical information shared by participants within Sierra Leone's social and organisational contexts (Baranauskas et al., 2024).

5.1. Informal contextual level

At the informal level, the research results outline how dominant patriarchal cultural practices and beliefs, such as gender discrimination, sexual objectification, and stigmatisation – along with social issues such as illiteracy – influence the extent to which GBV incidents are portrayed, reported and addressed both at individual and organisational levels. The findings demonstrate an important implication for designing and integrating an effective digital system that provides a safe and secure space for reporting GBV and processing and sharing sensitive data to mitigate the perceived socio-cultural challenges. Our data show that designing systems for GBV prevention and response in deep-rooted cultural environments is more than carrying out the normal HCI technical rituals where designers follow a set of structured approaches that focuses on humans (the users) interaction with technology systems (Saha et al., 2023). It involves a process where critical reflection is required on identifying design systems that support positive socio-cultural norms while mitigating the negative cultural practices that stereotype women and girls, normalise bad sexual behaviours and instil fear in victims when exercising their human rights.

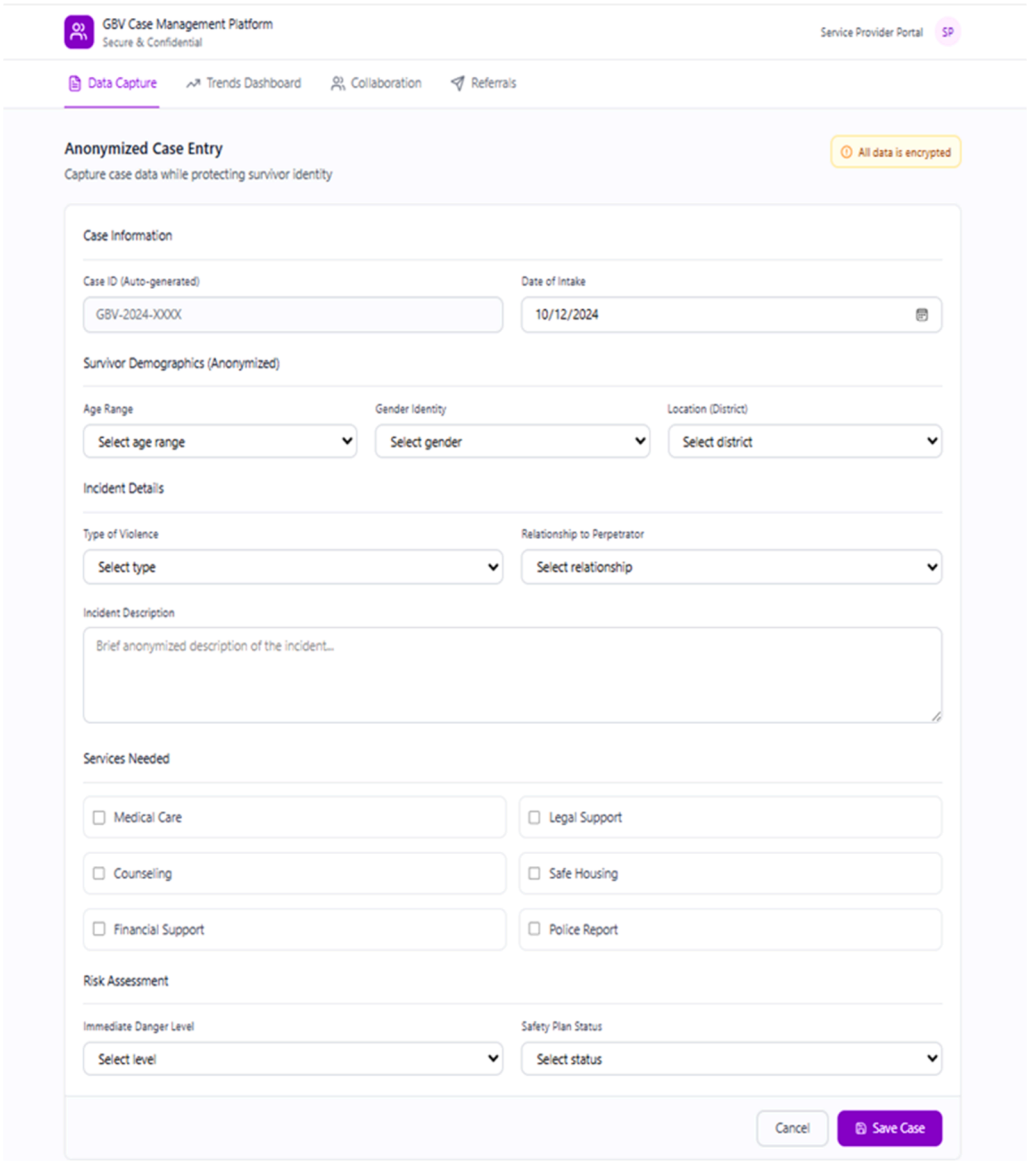

Fig. 9. Case reporting feature.

Essentially, designing digital systems for GBV prevention and response requires an iterative process that prioritises users' contexts and impact on the safety and security of GBV victims and perpetrators. More specifically, the results support HCI studies where socio-cultural contextual factors are recommended to be taken into consideration when designing systems for users in low-resource settings (Mkude and Wimmer, 2019; Winters and Toyama, 2009). Important here is also how we articulate socio-culturally aware problem understanding for prospective integrated technology support systems to support multi-agency collaboration and victim safety, focusing on the human, context, and technical aspects. In other words, the informal-level analysis in our study is situated within the context of understanding users' culture, beliefs, and everyday experiences (Baranauskas, 2014). We show that this approach is essential for developing technical systems that genuinely address the user needs.

5.2. Formal contextual level

Results of the formal contextual aspects deal directly with the practices and limitations of how organisations capture and manage confidential data and promote accountability in their approach to responding and preventing GBV. Many organisations reported limited collaboration and data-sharing activities, primarily due to concerns over potential breaches of confidential information, the absence of clear policies to govern data exchange and the lack of appropriate channels and mechanisms to facilitate secure and effective collaboration. This limitation can affect how organisations communicate, aggregate and share data, process referrals, and deliver timely support to victims. To this end, we propose a new referral system mock-up design and a secure data management dashboard aimed at streamlining multi-agency communication, data sharing, and referral pathways. Our systems respond to the view expressed in research on the need for effective communication systems and joint data-management and information-sharing systems for mediating multi-agency collaboration (Garcia-Moreno et al., 2015; Parkes et al., 2017), which are contributing factors to the limited response and prevention of GBV in Sierra Leone.

The relationship between the social contextual data and design systems characterises what has been conceptualised in literature as complex technological and societal relationships involving technological and human systems (Baranauskas et al., 2024; Ferrari et al., 2020; da Silva et al., 2016). Broadly speaking, we show how understanding social concerns within organisational and individual settings can shape

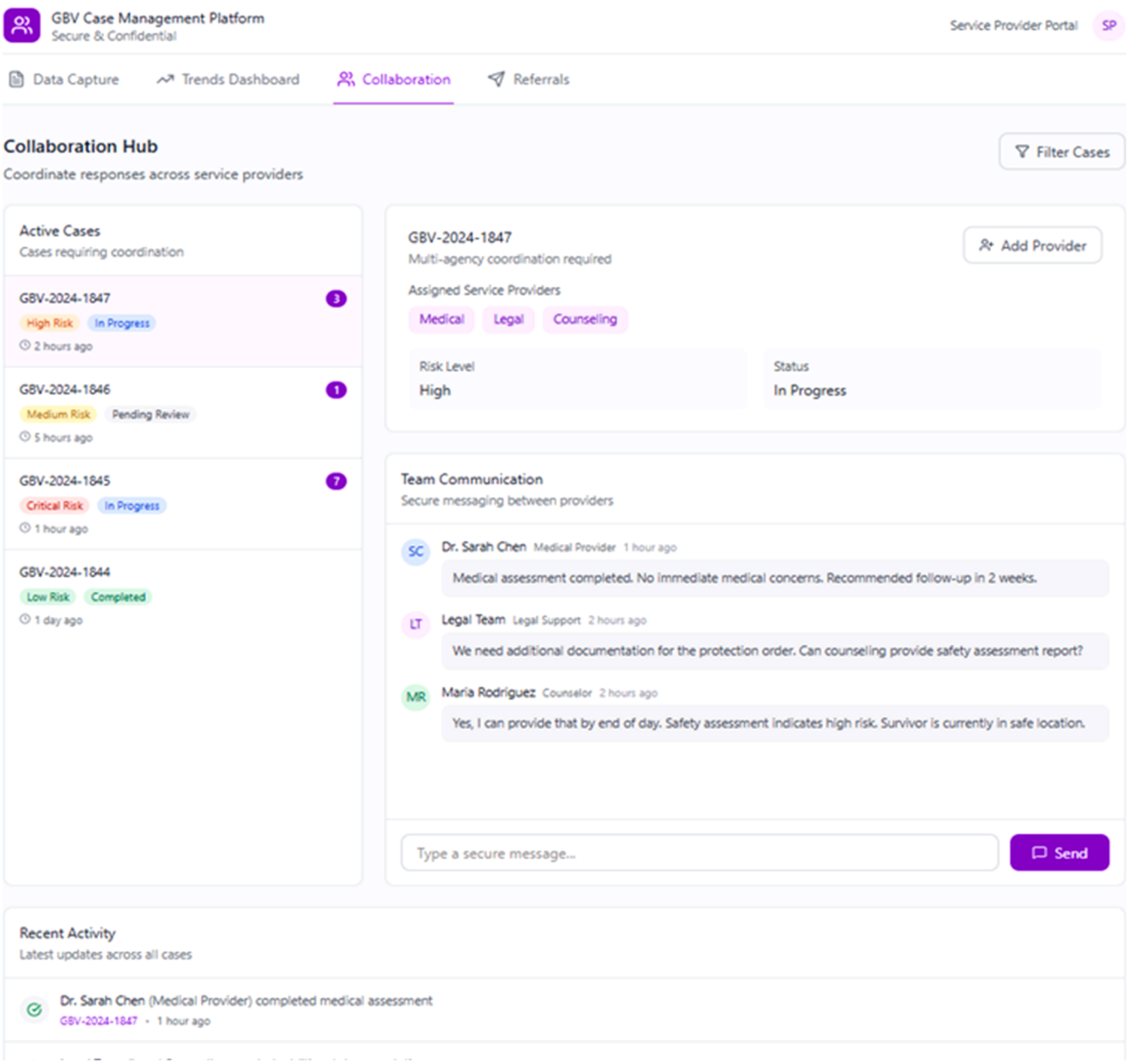

Fig. 10. Multi-agency collaboration hub.

technology design and shed light on the complex human-technology-society relationships in the design process. Along with integrating individual perspectives into the design process, we draw on the broader socio-technical awareness of the societal and organisational contexts to understand and articulate the social concerns surrounding GBV prevention and response in the design of the technology solutions. Here, like Baranauskas et al. (2024), we understand design as the interactions among people in their social world – or design situations – for creating technological solutions that address the interests of the actual users. In other words, we resist the attempt to portray design as a 'problem-solving' exercise. Rather, our research subscribes to the idea that design is 'socially situated practices' with solutions emerging from understanding the complex human-technology-society relationships (Baranauskas et al., 2024). HCI researchers, particularly those who have focused on initiatives such as HCI for development (Dell & Kumar, 2019; Ho et al., 2009; Mkude and Wimmer, 2019), postcolonial HCI (Lazem et al., 2021), HCI for social justice (Fox et al., 2016) and human-centred AI (Xu, 2019; Schmidt et al., 2021) have advocated for such an approach to be established.

5.3. *Technology information level*

From the technology information level perspective, our findings align with most HCI researchers in the GBV domain who have advocated for novel systems to protect the safety and security of the victims and improve support service delivery (Kim et al., 2022; Maeng and Lee, 2022; Tseng et al., 2021). Within this context, we propose design mock-ups for systems that aim to capture anonymised data and streamline incident reporting and service delivery not only from the victim perspective but also from the organisational viewpoint. We put much emphasis on improving secure data collection, raising awareness, addressing socio-cultural barriers to technology access and information sharing, improving resource mobilisation and timely service delivery in the organisational settings. Thus, the findings and designs reveal the

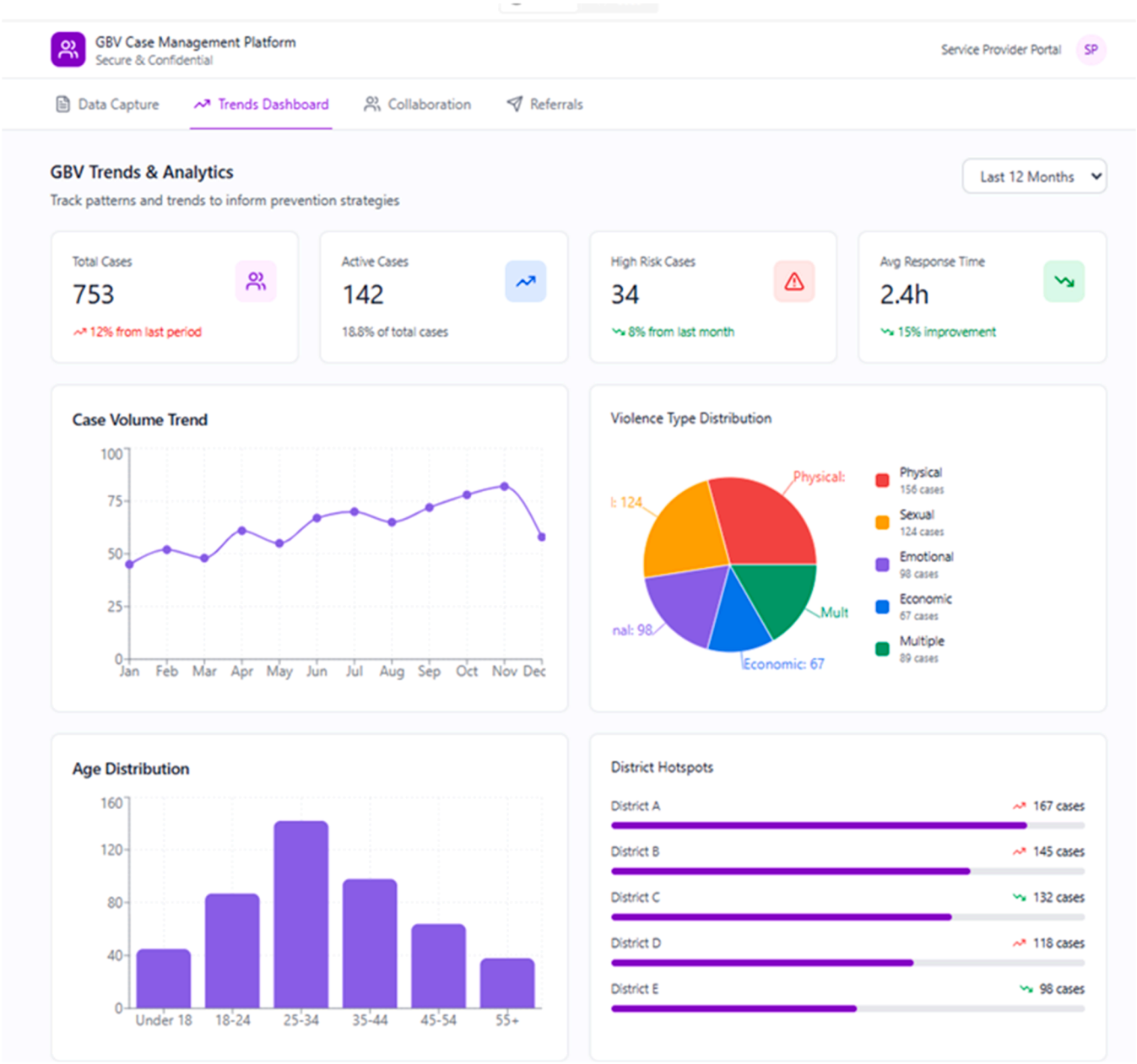

Fig. 11. Dashboard system.

extent to which GBV organisations can be empowered using integrated technology support systems to effectively respond and prevent GBV through strengthening their capacity, improving collaboration and communication, and supporting secure and confidential data management. Our study addresses a significant gap in GBV research within the HCI domain by contributing to the limited body of work that engages with elements of multi-agency expertise (Butterby and Lombard, 2024) and community-collaborative approaches to technology design (Liang et al., 2023).

The four design mock-ups have the potential to achieve a significant positive effect on the prevention and response to GBV in Sierra Leone if implemented. However, our focus here is on how situated organisational and GBV contexts influence the designs. Our findings show that a network of multi-agency organisations is involved in GBV prevention and response, but their collaboration, communication and knowledge exchange remain limited. Multi-agency collaboration enables results that individual sectors cannot achieve on their own by uniting diverse efforts into a coordinated strategy and combining the necessary skills and expertise to tackle specific issues or challenges (Amisi et al., 2024; WHO, 2020). This implies that the lack of collaboration within and across these institutions limits the impact and benefits of their involvement. More broadly, we leverage the understanding of this organisational context and local skills and knowledge of the stakeholders to inform the design of the systems that enhance multi-agency collaboration and secure data and knowledge sharing. By actively involving the stakeholders in the design process, we build trust and ownership, leading to designing the systems that are capable of altering the current organisational practices and potentially generating meaningful social and developmental impact in the response and prevention of GBV. From this perspective, our approach contributes to addressing the design gap highlighted by HCI researchers such as Dell and Kumar (2016), Ho et al., 2009; Saha et al. (2023) and Lazem et al. (2021) who argue for expanding the traditional research domain to view design not merely in terms of artefact usability, but as a process aimed at

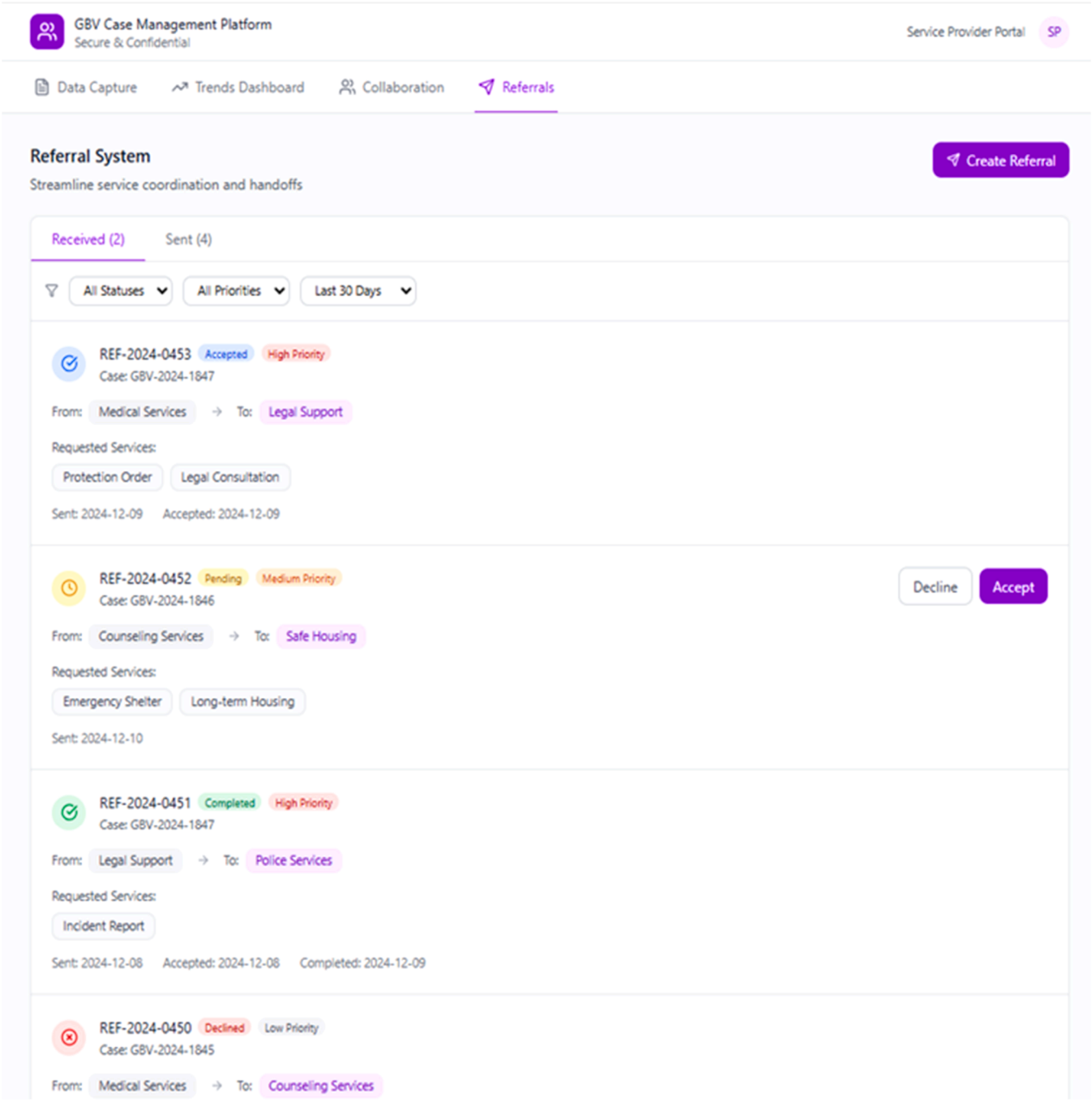

Fig. 12. Digital referral management system.

maximising broader developmental impact.

6. Conclusion

Designing with diverse organisations to facilitate multi-agency co-ordination and enhance GBV prevention and response in non-Western, specifically African, contexts remains an underexplored area of research that lies at the margins of traditional HCI research. In this paper, we explore socio-cultural and technical contexts, organisational settings, and practices around GBV response and prevention in Sierra Leone, with the view of designing systems that both facilitate user interactions and enhance GBV response and prevention. We address two research questions: (i) What socio-technical factors shape the design of digital systems that can support multi-agency collaboration and GBV service delivery in resource-constrained environments; (ii) What design solutions, based on these factors, can be developed to strengthen multi-agency providers' capacity to interact and coordinate in preventing and responding to GBV? We draw on Baranauskas et al.'s (2024) Socially Aware Design framework to conceptualise and situate our work within the HCI domain, analysing and understanding design both as a process of developing interactive systems and as a means of advancing social and developmental goals in the context of GBV prevention and response.

Empirical data from socio-technical research are analysed at the three levels – informal, formal, and technical information levels – conceptualised in the SAwD framework. Following the analysis, we gather design requirements and co-develop design mock-ups along with the research participants. Collectively, we show that when HCI researchers combine situated informal, formal design contexts and technical

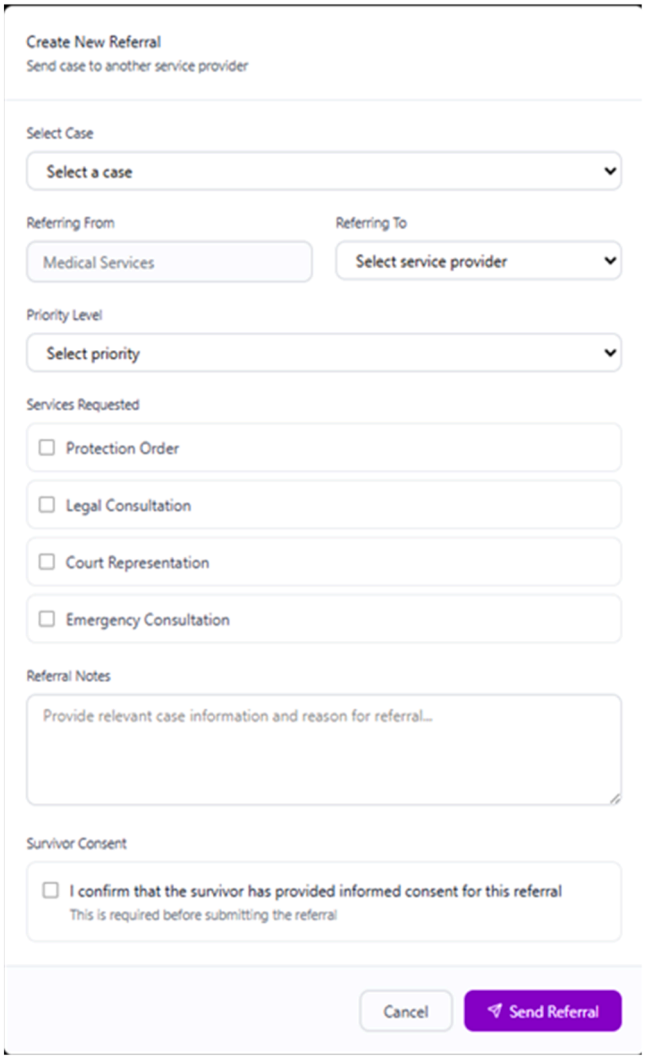

Fig. 13. Referral creation form.

information, they are likely to design systems that promote both human-technology interaction and the corresponding impact emerging from the interactive process. To this end, our research also advances the validity of Saha et al.'s (2023) framework in practice, which conceptualises design as a participatory and empathetic process. The approach calls on researchers to amplify users' voices and develop a deep understanding of their situational design contexts by investigating their socio-technical environments, actively engaging with them to leverage their knowledge and skills, and building trust to secure their buy-in (Ibid). In our research, we show that such an approach contributes to user-centric design and potentially generates meaningful development impact of the systems developed, a practice that goes beyond traditional HCI discipline (Dell and Kumar, 2016; Ho et al., 2009; Mkude and Wimmer, 2019).

Clearly, our research provides new evidence in the African context. It demonstrates the importance of aligning design principles with the social and development impact of interactive systems developed through a collaboration between the researchers and actual users. A key limitation of this study is the absence of mock-up implementations, which makes it challenging to assess the real-world use and impact of the proposed systems. Nonetheless, we are confident that the designs hold significant potential to strengthen GBV prevention and response efforts.

CRediT authorship contribution statement

Steven Sam: Writing – review & editing, Writing – original draft, Investigation, Funding acquisition, Conceptualization. **Nashwa Ismail:** Writing – review & editing, Formal analysis. **Lara Schibelsky Godoy Piccolo:** Visualization, Investigation, Funding acquisition, Formal analysis. **Soraya Kouadri Mostefaoui:** Investigation, Funding acquisition, Formal analysis, Data curation. **Talatu Jalloh:** Project administration, Formal analysis. **Sylvester Macauley:** Project administration, Investigation, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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