

User-centred design and development of a web-based Western Cape substance use assessment tool (WC-SUDAT)

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Abstract. Substance use disorders (SUDs), the uncontrolled use of substances despite harmful consequences, is a significant problem in South Africa, especially in the Western Cape. An important component in the fight against SUDs are questionnaires to assess the risk of an SUD, that are administered by social workers to identify targeted interventions. A web-based questionnaire with automated aggregation of responses can reduce the administrative burden placed on social workers. Here we use a user-centred design approach to build a web-based substance use disorder assessment tool localised to the Western Cape: WC-SUDAT. Our three-phase User Centred Design methodology comprised a first prototype; followed by evaluation of its suitability through a contextual inquiry, a usability test and heuristic evaluation; and then implementation of a final prototype incorporating unanticipated features critical for field use that were identified in the evaluation. This process was effective in generating a final prototype webtool with a dual function as both an SUD assessment tool and an organisational management tool. This deployment-ready prototype is a better fit for the needs of NGOs working with substance abuse disorders than our original conception of the webtool, thus validating a User-Centred design approach.

Keywords: web development, user testing, human computer interaction, user-centred design, substance abuse disorder

1 Introduction

Substance use disorders (SUDs) are endemic in South Africa and contribute to mental, social, and physical health problems [18], most particularly in the Western Cape. NGOs funded by the Western Cape Department of Social Development (DSD) run three SUD treatment programmes: early intervention (EI) to identify and treat at-risk clients before they show symptoms of an SUD; community-based treatment (CBT) to treat an SUD by building a community

of support around the client; and aftercare and re-integration (ARI) to help the client adapt to everyday life after treatment.

Screening tools are questionnaires used in EI programmes to identify subjects who may be experiencing, or are at risk of developing, an SUD [110316]. A standardised paper-based assessment tool localised to the Western Cape was recently piloted at SUD NGOs in the Western Cape to assess a client's SUD risk level and risk factors (WC-SUDAT) [7]. This is administered by social service professionals in a paper-based format; a web-based screening tool has the potential to improve and accelerate the screening process and lessen the administrative burden on social workers [6117151618]. Computerised screening also has the potential to be integrated with eHealth records [516].

We followed a three phase User Centred Design (UCD) process comprising the build of a first prototype localised web-based version of the WC-SUDAT [7] questionnaire; followed by evaluation of its suitability through a contextual inquiry, a usability test and heuristic evaluation; and then implementation of a final prototype incorporating unanticipated critical features needed for field use that were identified in the evaluation. The participatory design process involved users from two NGOs in the Western Cape. The first prototype was evaluated for functionality and usability with a contextual enquiry, heuristic evaluation and a usability test with the System Usability Scale (SUS), which has been found to be effective in usability evaluations of an eHealth web tool [14]. We incorporated feedback from this process to develop a second prototype tool ready for deployment.

2 Methodology

We followed a UCD process used for development of our prototype, incorporating users into the design process. Human centred design (HCD), as defined by ISO 9241-210:2019, is a design methodology that requires developers to consider all people as potential users and so requires developers to build for a wide range of people. UCD [4] is a more refined version of HCD, but the two terms are often used interchangeably. UCD requires developers to define their user base (which is not all humans, as in HCD) and then build empathy for their users. This can be accomplished using methods such as: a contextual inquiry [26], where the developer interviews end-users to understand their workflows; personas [25], where the developers create imaginary users that represent certain user demographics uncovered by their contextual inquiries; and day-in-the-life studies [27], a quick method in which users sketch their day to help developers understand inefficiencies. Other design methodologies include persuasive design (PD) [29], where developers analyse what could influence their user's behaviour and then build those principles into the design to make it more compelling; and participatory design, where the users are included in the design process from the start of the project by taking part in brainstorming workshops to decide on features and solutions [28]. Development of related eHealth web tools with UCD indicates that focus groups are useful for conducting usability interviews [131419] and

unstructured and semi-structured questions allow "digging deeper" to provide valuable insights [24][20][9][14]. Marien et al. suggested that five participants is sufficient, due to the time constraints of conducting lengthy usability assessments [14]. Both qualitative and quantitative data capture in a usability study is important for the quality of the study and the System Usability Scale (SUS) are effective for quantifying the usability of an eHealth web tool [14][24][20][19][9][13].

2.1 Approach

We aim to identify and implement key features in the webtool to enable it to be adopted in the EI programmes for SUD treatment. We identified two categories of potential user of our webtool: either clinicians, who are client-facing, or researchers, who need access to an anonymised database of client records. Our UCD process incorporated two client NGOs: the Cape Town Drug Counselling Centre (CTDCC), a multi-branch NGO in the Western Cape with EI, CBT, and ARI programmes covering the full range of support that is funded by the DSD, and the Knysna Alcohol and Drug Centre (KADC), a single-branch NGO offering EI and ARI programmes.

The webtool was developed in three phases, as follows. Phase One developed a first prototype (V1) that encoded the WC-SUDAT [7] questionnaire. In Phase Two, the suitability of the V1 prototype was evaluated in three ways with users from CTDCC and KADC: a **contextual inquiry** enabled the development team to understand the users through job shadowing; a **usability test** assessed the tool with a set of users; and a **heuristic evaluation** tested interface with trained evaluators. Phase Three addressed fundamental issues raised in the evaluation phased implementing core necessary features to create a beta build of the webtool (prototype V2) that is fit for purpose and WC-SUDAT ready for deployment.

3 Phase One: Prototype V1

The basic functionality implemented in prototype V1 allows clinicians to create clients, save their details, and administer assessments from which SUD risk levels are calculated. Once the assessment is administered to a client, the clinician can interpret the risk visualisation and determine the path forward for their client. If the clinician needs to focus on a specific set of the clients answers, they can view the assessment again along with the notes they may have taken during the assessment. This use case is represented in the core features: user accounts; organisational-based access for clinicians; client creation and management; implementation of the WC-SUDAT assessment; visualisation of the client's SUD risk levels grouped by risk factors for each completed assessment; assessment history and clinician comments; and a feedback mechanism for communication with the developers.

There are four pages accessible once a user is logged in: the home page for clinicians for creation and editing of new and existing clients; a page displaying

the results of an assessment, with risk factors and a client's risk levels; the page with the WC-SUDAT assessment where questions are read to a client by a clinician who records the client's answers; and the researcher page presenting all the anonymised client answers.

The *user accounts* feature enables user registration and, once signed in, allows access to all the other functionality of the tool. The feature is implemented with the Django app `textitAccounts` that securely stores user's passwords with usernames (unique identifier). We extended the model to enable the user's unique identifier to be the email address. Rudimentary log in and registration pages were built using static html forms. Lastly, we configured the Django admin portal to do basic create, read, update and delete (CRUD) functions on the users, including password reset, since no user flow for this had been implemented. The user model has a unique South African Council for Social Service Professions (SACSSP) registration number attribute that is used to retrieve clients, as well as a supervisor's SACSSP registration number for the cases of student social workers that may have a supervisor who must be able to see their clients.

The *organisational-based access for clinicians* feature allows users in the same organisation to view and administer assessments to one another's clients so that clients can be attended to in the event that their social worker is unavailable. The implementation attached an organisation model to the user object. The data the user can access is filtered based on SACSSP registration number and on the organisation that they are a part of. Organisations can be managed in the admin portal.

The *client creation and management* feature allows social workers to register and manage their clients personal details. The client model has all the attributes that WC-SUDAT requires for data analysis. Clients are assigned only one registered social worker, however, they are visible to all social workers in their social worker's organisation and to their social worker's supervisor.

The *implementation of the assessment tool* allows an administrator to create or edit an assessment via the Django admin portal. Once created, a user can administer the assessment to a client. The WC-SUDAT assessment consists of long form answers, Likert scale questions and yes/no questions. The Likert and yes/no questions can unlock follow up questions and have risk calculations based on the answers. For the implementation, the assessment is generalised into sections, subsections and two question types: text answer questions, which have a text field as the answer input; and choice answer questions, which can be assigned choices that allow these questions to be yes/no or Likert questions. The choice questions and choice answers (the objects that can be assigned as answers to choice questions) can be assigned risk factors and risk values, respectively. Risk factors are grouped into risk categories for reporting purposes. Sections and subsections can be assigned risk thresholds that determine the total categorical risk a client must have to unlock that subsection. Each section and subsection also have a text field that allows clinician notes to be taken during the assessment. This implementation gives enough flexibility to completely digitise the WC-SUDAT assessment tool.

The *visualisation of the client's SUD risk levels grouped by risk factors for each completed assessment* feature allows for a visual representation of the clients risk profile as calculated from a completed WC-SUDAT assessment. The visualisations displays all the risk categories and their factors that have been configured in the admin portal. A toggle allows selected risk factors to not be displayed, primarily if they are used for the logic of which questions to show and do not have application for the social worker. A client can have multiple assessments so the visualisation displays the result of the selected assessment as well as the average result. The implementation makes use of a Javascript graph library to visualise the risk factors. Each risk factor has description that can be configured in the admin portal to provide context and explanation to the user.

The *assessment history and clinician comments* feature is a non editable replica of the assessment. It displays all the answers to the assessment. Although the clients answer cannot be edited, the clinician notes are editable in this view.

The *feedback mechanism* feature allows the user to provide feedback to the developer team, it was intended to be used throughout the evaluation process. It saves the feedback in the admin portal.

At this point the tool was considered a minimum viable product, however the following four features were added before conducting the evaluations in Phase Two.

The *email password reset and user roles approval* feature allows all users to reset their password and confirm their email addresses, and organisation administrators to approve new users, granting them access to the WC-SUDAT system according to their role. This functions via email: the system emails the user a link to perform one of the three tasks (email confirmation, user approval, or password reset). An email confirmation link is emailed to the user after registration, the user approval link is emailed to the organisation administrator after a user registers, and the password reset link is emailed after clicking "Forgot password" on the login page and following the prompts. A new user cannot sign in until they have confirmed their email and cannot access the tool until they are approved by the organisation administrator.

The *branch-based user permissions* feature caters for multi-branch organisations by allowing branch-wide client access to all users at the branch and is important for allowing social workers all social workers in a branch to access all clients. The branch model has a parent organisation, address and branch manager as fields. The user and organisation models have an assigned branch and head office as fields, respectively. The system filters client objects by matching the logged-in user's branch to the client object's social worker's branch. This filter happens every time a URL that requests client data is rendered to ensure that there is no unauthorised access.

The *Google Places API for client location* feature implemented in the client creation form enables WC-SUDAT to search Google Maps for location data. This feature prevents errors when capturing a client's location and allows for a range of precision in capturing location. This is important to standardise location data for clients living in informal settlements. Organisations have varying policies

on capturing the client's location: some feel that street addresses are too high precision and could be used to arrest clients, with Google Places they can choose how specific they want to be.

The *answer-dependent question access* feature allows dynamic control of which questions appear in the client assessment, dependent on the answers to previous questions. This was done by implementing a question-answer requirement model to allow combinations of questions and answers to be requirements for other questions to be shown.

The prototype was built using Python to implement the controller and model of the Model View Controller (MVC) architecture (Model Template View in Django) and JavaScript, HTML and CSS to implement the View. All prototypes were developed with the Agile methodology, which relies on multiple iterations of development and testing [2].

The prototype was *deployed* on the Department of Computer Science's servers at the University of Cape Town with the URL wcsudat.cs.uct.ac.za.

4 Phase Two: Prototype Evaluation

We followed a UCD approach to evaluate the first prototype of WC-SUDAT. using contextual enquiries to gain empathy for the user and understand the WC SUD NGO processes; a usability test to evaluate how well the webtool performs in the field; and heuristic evaluations to identify usability issues.

4.1 Contextual Enquiry

We conducted two **contextual inquiries** to identify the overlap between two SUD organisations' requirements for a webtool. As we already had a webtool prototype, the gaps between the users requirements and the functionality of our tool were more easily identified. The first inquiry was conducted at the Cape Town Drug Counselling Centre (CTDCC) to understand the organisational processes of an SUD clinic. The inquiry followed the director of the organisation and the head social worker through the client intake process and the compilation of quarterly reports for the DSD, to understand the entire paper trail of a client from intake to quarterly report. A second smaller contextual inquiry consisted of an unstructured interview conducted over Zoom with the Knysna Alcohol and Drug Centre (KADC).

These contextual enquiries identified the following three key requirements for a webtool.

Reduced assessment time. SUD organisations administer multiple assessments are administered to each client, which is time-consuming. Some of the assessment's questions overlap, which wastes time in repeating the answers. Self-administered assessments are not desirable as the KADC said that interaction with the client during an assessment helps to inform the diagnosis. Therefore assessment questionnaires need to be as short as possible, and the most important questions should be answered first.

Reduced administration for social workers. A client's file includes an assessment, a treatment plan, counselling notes, summaries of interactions with parents or employers, and the drug tests conducted. Files are accessed by a client's social worker, other social workers, sessional staff (art therapist, doctor and psychiatrists), and the DSD. In addition to the assessments, for each client social workers must scan the paper documents, including handwritten observations and professional opinions, and count the number of drug tests (positive and negative) per client as important information for both the client's file and for generating reports. Consolidated quarterly reports are sent to the DSD and the City of Cape Town. Generating quarterly reports is a complex process with multiple steps (Figure 1). The DSD funds three programs: Community Based Treatment (CBT), Aftercare and Re-integration (ARI), and Early Intervention (EI). Social workers in each branch of an organisation capture client's data and the interventions on an Excel spreadsheet for each of the programmes (CBT, ARI, and EI) and send them to the director. The director then create a consolidated Excel sheet for that branch (CBT-branchX, ARI-branchX, and EI-branchX), resulting in three files per branch and also compiles narrative progress reports for each program: for every branch six documents are sent to the DSD. Twice a year, each branch has an on-site visit during which the client's files are inspected. An automated system which reduces this administrative burden, particularly for report generation, would be very valuable.

Adherence to operational constraints. NGOs need to ensure that every social worker in a branch can access each other's clients. Currently, everything is filled out on paper and kept in a file. Replicating this system would lead to better uptake with the social workers. In addition, POPIA [South Africa. Protection of Personal Information Act of 2013] and client confidentiality must be ensured. Currently all client's data must be hosted on-site at the branch head office.

4.2 Usability Test

The usability test was conducted with four social workers from the CTDC and four from the KADC organisations in two parts: a SUS questionnaire [1211] (a standardised 10-question questionnaire to calculate a usability score out of 100), followed by semi-structured interviews. The tests took place at organisation's offices, which are the real-world locations where the tools would be used. Of note is that both organisations only recently purchased laptops for their staff; hence the user's may be unfamiliar with the technology. Social workers were given a week to use the webtool. They were required to add a client to the tool and complete an assessment for that client. This task required them to perform multiple sub-tasks: registering a user account; signing in; registering a new client; administering an assessment; and analysing the assessment feedback for that client. After using the tool, the users completed a SUS questionnaire and participated in semi-structured interviews, which further explored the usability of the tool and any feature changes they would need for the tool to be adopted as part of their processes. There were some significant real-world challenges that cause significant delays in completing the usability tests: taxi strikes prevented

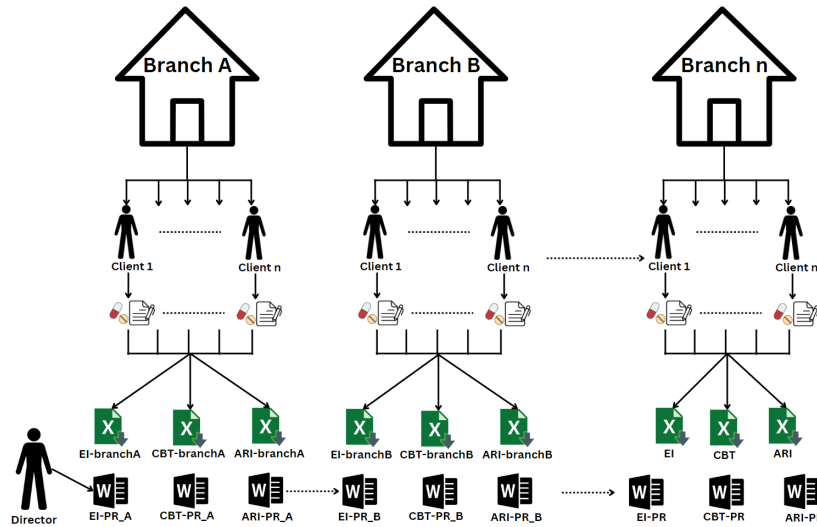


Fig. 1. The process of compiling quarterly reports for a multi-branch organisation

organisations from operating, a death at one of the organisations, and one of the branches of a organisation burnt down.

During the interview with the CTDC social workers, it became apparent that their usability concerns were primarily with the questions in the assessment rather than the interface. To mitigate this users at CTDC completed two SUS tests: for the first test they were asked to evaluate the usability of the assessment itself instead of the interface; a second test was then completed focussing only on the usability of the interface. The first test had an average usability score of $51.3 \pm 6.3\%$ within the 10th percentile of interface usability [12]. The SUS questionnaire focussing only on the interface had an average score of $72.5 \pm 5.9\%$, within the 64th percentile of interfaces. One outlier of 62.5 (included in the mean calculation) was obtained from P1, the oldest in the group of participants.

The interviews highlighted the issues in more depth, as follows.

The sign-up page was unusable. This test highlighted poor implementation of the sign-up process in prototype V1. One participant said "It was terrible" even after email support from the development team. The main issue was the lack of useful error messages: different errors used the same message, a participant said, "It wasn't very specific".

Overview on the home page. Although users said that interaction with the home was "fairly straightforward" (it was easy to create a client and the jump to the client page once a new client is registered was "actually cool") they said that they would prefer an overview page on the home page. One participant

mentioned that it could display the status of their clients saying, "These are my CBT clients, these are my early intervention clients, and so on".

Confusion with the assessment. Participants were not familiar with the assessment implemented in V1. Some found answering the questions confusing ("you had to first think yes I am not able to and then no I am not able to"; "I thought, what's going on?"). Participants mentioned an overlap in questions and that different sections would "ask the same sort of question in a different way". Participants felt that questions were closed-ended and made a "barrier between client and social worker". They were concerned that it "shuts down a flow in conversation". One participant mentioned that they, "walked away from my assessment, not knowing much [about the client]" and that the assessment was "very surface level". They felt that some questions played into the psychological defences of SUD. These were things such as blaming it on external factors (in the sections that ask how much your community/family affected your SUD). One participant said, "Someone could say, this is my girlfriend's fault or my sister's". But then the participant considered that "this is more of a critique on all assessment tools".

Resistance to change of assessment. One participant said, "We've been working with our own assessment for so long that I gravitate towards accepting that." They mentioned that the WC-SUDAT questions are "very specific" and that their questions are "a lot broader" but have fewer sections. Their questionnaires do not look into school-based factors. They agree that new questions are important and that "we need fresh eyes on it" because "we can't respond to a growing and a different external environment doing the same thing".

Assessment is too long. Participants unanimously agreed that the questionnaire was too long ("took 50 minutes to close to an hour") and would take up important conversation time with A client. The completion time is an issue because the webtool complements existing assessments since it does not ask all the questions that the social workers need e.g. "we did not know what [substances] they were using".

Risk assessment available beforehand The risk breakdown needs to be accessible before talking to the client. If the social worker could see the risk factors before engaging with the client then they could use them to inform their conversation with the client. One participant said that "in an ideal world we could say to a client [before coming to the appointment], log into our app on the website and fill out the assessment". They were only concerned about the practicality of this. One participant said that "the only issue is the resources".

Concerns with digitisation of their assessments and processes. Social workers are used to writing everything down. One participant said, "I'm so used to writing by hand, typing it out may be a little bit challenging". Another issue was that clients usually complete pre-appointment assessments on paper. To digitise, the clients would need access to a computer to complete the assessments. One participant pointed out that the place to make notes about a client should resemble the paper-based assessment tool and should come after the section of questions, and not on the side. When asked if they use a digital calendar, a

participant said, "A digital calendar would be great". Currently, they keep track of everything on paper-based diaries.

Other than the sign-up page, the interview comments about the usability of the interface were all positive. One participant said that the "system itself seemed to flow" when asked about the interface. One participant said that the tool "*wasn't a scary tool to use*". This statement is worth noting, as the same participant does not "make online purchases because they are too complicated".

4.3 Heuristic evaluation

For the heuristic evaluation, the evaluators were given heuristic checklist to critique the design comprising all 10 of Nielsen's heuristics [21] and five additional guidelines (Table 2). Each problem identified by the evaluators was related to a heuristic and given a severity rating (Table 1) out of four, which indicates the urgency of fixing the problem. The evaluators and developer then discussed possible solutions to the problem. This is an effective way to find, prioritise and solve usability problems [23]. We used two evaluators who had previously completed heuristic evaluation courses.

Table 1. Severity ratings for each usability issue for the heuristic evaluation as per the Nielsen Norman's group "Severity Ratings for Usability Problems" [22,30].

Severity Rating	Explanation
1	Cosmetic problem
2	Low-priority usability problem
3	High-priority usability problem
4	Usability catastrophe (imperative to fix)

The evaluators determined that V1 of the prototype covered all but two of the selected heuristics (86%), with only *help and documentation* and *structure of information* not covered adequately. The insufficient *help and documentation* was rated a three, a high-priority usability problem (Table 1). Evaluators said that the tool felt overwhelming to a first-time user. A potential solution is an on-screen walk-through or tutorial on the first login, which would subsequently be accessible through a help button.

The home page of the tool was overwhelming due to the client creation form being immediately visible, which gives a new user too much information too soon. This is in contravention of the the *structure of information* and *aesthetic and minimalist design* heuristics. Evaluators suggested replacing the form with an overview of the status of the user's clients and providing a button to show the client creation form *on demand*. In addition, we could apply *flexibility and efficiency of use* heuristic and allow the user to choose the default view of the homepage. The severity of the issue was rated a three, a high-priority usability problem.

Table 2. Nielsen's ten and five additional heuristics used for the heuristic evaluation [21]

Heuristic	Description
Visibility of system status	Reasonable and timely feedback to inform the user what is happening.
Match between the system and the real world	Avoid unfamiliar terms or processes by emulating the user's environment.
User control and freedom	Users need to leave unwanted states easily and support undo and redo.
Consistency and standards	Ensure the system is consistent and follows platform conventions.
Error prevention	Design for error prevention and present useful error messages if you cannot avoid the error.
Recognition rather than recall	Make relevant actions and information visible to reduce memory load.
Flexibility and efficiency of use	Cater to both inexperienced and experienced users by allowing users to tailor frequent actions.
Aesthetic and minimalist design	Irrelevant or rarely needed information should be avoided.
Recognize, diagnose, and recover from errors	Error messages should be intuitive and plain while also providing quick recovery options.
Help and documentation	Provide natural help and documentation to the user
Navigation	Provide navigation aids (search functionality) and give feedback about where the user is
Use of modes	The system caters for a variety of modes
Structure of information	Information is presented simply and understandably
Enjoyment	The system is fun and satisfying to use
Extraordinary users	Cater for a wide variety of users, including those with disabilities

A smaller usability problem was the lack of an overview for the users which falls under *system status* with a rating of two, a low priority. This would be investigated in the usability test to see what information the users want in an overview.

A problem with the auto-scroll, the system that automatically moves the user to the next question, was identified under *user control and freedom*. When the auto-scroll of an assessment is on (it can be toggled) and the user skips a section and continues further below, the screen "whips" back to the next incomplete question in a jarring motion. This is usually unintentional on the user's part. The severity was rated a three, a high priority, with the solution being to make the auto-scroll never jump to previous sections and to just scroll to the next incomplete question relative to the user's position in the assessment.

A final usability suggestion was made, under *flexibility and efficiency of use*, that the search bar on the home page should filter using more than just the client's name. The search could also filter clients based on other details, such as

file number or contact details. The severity was rated a two, since it would be a useful feature but is not a usability problem.

5 Phase Three: Prototype V2

In accordance with the findings of the contextual inquiry, usability test and heuristic evaluation, prototype V2 was reformulated to have a dual purpose, operating as both an SUD assessment tool and an organisational management tool.

Prototype V2 enables digitisation of any forms that a SUD organisation would use. The tool incorporates the idea of a test suite, allowing organisations to add multiple assessments or forms for their clinicians to use in conjunction with one another. With this much expanded assessment and information storing system, all the data for the DSD can be captured. The intention is to ultimately make generating quarterly reports a seamless process (not yet implemented). Upgrades to the WC-SUDAT assessment now enable clients to complete it on their own using a OTP to access their unique assessment. This should speed up the on boarding process for a new client. One caveat to the tool is that the risk calculation is only applicable to the WC-SUDAT assessment. This is to incentivise the use of WC-SUDAT as there are benefits to standardising an assessment tool of this nature.

Most importantly, the beta build digitises the paper-based processes of Western Cape SUD NGOs, a central theme highlighted by the contextual inquiry to allow for automation of processes (such as DSD data collection).

Four key features were implemented: a *multiple assessments feature*, which allows multiple assessments to be added to the tool; *sign-up page validation*, to provide helpful error messages to guide users through the sign-up process; *one-time pin (OTP) based assessment access*, to allow social workers to generate assessments that a client can complete without logging in to the tool; and *DSD data capture*, to add all the client data capture required by the DSD. All features were tested manually or through unit tests.

V2 allows for *multiple assessments* or forms to be administered: the prototype can digitise any assessment or form using the same style as the original questionnaire (Fig. 2). This is a fundamental change to the original prototype. An assessment comprises sections, which have subsections containing three question types: text answer questions (which have text input as their answer, Fig. 2 pink arrow); choice answer questions (which have choices from which a user can select one or multiple answers, Fig. 2 blue arrow); and client detail questions (which take fields of a client object and insert them into an assessment, Fig. 2 green arrow with black border). Assessments and forms appear as tabs on the client page which a user can switch between (Figure 2 maroon spotted arrow). Assessments are only displayed to the users of the organisation that created them. The risk report was updated to work with multiple assessments. In addition, every client may one of each assessment; the assessment questions and client answers can

be updated at any time, assessments may log client information that is already captured, and assessments may require multiple choice answers per question.

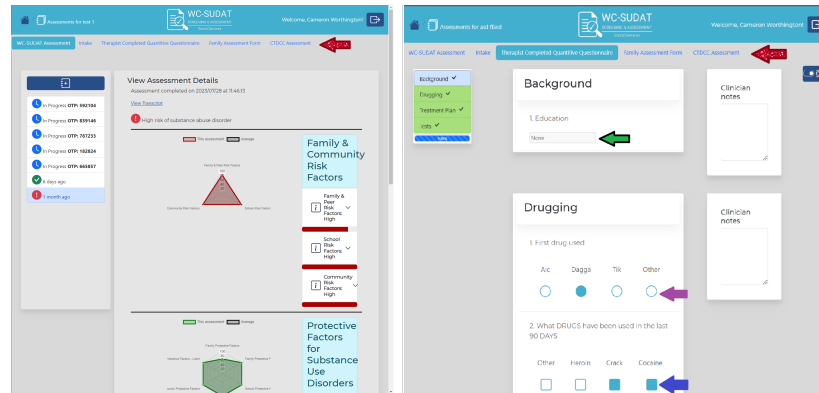


Fig. 2. Prototype V2 client page dynamically loads all the assessments that an organisation has digitised. The left image is the original assessment, the right image one of the digitised assessments of CTDC. There are three question types: text answer questions (pink arrow); choice answer questions (blue arrow); and client detail questions (green arrow with black border). Assessments and forms appear as tabs on the client page which a user can switch between (maroon spotted arrow)

The sign-up page in prototype V2 validates all data fields with the level of detail in error messages brought in line with other websites (Google and Facebook) and occasionally provides more detail (e.g. the password field tells the user exactly what character types they require to make the password secure). The page is organised to avoid errors, for example, the dropdown for selecting an organisation filters the branches depending on which organisation the user selected. A one-time pin (OTP) based assessment access feature was added to enable a social worker to generate an assessment that a client can access with a 6-digit unique assessment code (or OTP) without logging in.

All features were implemented using client page HTML, CSS and Javascript.

6 Discussion

Our User Centred Design methodology had three phases: building a first throw-away prototype of a webtool questionnaire as a straw man in Phase One, and then subsequent contextual enquiry and evaluation with a quantitative usability test and qualitative heuristic evaluation in Phase Two. As we already had a webtool prototype, the gaps between the users requirements and the functionality of our tool were more easily identified in the contextual enquiry than if this

had been performed before Phase One. This approach highlighted fundamental issues with the both the focus and implementation of the first prototype, which were addressed in Phase Three of our second implementation which is fit for purpose and ready for deployment.

A primary issue raised in both the contextual enquiry and the usability test is that prototype V1 did not have sufficiently broad and useful functionality: SUD organisations do not want another standalone assessment tool. Because social workers spend a large amount of time on assessments and administrative tasks, a webtool must function not only as an assessment tool, but also a client and organisational management tool. This dual purpose is critical for the uptake of the webtool by NGOs.

We addressed this in the second prototype reformulating the tool to to have a dual purpose: an SUD assessment tool and an organisational management tool. We added extensive additional functionality to digitise the paper-based processes of Western Cape SUD NGOs and so allow for automation of processes such as data collection for the DSD which will be useful for the generation of quarterly reports by NGOs. . We also implemented other desirable features included validation on the user sign-up page; and OTP-based assessment access by clients..

Another key finding is that users were unhappy with the format of the questions and length of the questionnaire used for assessment, to the extent that this impeded assessment of the tool's usability. Although the interface had an average SUS score of $72.5 \pm 5.9\%$ and is more usable than 64 % of interfaces currently in use [12], we found that users were assessing the questions in the assessment rather than the usability of the tool.

We addressed this in the second prototype by allowing multiple and alternative assessments to be administered in additional to the original assessment. V2 of the prototype can digitise any assessment or form using the same style as the original questionnaire.

Deployment of prototype V2 will require a distributed database to store the organisation's client information on-site. However, before deployment, the issue of POPIA and client confidentiality must be addressed. The constraint is that private client data (name, surname and ID number) must be stored on-site at the organisation. This could be done by deploying an instance of the database onsite which stores the client data only. This would require a small computer at every organisation's head office.

7 Conclusions

Our three-phase User Centred Design methodology was effective in generating a final prototype webtool with a dual purpose as an SUD assessment tool and an organisational management tool. Although the prototype developed fulfils our aims, there are a number of possible future additions to the tool. Most beneficial would be to integrate the data captured with the Department of Social developments quarterly reporting processes. This is a complex task that will

require an extensive further UCD process, and hence is outside the scope of this project.

The development of our WC-SUDAT webtool is a case study in the value of using UCD to develop effective software for the public sector in South Africa. Our final deployment-ready prototype is a better fit for the needs of NGOs working with substance abuse disorders than our original webtool, thus validating the User-Centred design approach.

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A WC-SUDAT code repository

The repository for the project code can be found at this url <https://gitlab.cs.uct.ac.za/wrtcam003/wc-sudat>