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Drug prevention in large companies

An enterprise design case study suggesting the use of Eyescanner drug test and health promotion to achieve safer workplace environments

Master of Science Thesis in Industrial Design Engineering

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Department of Industrial and Materials Science
Chalmers University of Technology
SE-412 96 Gothenburg, Sweden
Telephone + 46 (0)31-772 1000

Abstract

Eyescanner was a newly founded startup with the vision to develop a new solution for drug testing through scanning of pupil reactions and eye movements. The aim was to integrate the software into a cell phone application, so that it could be used in an efficient way by future customers. Potential customers were private sector companies, using drug tests to achieve a drug free work-place.

This single case study involved eight private companies of which the majority were large, in initial phases, and focused on one of those in later conceptualisation. Questions to be answered were related to the current and wanted drug prevention work, identification of service needs and preconditions for user acceptance for the implementation of a new solution. The aim was to investigate and suggest how the Eyescanner drug test with complementing service offer could be used as tools for creating a safer work environment in private sector companies. Semi-structured interviews and a survey were used to gather initial data about current drug prevention work at the companies. Several ideation and evaluation methods were used throughout three iteration phases, leading to the final concept.

The findings of this work revealed that drug testing at the workplace required a trade-off between integrity and safety. Companies struggled to both respect the integrity of their employees, and sustain a safe working environment. The methods used for drug testing had several shortcomings, as they did not generate the wanted preventive effects. The drug tests could be manipulated, and caused uncomfortable situations for the testee. The number of random tests was not enough to achieve preventive effects, deterring employees from drug use. This was compensated for by using suspicion tests, requiring confrontation of individuals. Confrontations came with the risk of mistakenly accusing someone and negatively affecting the personal relationship, or even threatful situations for the person confronting. Further on, preventive interventions were not prioritised, nor did they involve employees to a large extent.

It was clear that the situation at the case company required both controlling and preventive measures. The solution was therefore a combination of two concepts; a drug testing process with the Eyescanner test, and a health promotion app. The Eyescanner test would allow an increased frequency of drug tests, performed in an objective and efficient way. The health promotion app would give employees information, motivate them to engage in activities and facilitate a dialogue, aiming to make the employees feel safe at their workplace.

Keywords: Drug prevention, Work environment, Service blueprint, Enterprise, design, Eyescanner, Drug test.

Acknowledgements

This work would not have been possible without engagement and valuable insights from all people participating throughout interviews and evaluation sessions. Special thanks to the case company representatives who made sure we were able to understand their workplace context and needs in relation to a drug prevention solution. We hope that we have been able to propose a solution that is of value for your company in the future.

We are grateful for the opportunity to be part of the Eyescanner journey, thank you Stefanie Najafi and Jenny Johansson for this time. It was a great experience; we learned a lot and we hope you did as well. We wish you all the best with the future development of your company.

Thank you to Joakim Gustin and the Evolvers for connecting us with Eyescanner and for welcoming us. Your tech- and strategy guidance throughout the spring helped us in decision making times.

We would also like to thank our examiner and supervisor Bijan Aryana, who supported us with advice and wisdom. We learned a lot about the relevant aspects of academic work.

Elin and Kajsa

Glossary

Companies	
Eyescanner	The startup company Eyescanner Technology Sweden AB.
Evolve	Evolve Technology Sweden AB. Combined software development and investment company, co-owner of Eyescanner.
Drugs and drug influence	
CNS influence	Ongoing drug influence, in this report assumed to equal a risk of not being able to perform work tasks in a safe manner (as opposed to remaining substances).
Drugs	Illegal narcotic substances.
Prescription drugs	Legal drugs used after getting a prescription from a medical professional.
Remaining substances	Drug substances remaining in body, in this report assumed not to influence the CNS.
Drug testing process	
Eyescanner test	Scanning of eyes (with a cell phone camera) to detect CNS influence.
Eyescanner result	Result from an Eyescanner test. Should, like urine quick tests, be verified using a urine test before disciplinary actions can be taken.
MRO	Medical review officer, a specialist physician who evaluates if a drug test is positive or not, by reviewing the test result from an accredited laboratory.
Random drug tests	Drug tests used after randomly selecting testees.
Suspicion drug tests	Drug tests used when someone is suspected to influenced by drugs.
Testee	Person being subjected to drug tests.
Urine quick test result	Preliminary test result from a urine stick that detects a limited number of drugs (2% margin of error). Should be seen as preliminary until verified.
Verified result	Drug test result(s) that has been verified to be positive at an accredited laboratory and assessed by an MRO.
Other	
Nudging	A method used to influence behaviour by making changes to choice architecture.

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1. Introduction

Drugs in society

Drug use has been considered a serious societal issue in Sweden since 1960 (Folkhälsomyndigheten, 2019). An investigation by Centralförbundet för Alkohol- och Narkotikaupplysning (CAN) (2019) showed that use of drugs in Sweden had increased during the last 10-years. Along with new distribution channels and new substances, drugs had become more accessible. The same study showed that despite doubling the confiscation of drugs since 2008, the prices remained relatively low, making drugs accessible also from an economic perspective. A survey from 2017 showed that 9,5% of the Swedish population had used drugs during the past 12 months. The result was based on responses from 27 025 people aged 17-84. Further on, 1,8% had some kind of substance use syndrome caused by drugs, and 6,1% stated they had been negatively affected by someone else who used drugs (CAN, 2018).

The societal costs related to drug addiction were investigated in a public enquiry (Statens Offentliga Utredningar [SOU], 2011) and estimated to be 23,6 billion SEK in 2008. The costs included indirect costs such as deaths, early retirement, sick leave and imprisonment (42%), social services and healthcare (26%), public authorities (27%), and the private sector including insurances and occupational health services (5%, 1,26 billion SEK). Considering the increased drug use, it was reasonable to assume that the societal costs had increased over time, and that the interest to minimise them should exist both from a political standpoint and within the private sector.

The Eyescanner idea

The idea to use eye scanning to detect if a person is affected by drugs was initiated by the two police employees Jenny Johansson (psychologist) and Stefanie Najafi (police inspector), the founders of Eyescanner Technology Sweden AB (Eyescanner). They came up with the hypothesis that eye scanning could be used to create a structured test based on the subjective assessment method that is used by the police. The police analysed movements in the eyes using a pen, a flashlight and a card with reference of pupil sizes to evaluate if a person is influenced by drugs. According to the founders of Eyescanner, this method was used in traffic controls, but also when meeting people suspected to be influenced by drugs for example on the streets or at festivals. If drug use was suspected based on this assessment, further testing was needed to confirm the suspicion and the suspect was brought to the police station. Compared to a breathalyzer (used to test for alcohol), the subjective drug assessment had a higher risk of not detecting drugs in traffic. There was also a risk that the police would feel uncomfortable bringing the suspect to the police station to pursue a blood or urine test if he/she was in doubt. 20-25% of laboratory tests taken after subjective assessment by the police showed that the subjective assessment was incorrect (Brottsförebyggande rådet [BRÅ], 2016) These numbers indicated a need for a tool to make this assessment more accurate.

Eyescanner wanted to digitalise the assessment method and make it less subjective. To achieve this, they were supported by the combined software development and investment company Evolve Technology Sweden AB (www.evolvetechnology.se) with development of the software. Their aim was to integrate the eye scanning technique into a mobile application, and through the cell phone camera measure four parameters in the eyes of the testee, to evaluate drug influence.

The initial investigations of the need for such a product showed interest not only from the police department, but also from for example private actors in the industry, customs, private consumers, schools, healthcare and residential care homes, according to the founders of Eyescanner.

Although the idea behind Eyescanner was initiated with the aim to get a better, more objective first drug assessment for the police, the police department was decided not to be the focus of this work. Instead, the focus was to find a way to implement Eyescanner's services in private companies, as the founders of Eyescanner had a fairly good understanding of the different use scenarios within the police, and that there was a confirmed interest but little knowledge about the needs in the private sector. Compared to developing Eyescanner for the police, the private sector would potentially allow for a faster implementation of a new product, especially if they were part of the development process, and the chance to get investment was seen as higher if focusing this work on the private sector.

Drug testing in the private sector
Swedish companies have used urine tests to detect drug use among employees since the beginning of 1990 (Sveriges företagshälsor, 2019). Illegal drugs were found in nearly 5% of the 60 000 samples analyzed at the laboratory at Karolinska University Hospital in 2017. According to Sveriges företagshälsor, the amount of positive test results had increased during the last years. Many aspects need to be considered when it comes to drug testing in private companies. It involves ethical, legal, economic, safety and personal integrity aspects (Alna, n.d.) A new tool within the field of drug testing would face challenges in terms of acceptance and would need to be developed with personal integrity in mind.

1.1 Aim

The aim of this work was to investigate and suggest how the Eyescanner test with complementing service offer could be used as tools for achieving a safer work environment in large private sector companies.

1.2 Study questions

In order to understand needs in relation to drug testing within the private sector, three study questions (Q1-Q3) were to be answered. To further define these, sub-questions were used.

Q1: Why and how do companies perform drug tests today?

- On what grounds are drug tests performed today? What is the wanted situation like?
- What are their main reasons for performing drug tests today?
- What is the use frequency of drug tests today and what is the wanted situation?

Q2: How can Eyescanner provide a valuable solution for achieving a safe work environment?

- What is needed for private companies to implement the Eyescanner test?
- Are there other complementing services needed in order to create a valuable solution?

Q3: How can user acceptance be achieved?

- Why is drug testing seen as a threat to personal integrity?
- How can the drug testing scenario with an Eyescanner test be developed with minimised intrusiveness of personal integrity?

1.3 Limitations

To ensure that this work could reach its aim, it was important to limit its scope.

- Focus was on studying needs in private companies. They were seen as a potential group of customers that could create opportunity for future revenue.
- Only companies operating in Sweden were included in the study. It was assumed that the study could reach higher validity and reliability if the investigated contexts existed under the same laws and regulations, and if companies included had the same responsibilities towards their employees.
- Legal aspects were not investigated in detail, since there was a lack of clear laws regarding drug testing in private companies. However, consultation with knowledgeable people could be relevant to increase the likelihood of an implementable solution.
- The solution space for the Eyescanner test was limited to a mobile application since it was important to keep the costs low.
- It was not an aim to develop the concept to a detailed interface level. It was more important to investigate the possibility of creating a solution that could be valuable to many private companies, and answer questions regarding their needs on a higher process level.
- The work did not specify how the technical solutions would be developed. However, a continuous dialogue was kept with Evolve to ensure that wanted functions were reasonable from a developer's perspective. Nor did the work include deep investigation of the scientific ground for connecting affected eye parameters to drug influence.

1.4 Introducing the Eyescanner technology

As previously mentioned, the hypothesis was that it would be possible to develop a software that, through a mobile camera and application, could scan and analyse parameters in the eye to detect drug influence. The parameters are scientifically proven to be affected during influence of drugs, because they are part of the central nervous system (CNS) (Tennant, 1988). The parameters are the pupil size, involuntary eye movements (nystagmus), pupil reaction to light and the ability to cross the eyes, see figure 1. In order for an Eyescanner result to be positive, two of the mentioned parameters should be affected.

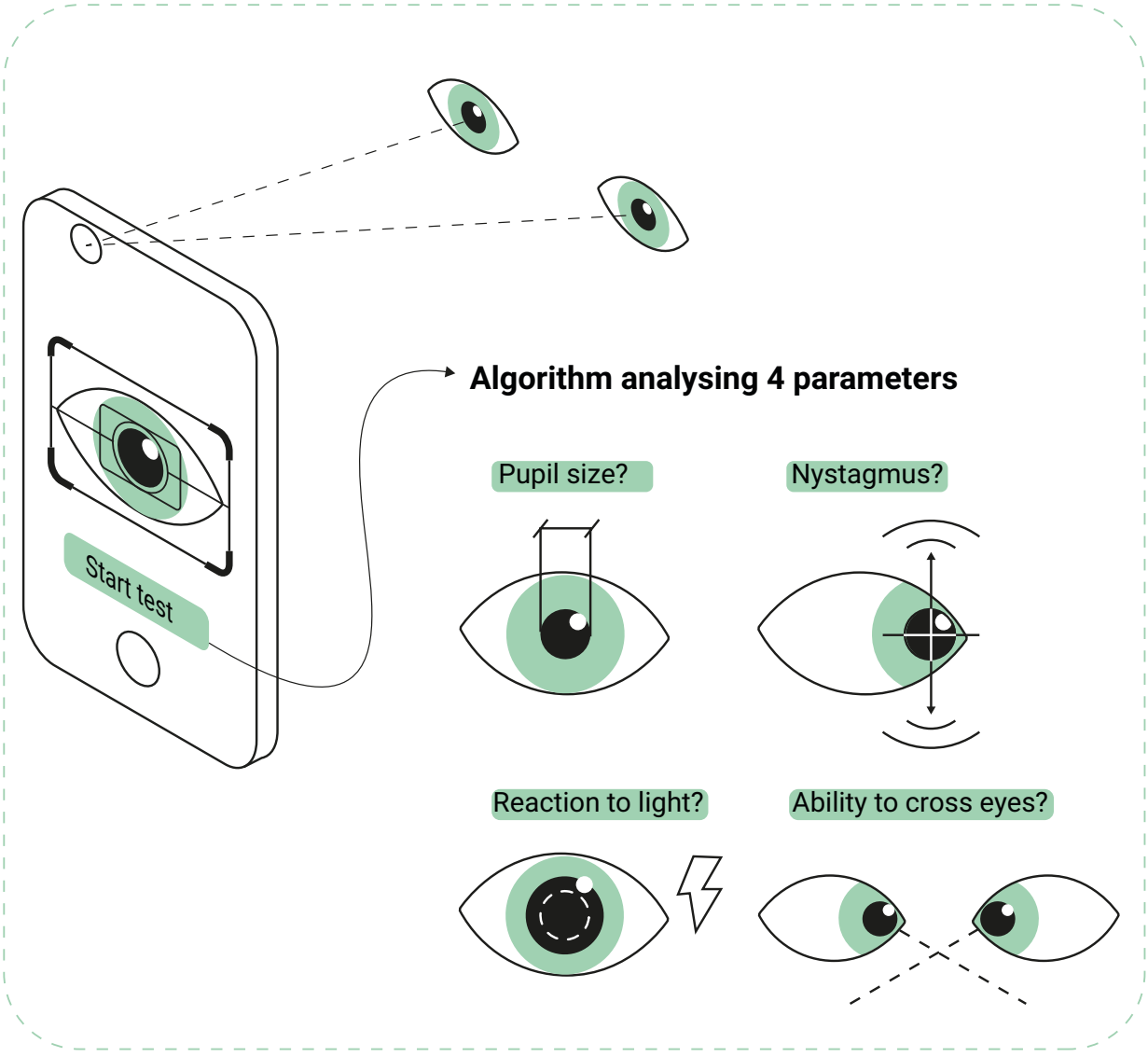


Figure 1 - The parameters measured in an Eyescanner test.

One factor differentiating drug test methods is the detection time, that is, for how long after drug intake can the drug be detected through the test. Read more about this in section 2.4 Different types of test. One distinct difference between eye scanning and other techniques was that a positive result equals CNS influence, and thus confirmed safety risk. Results from other techniques showed substance and amount, but there was no limit value for which, if exceeded, one could say that the person tested posed a safety risk.

2. Background

This chapter describes practicalities around drug testing in the Swedish industry, including legal aspects, when drug tests were used and the different methods. The chapter ends with a review of strategies to promote healthy behaviour.

2.1 Legal aspects

The Swedish law and trade unions, as well as authorities provide aspects that need to be considered when introducing drug tests at a workplace. This section will touch upon some of these that can have an impact on a design solution.

Narkotikastrafflag (1968:64)
1 § states that using drugs is an offence in Sweden:

> Any person who unlawfully…
>
> ***(...) possesses, uses or otherwise handles narcotics shall, if he has acted wilfully, be sentenced for a narcotic drug offence to imprisonment for not more than three years.***

Arbetsmiljölag (1977:1160) AML
3:2 § An employer is obliged to prevent risks of ill-health and accidents at the workplace.
6:1 § The employer and employees should cooperate in creating a satisfactory work environment.

Arbetsmiljöverkets författningssamling (1994:1) AFS
13 § an employer should clarify internal rules and routines in an alcohol- and drug policy supported with an action plan, as well as organising adaptation of the work and rehabilitation services in a way that detects drug-related problems as early as possible among employees.

Trade unions
A trade union is an organisation that unites employees within a certain workplace or branch of an occupation to represent their interest towards the employer (Fackförbund, n.d). Lag om medbestämmande (1976:580) states that an employer has to take the initiative to negotiate with the trade union before making major changes to its activities or terms of employment. Landsorganisationen i Sverige (LO), (2012) accepted drug testing at the workplace under the following circumstances:

- Employees are performing "safety work" or equivalent
- The employer has a drug policy that has been negotiated with the union
- Instruments used must be reliable (no "Clas Ohlson gauges"). The instruments must be handled properly and calibrated to a sufficient extent
- The tests shall cause as little interference of integrity as possible
- Urine or blood samples should be handled by healthcare professionals

- The samples must be treated in a satisfactory manner
- The samples must be analysed in an accredited laboratory
- The analysis of the samples must not include excessive information
- Consent from the testee is necessary for anyone else to take part of the test result
- Tests targeting only one individual worker are only allowed as part of rehabilitation and require explicit consent according to a rehabilitation plan

There was no specific law regulating how drug tests should be performed in private companies, and the legislation and guidelines were unclear (Sveriges radio, 2015).

Guidelines for accredited drug testing

- **Swedac:** Swedac is the Swedish government authority with a mission to accredit and control Swedish drug test laboratories. To ensure that drug test results are reliable from a legal viewpoint, laboratories should be accredited according to one of two ISO standards (Swedish Standards Institute [SIS], 2014; SIS, 2018; Swedac, 2020).
- **European Workplace Drug Testing Society (EWDTS):** EWDTS is a European society who provides guidelines for workplace drug testing analyses in urine (EWDTS, 2015a), oral fluid (EWDTS, 2015b) and hair (EWDTS, 2015c). Swedish laboratories can use EWDTS guidelines as a requirement document when accrediting their analysis processes (Swedac, 2020).

Summary
The previous section describes legal aspects, trade unions point of view and guidelines for drug testing. The main points from these aspects are summarised as following:

- Drug use is illegal, meaning that employers can report drug use to the police.
- Employers are responsible for creating a satisfactory work environment. They should work together with employees to ensure this.
- Employers should have a drug policy and action plan to detect and prevent drug use.
- The trade unions work to protect the integrity of employees and argue that drug tests should be used only when there is an obvious reason for it (safety), and that tests are handled correctly. They take part in negotiations with companies
- SWEDAC/EWDTS - provides guidelines for testing, quality assurance of the testing process is important.

2.2 Drug test applications

There were several situations where companies performed drug tests. The goal of testing was to detect drug use or prevent people from using drugs, but there could also be other reasons motivating drug tests (Sveriges företagshälsor, 2019):

- **When hiring:** Drug tests in an employment process could be used as a signal to clearly state that the company has a policy against drugs.
- **In case of suspicion:** If there is suspicion of drug use, drug tests could be motivated to objectively dismiss the speculation. If an incident or accident has happened, drug tests could be used regardless if there is suspicion of drug use or not, in order to prevent any speculation regarding the cause of the accident.
- **Random tests:** Similar to tests performed in an employment process, random tests are used with the intention to send a clear signal stating the company's drug policy. All employees should be included in order to not discriminate against a group or an individual.
- **Rehabilitation:** Drug tests during rehabilitation for drug use aimed to control that the person stays drug-free and to help the employee to reach rehabilitation goals.

2.3 Quality assurance

Drug testing processes have to be performed in a quality assured manner to minimise the risk of results being false positives or false negatives, to minimise the risk that a test is manipulated, as well as to get results that are valid from a legal point of view. The urine test process includes specimen collection and screening for all test samples, followed by verification and final assessment by an MRO for positive test samples, see figure 2 (Sveriges företagshälsor, 2019). The workplace should have established Standard Operating Procedures (SOPs) for the specimen collection process. Specimen collection should be performed by someone formally authorised to collect the sample. Examples of aspects that need to be covered in the collection process are identification of testee, respect for privacy and confidentiality, surveillance of sample until it is sealed, minimising risk of manipulation, and documentation of medications that can affect the test result. Further on, to obtain legally defensible test results, analysis (screening and verification) must be performed at an accredited laboratory. An a- and a b- sample should be taken to enable a second analysis, and all sample handling should be documented and traceable (EWDTS, 2015a).

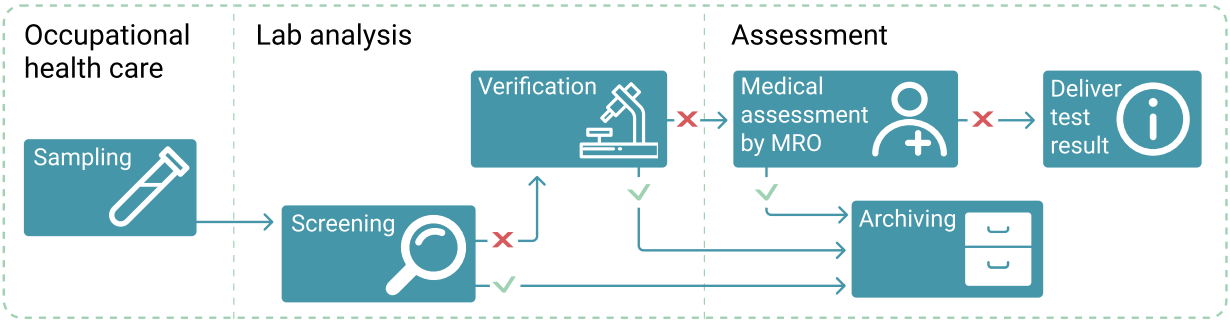


Figure 2 - The quality assurance process. Adapted from Sveriges företagshälsor (2019).

2.4 Different types of tests

Different types of drug tests were used to detect drug use in the workplace. According to Swedac (2020), urine tests were used most frequently, but oral fluid and hair analysis also occurred.

Urine

Urine was the most common sample material for drug testing (Swedac, 2020). It is a well researched and available testing technique (Hadland & Levy, 2016). Urine tests performed according to standards and guidelines give a reliable result, however there is risk for manipulation of the sample during specimen collection. The risks include amongst other, replacement or dilution of urine sample (EWDTS, 2015a). Generally urine tests have longer detection time than blood, oral fluid and breath analysis. Using a urine test, drug use can be detected up to days or weeks after intake (Hadland & Levy, 2016).

Oral fluid

Oral fluid testing was not as commonly used as urine testing, but has the advantage that it causes for less intrusion of privacy than urine testing (Hadland & Levy, 2016). Tampering is a risk also in oral fluid testing and thus, precautions have to be taken during the specimen collection (EWDTS, 2015b), however, the risk for tampering is lower compared to urine tests (Hadland & Levy, 2016). A disadvantage with oral fluid testing is that the testee has to be supervised for at least 10 minutes before specimen collection, to ensure that the person has nothing in their mouth (EWDTS, 2015b; Hadland & Levy, 2016). The detection time is generally shorter than for urine testing, drug use can be detected from minutes up to hours after intake (Hadland & Levy, 2016).

Blood

Drug testing through blood was rarely used in workplace drug testing, but rather when there is suspicion of crime (Sveriges företagshälsor, 2019). Blood sample analysis should be used when it is important to know the exact amount of a substance in the blood at the time of the sample collection (Rättsmedicinalverket, 2018). Blood tests are invasive, something that is seen as a disadvantage of the technique (Hadland & Levy, 2016).

Hair

Drug substances are stored in the hair and can therefore be detected longer through hair analysis than through other techniques. How long the detection time is depends on the length of the hair (Rättsmedicinalverket, 2019), but in some cases substance use can be detected up to months or years after intake. It takes up to a week before drug use can be detected through hair analysis (Hadland & Levy, 2016).

Breath

Breath analysis for detection of drugs was a relatively new drug testing technique (Sveriges företagshälsor, 2019). It was developed with the aim to create a drug testing technique that was easier to use than urine, blood and oral fluid. Studies have shown promising results when breath tests were compared to urine tests, however, the detection time for drugs through breath analysis was limited to around one day (Kriminalvården, 2016).

Rapid tests

Rapid tests (often called urine stick/strip) were an option when it was very important to get the results right away. These tests were limited in terms of how many drugs they detect. Screening for drugs with rapid tests was not recommended in workplace testing, since the risk for false positives was larger. The result should therefore be verified with another method afterwards (Equalis, 2019).

2.5 Strategies to promote healthy behaviour

As mentioned in section 2.1 Legal aspects, employers have a number of obligations based on which one can argue that drug prevention programs should be an important aspect of work environment initiatives. Interventions for dealing with drugs in a workplace can apart from including drug tests also include other preventive measures, such as peer support by educated union workers (Spicer & Miller, 2005), giving information or arranging training activities for employees (Reynolds & Lehman, 2008; Bennet, Lehman & Reynolds, 2000). Pidd & Roche (2014) concluded there was a lack of evidence regarding effectiveness of workplace drug testing. It also seemed like there was limited research to find including systematic reviews of drug prevention programmes in workplace settings specifically (Uchtenhagen, 2005; Miller, Zaloshnja & Spicer, 2007). Although these articles were from a while back, scanning of available articles indicated there had not been much work on this area in recent years. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (2019) confirmed that not much emphasis had been put on substance prevention in workplace settings. However, the same organisation provided a handbook for prevention of drug use and drug addiction applicable for many contexts. They described workplace substance prevention in different categories:

Universal strategies

- Having drug policies
- Education about how drug use affects the workers' health. This should be directed to managers and employees.
- Strengthening cohesion and support among groups of workers, with the aim to influence social norms towards becoming against drug use.

Selective prevention

- Confidential screening, aimed at workers who are at risk of substance use.
- Assistance programs for employees with the goal of solving productivity issues affected by employees' personal concerns.

Indicated prevention

- Confidential substance use assessments, aimed at identifying workers who are in need of treatment or brief interventions.
- Brief interventions, investigating problems that can be caused by substance use. This is done through focused processes with the aim to get individuals to change their behaviour.

According to EMCDDA, workplace substance prevention policies should target three different levels; The workplace, social interactions/peer support and individual substance use.

Taking a broader perspective, drug prevention is part of health promotion. Harden, Peersman, Oliver, Mauthner & Oakley (1999), did a systematic review of effective health promotion strategies. They concluded that partnerships with employees is a promising strategy for achieving effective health promotion programmes and suggest the following:

- Top management should be involved in, and visibly and enthusiastically supportive of the intervention.
- Employees at all organisational levels should be involved in forming and implementing the intervention, as well as in its activities.
- In order to make an intervention more accepted by a certain group of employees, one could focus on a risk factor that has high priority for that specific group.
- The intervention should be adjusted and tailor made to address the needs of its target group.

In a more recent qualitative systematic literature review, Rojatz, Merchant & Nitsch (2017) identified barriers and facilitators influencing workplace health promotion interventions. They provide a list with factors on different levels:

- The conduct of a pre-study, in order to succeed (contextual level)
- Support for the intervention by management (organisational level)
- Intervention approach, such as using a participatory approach (intervention level)
- Accessibility of participants (implementer level)

The full list is long, and could be used as a checklist for health promotion concepts.

It is likely that preventive and health promotion interventions are better at reaching some employees than others. Reynolds & Lehman (2008) conclude prevention programs should be tailored to the different sub groups of the workers, since the effectiveness of interventions depends on factors such as norms and stigma. In a study from the States, Crosgrove, Ariss, Nigem & Wedding (2016) discuss how to address millennials' concerns regarding workplace drug testing. They refer to a survey conducted at The Ohio State University and The University of Toledo, where it was found that only 34,7% of millennials would accept their employer testing for marijuana at the workplace. The right to use decriminalised marijuana was the reason for negative attitudes towards drug testing, although only few millennials use marijuana. They provide suggestions for turning drug testing into a more accepted intervention for that group of workers:

- Make sure that employees know the reason why drug tests are being performed. Valid reasons for drug tests could be requirements from third parties, such as government or customer, or safety. However, when claiming safety to be a reason, one should emphasize the importance of keeping everyone safe, rather than emphasizing the individual's safety. The reason for this was that only 7% of millennials use marijuana, and thus, 93% would not feel affected by the individual safety justification.
- Information should be given in a positive light, so that the employees know that drug tests are performed based on respect and concern for the employees.

Strategies for effective prevention and health promotion programs seem to have in common that employees should be involved and group wise targeted in intervention programs, activities as well

as in planning. Ultimately, the goal must be to change an unsustainable behaviour. By involving and targeting different employee groups, it is more likely that their behaviour will change.

Nudging behaviour change

The effectiveness of workplace drug testing as a preventive measure was questioned by Pidd & Roche (2014), and early findings in this work also indicated the need for other interventions to achieve a change of attitudes and behaviour regarding drug use at the workplace. One technique to target behaviour change is nudging, introduced by Thaler & Sunstein (2008). They suggested that nudges could be implemented in public policies, as a way to influence behaviour towards choices that would improve people's lives. Nudge theory initially gained popularity among private and public institutions, as the nudges generally are related to a low cost and can be used to promote economic goals and public health (Sunstein, 2014). Nudging has also found its way into the field of design, as a tool to target a certain behaviour change. Caraban, Karapanos, Gonçalves, & Campos (2019) reviewed how nudging had been used within the field of Human Computer Interaction (HCI).

Thaler and Sunstein define a nudge as:

> ***A nudge, as we use the term, is any aspect of choice architecture that alters behavior in a predictable way without forbidding alternatives or significantly changing economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. (Thaler & Sunstein 2008, p. 6)***

To understand why nudges can influence human behaviour, it is necessary to understand the concepts of choice architecture, the automatic and reflective systems for thinking, and cognitive biases. Thaler & Sunstein (2008) describe choice architecture as the primary tool within nudging, since the arrangement of available options influences the choices people make. How people think is commonly explained by referring to the two different modes of thinking, the automatic system and the reflective system (Chaiken & Trope, 1999; Kahneman, 2003). The automatic system is fast and used for tasks that are instinctive and require low mental effort, while the reflective system requires more mental effort to activate and is slower than the automatic system, see table 1. Our thinking systems are susceptible to cognitive biases; errors in thinking that influence decisions and thereby also behaviour, a concept that originates from behavioural economics and the work by Tversky & Kahneman (1973). One example of a nudge is "messenger", as cited in Lindhout & Reiners (2017), relating to the cognitive bias of preferring things and people we are familiar with or fond of as better, meaning that the person delivering the information influences how the message is received.

Automatic system	*Reflective system*
Uncontrolled	Controlled
Effortless	Effortful
Associative	Deductive
Fast	Slow
Unconscious	Self-aware
Skilled	Rule-following

Table 1 - Two cognitive systems. Adapted from Thaler and Sunstein (2008).

The concept of nudging has faced criticism for its practical and ethical issues, as described by Selinger & Whyte (2011). They argue that the theory lacks guidance on how to create reliable nudges to use within different cultures, as the meaning of a nudge can be understood differently depending on the receiver's interpretation. This could result in unintended outcomes rather than predicted ones. Selinger & Whyte also points out that nudging plays on influencing more or less unaware choices, that the nudged person might not be okay with as the nudge indirectly modifies the freedom of choice.

One of Thaler & Sunstein's goals with nudging was to make it easier for people to rely on their automatic system without getting in trouble and thereby improve people's lives. However, the ethical issues related to nudging should be considered carefully when designing for behaviour change. Hansen & Jespersen (2013) suggested a framework to make it easier to distinguish between different nudges and their ethical implications. As seen in figure 3, the framework provides a categorisation of the different types of nudges based on which thinking system they target, and whether they are transparent or non-transparent. The non-transparent nudges are the ones that are related to ethical issues, and in the context of preventive work and drug testing at the workplace, it could be ethically questionable whether it is appropriate to manipulate choices or behaviours of the employees.

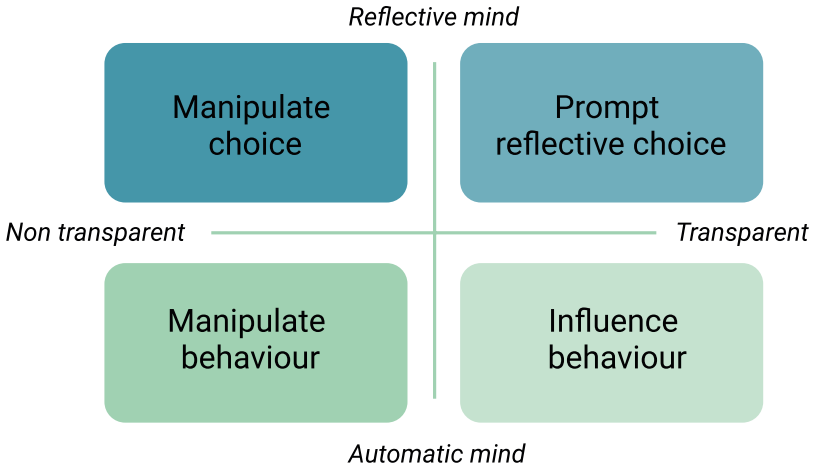


Figure 3 - Classification of nudges, adapted from Caraban et al. (2019).

The effectiveness of nudges was studied by Hummel & Maedche (2019) who reviewed 100 studies of nudging within psychology, economics and information systems. They concluded that some nudges seem to be more efficient than others and that the effect were related to the context and the type of nudge. They found that most nudges were related to the health context. The most efficient one was the use of a default-nudge. A default-nudge is explained by Sunstein (2014) as when there is an automatic rule for the default choice, for example an automatic enrolment for retirement savings. Sunstein also states that this might be one of the most efficient nudges. However, this could be considered as a non-transparent nudge if the users do not notice the option to opt-out from the default, or if the default choice simply does not benefit them. Caraban et al. (2019) also looked into the question of whether nudges are effective to change behaviours and attitudes and found that 66% of the reviewed nudges in the HCI field were successful to do so. They did not identify any direct relation between specific nudges that are more effective than others, rather that the success depended on the implementation of the nudge in a specific context. Instead, they found some factors related to when nudges fail; as described in table 2.

Lack of educational effects	This applies mainly to nudges that target the automatic system. When the nudge is no longer present, the new behaviour might also disappear.
Unexpected effects and back-firing	Most of the studies in the review did not consider the aspect of what could go wrong with the nudges. The outcome of a nudge is not always predictable.
Nudging effects not sustaining over time	The effects might not sustain over time, for example warnings can lose their effect. Caraban et al. (2019) suggest that nudges should be studied in the field to learn more about the how nudges sustain over time and what happens when a nudge is removed, research is lacking on the long-term effects of nudges.
Intrusiveness and reactance	Some nudges fail when they create too much friction and frustration for the user.
Timing and strength of nudges	This can impact whether the nudge will be successful or not. One study found that displaying warnings to smokers had a better effect if shown earlier than when the actual smoking took place (Räisänen, Oinas-Kukkonen & Pahnila, 2008)
Strong preferences and established habits	It can be difficult to target behaviours that are connected to strong preferences or habits.

Table 2 – When do nudges fail within HCI? A summary of the findings from Caraban et al., (2019).

Summary

No specific nudges were found related to preventive work against drug use, and there is a lack of research on drug prevention programmes in workplace settings within health promotion. Based on the reviewed literature, some implications for a design solution can be summarised as follows:

- **Consider the target group needs and motivations.** A solution should be tailor made for the target groups, both to increase the chance that the nudges will be understood correctly, and to create engagement in different health promotion interventions. The solution should involve managers as well as employees and aim to strengthen cohesion among employees to influence social norms. Employees should be involved in forming/implementing interventions.
- **The solution should use transparent nudges to avoid ethical issues.** This could be done by selecting nudges that makes employees reflect about their behaviours, rather than using nudges that are categorised as manipulating.
- **Include some educational effects,** an aspect that is recommended both from health promotion and nudging strategies. Employees need to understand why drug testing is performed. To present information in a positive light could be a way to clarify that testing is done for everyone's safety and with respect for employees.
- **Nudging should be complemented with other solutions to sustain over time.** The lack of understanding how nudging affects behaviour over time indicates that a solution needs more than just a change of choice architecture to be sustainable over time. A solution within the context of a workplace is likely to have different effects depending on the culture of the specific company. There should be an aim to follow up the effects of the intervention.

3. Theoretical framework

This chapter describes theory about case study research, and the Enterprise Design framework.

3.1 Case study

Case study research is commonly described as a qualitative method to be used when aiming for a comprehensive, holistic, and in-depth investigation of a complex issue, as described in a study by Harrison, Birks, Franklin & Mills (2017). Yin (2003, 2017) provides a structured methodology for case study design, and suggests that the approach is suitable to answer how and why questions as well as to understand the impact of the context in the studied situation.

Yin (2003) describes three types approaches of case studies:

- Explanatory: To explain presumed cause-effect links of events or interventions
- Exploratory: To explore problems where the studied intervention does not have a clear, single set of outcomes
- Descriptive: To describe an intervention or a phenomenon and its context

Yin (2017) suggests four different designs of a case study. The study can be a single case study or a multiple case study, with or without embedded units of analysis, see figure 4. In a single case study, one case and one context is studied, as compared to a multiple case study where several cases and contexts are studied. A multiple case study can contribute to a more robust result, but it requires more time and resources than a single case study. The embedded units can be selected to include perspectives of different elements within the case. This can support the focus of the study and allow for a more extensive analysis of the case. However, a common mistake in case studies with embedded units is when the subunits take too much focus from the major unit of analysis, the case itself. Therefore, as Yin emphasizes, it is important to connect back to the original case throughout the work.

Yin (2017) describes five different rationales for a single case study.

- Critical: The case can be a critical test of a specific theory
- Unusual: The case is unusual and differ from theory
- Common: Aims to understand a common situation because the learnings are believed to contribute to theory
- Revelatory: A case that has been previously inaccessible for investigation
- Longitudinal: Focuses on how conditions change over time

Furthermore, Yin proposes five components to consider for the case study design, (1) the study questions, (2) the study propositions (not used for exploratory approaches), (3) the case's units of analysis, (4) the logic linking data to the propositions and (5) the criteria for interpreting the findings.

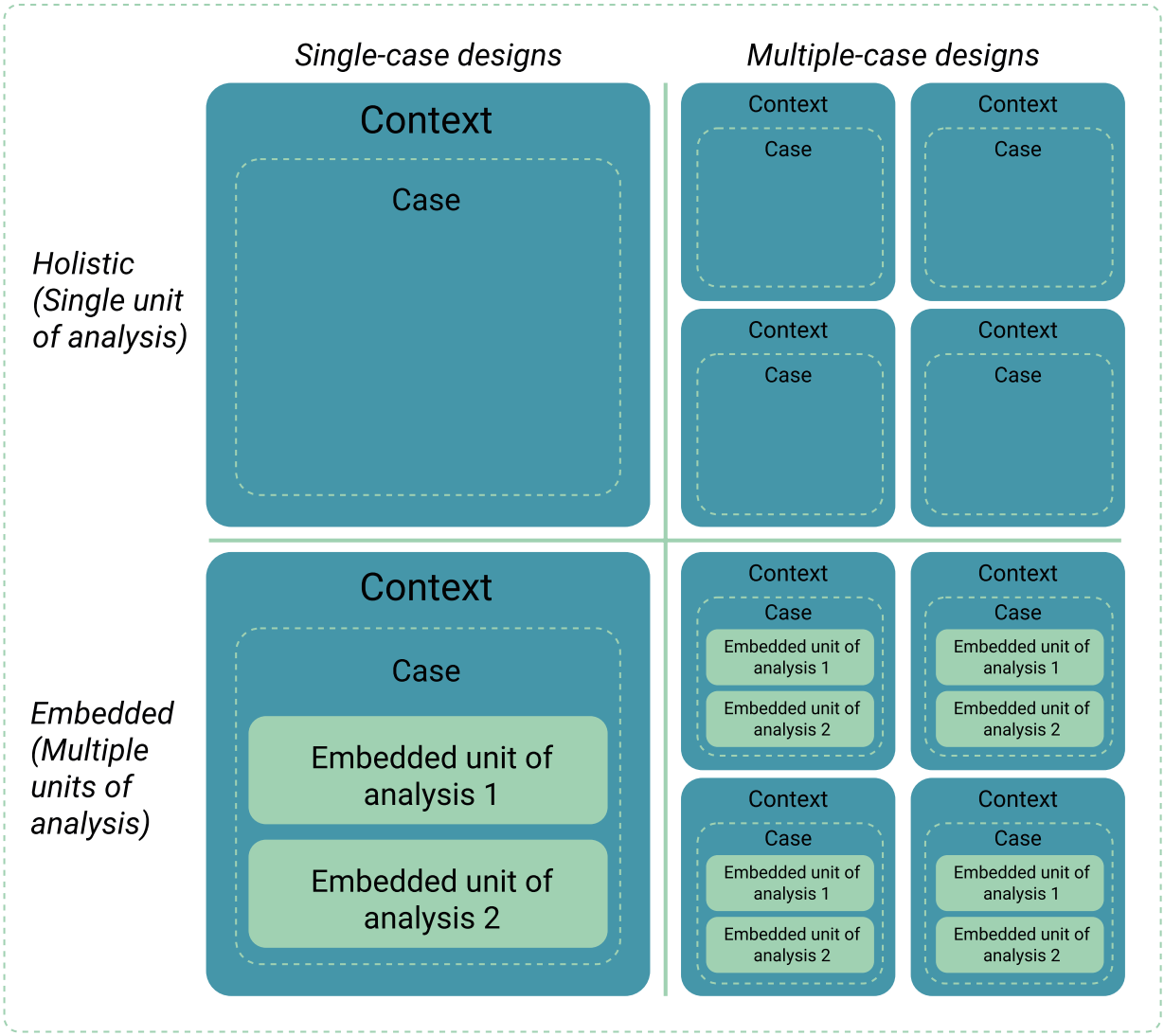


Figure 4 - Four different case study designs. Adapted from Yin (2003).

3.2 Enterprise Design

Enterprise design, as described by Guenther (2013), is a framework to support transformation or creation of an enterprise. The Enterprise Design framework can be used both within start-ups and established organisations to understand the enterprise as an overall system. In this framework, an enterprise is seen as the different actors in the market, the people and stakeholders that an organisation is interacting with. To deal with the complexity of an enterprise in a holistic way, the framework suggests to structure it in five levels. Each level comes with aspects to consider, along with questions to guide the research. The different levels of the framework are introduced in short below and illustrated in figure 5.

Big picture: This level describes the enterprise on a holistic level. The focus is visionary and decisions are of strategic nature. Questions to answer are What people feel and think about the enterprise?, How does it function and what supporting processes build it up?, and What do people experience when interacting with the enterprise?

Anatomy: Can be seen as building blocks that make up the enterprise, including stakeholders and their roles, touchpoints where people interact with the enterprise, value propositions of its services as well as contents of those services.

Frames: This level describes the enterprise in terms of business models and the people for whom the enterprise creates value for. It should also describe the function of the enterprise – It defines the activities and goals supported by the enterprise. Lastly, the frames level includes structure of, or interrelationships between objects relevant for the enterprise.

Design space: The design space level of an enterprise defines ways of communication, information flows, and how people interact with services or products. It also describes how business operations are carried out, what the organisation looks like in terms of people and teams, as well as how the technical solution is used in the design.

Rendering: The focus of the rendering level is applied, in contrast to visionary, and decisions are operational, rather than strategic. The level describes signs, such as media and symbols that allow people to recognise the enterprise. It also defines things and places, that is, devices or tools available, and where people interact with the enterprise, respectively.

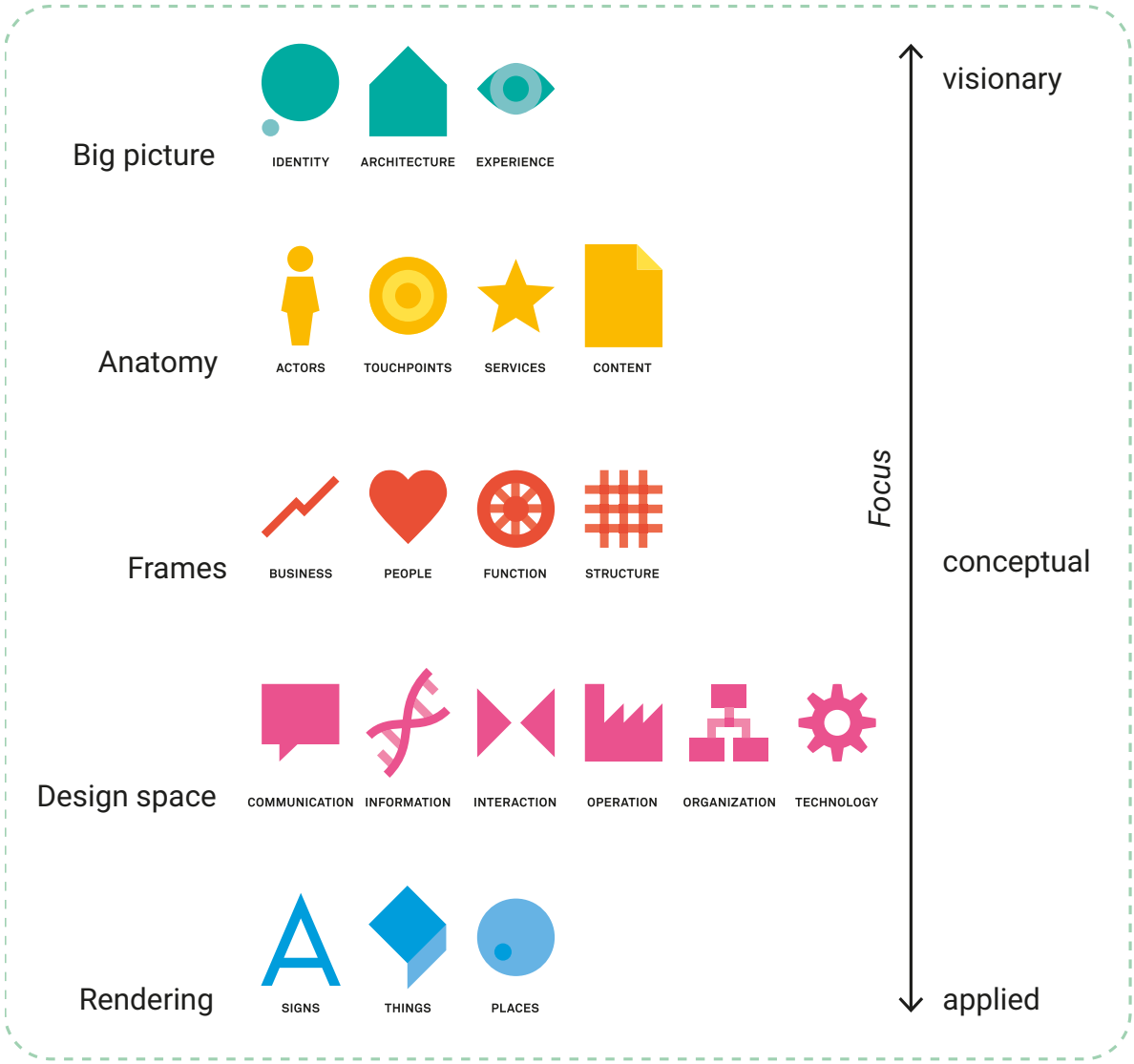


Figure 5 - Overview of the levels in the Enterprise Design framework. Adapted from Guenther (2013).

Guenther suggests that the framework can be used by:

- Executives and strategists to apply design in a strategic way to develop their organisation as part of a bigger whole
- Designers and architects to expand their view of the design challenge and the enterprise
- Consultants and technologists to strategically manage the different needs from stakeholders
- Entrepreneurs and visionaries to guide their decisions when creating an enterprise from scratch

The Enterprise Design framework suggests a design process as seen in figure 6. Each phase focuses on different levels included in the framework.

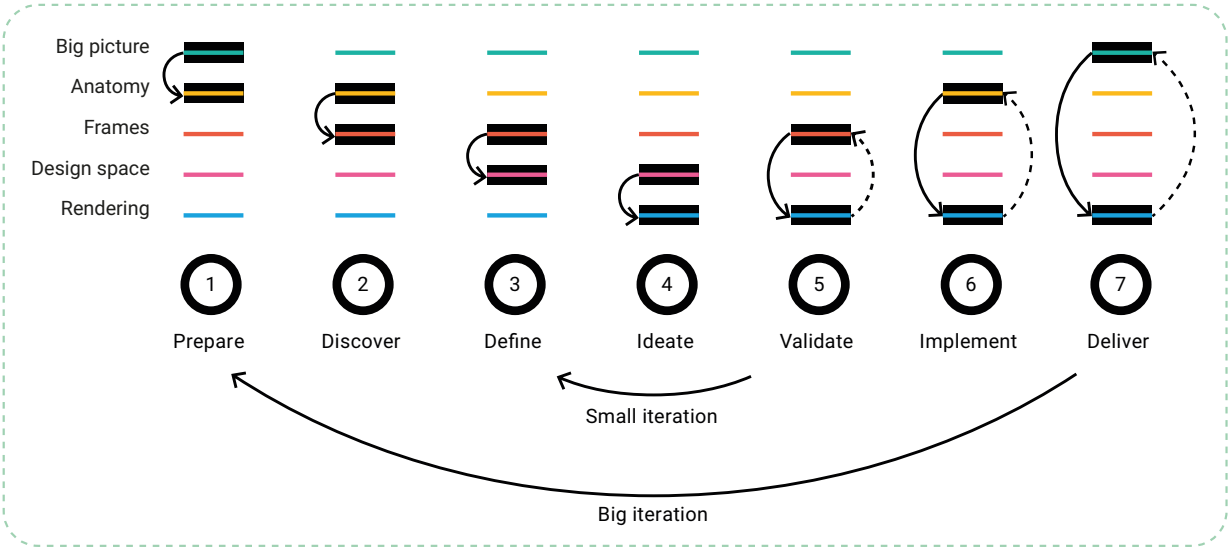


Figure 6 - Design process from the Enterprise Design framework. Adapted from Guenther (2013).

4. Method

This section describes how the work was conducted, including the broader research approach case study, the Enterprise Design framework, as well as the five phases that built the process.

4.1 Single case study

A case study was seen as a suitable method since it allows for an in-depth understanding of the context of the studied phenomenon. The method was used for planning the research and finding a suitable focus for the project. The case study was conducted in the context of one company in the private industry. This approach contributed to narrowing the focus of the study, as well as generating valuable insights from a potential future customer for Eyescanner.

The case study was further defined by using the components suggested by Yin (2017) for describing the case study design. The study questions are described in section 1.2. The units of analysis and the case definition are described below. The logic linking of data to the propositions and the criteria for interpreting the findings both refer to analysis of data. This was a continuous activity throughout the work, however, specific methods for analysis are found in section 4.5 Phase 3 - Define.

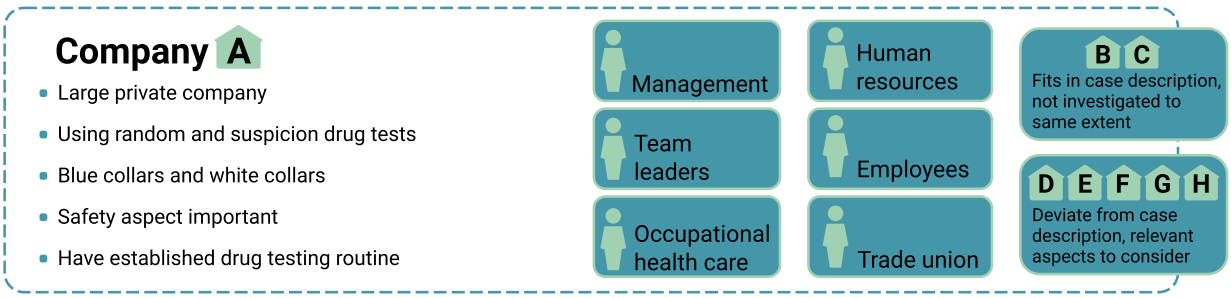


Figure 7 - Case definition with embedded units of analysis.

The case study in this work was defined as a single case study with embedded units of analysis, see figure 7 for definition of the case. An exploratory approach was used, and to reach the aim, this work needed to investigate the circumstances around an everyday situation for companies included in the case, and thus, the common rationale best described this case. The case was defined after initial interviews had been held. One of the eight companies had the possibility and interest to participate in a case study throughout the time of the project, and thus, that company was chosen as the case in this study. However, several companies were interviewed in the beginning of the study to get an understanding of the general market need in related to the Eyescanner test. Some of those companies (B and C in figure 7) fitted into the case description and had similar overall needs. Other companies (D-H in figure 7) deviated from the case description, had different viewpoints and less similarities but were considered relevant references. As those companies could not be involved to the same extent as company A throughout the work, the decision was made to define them as embedded units of analysis in this single case study, rather than choosing a multiple case study where companies would have represented different cases.

4.2 Design process

The design process used in this work was inspired by the Enterprise Design framework described by Guenther (2013). As Eyescanner was a newly founded startup company, it was considered relevant to be guided by the Enterprise Design framework throughout this work. However, the Enterprise Design framework includes describing all levels of an enterprise, from visionary to applied, as seen in figure 5. If done thoroughly, the enterprise design process requires more time and resources than what was available in this work. Therefore, selected levels of the Enterprise Design framework were used to define the scope of this work, see figure 8. Those levels were big picture, anatomy and frames, and were chosen because they had visionary and conceptual, rather than applied focus, which was seen as appropriate to answer the study questions. The Enterprise Design framework was seen as a guide when designing the case study, when planning the design process and taking decisions. The goal was not to thoroughly define each aspect of the levels included in the scope, but rather to use them as guides in the process.

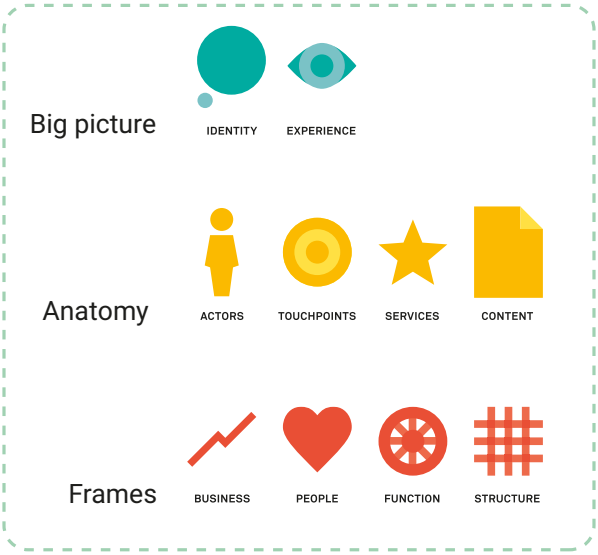


Figure 8 – Enterprise design scope.

Figure 9 shows the design process used within this case study, inspired by the Enterprise Design framework. It shows phases, methods and enterprise design levels targeted in each phase. It also describes that several companies were included in the first two phases, and that one company was in focus in the latter phases. Lastly, the figure shows the number of meetings and stakeholders included in each phase.

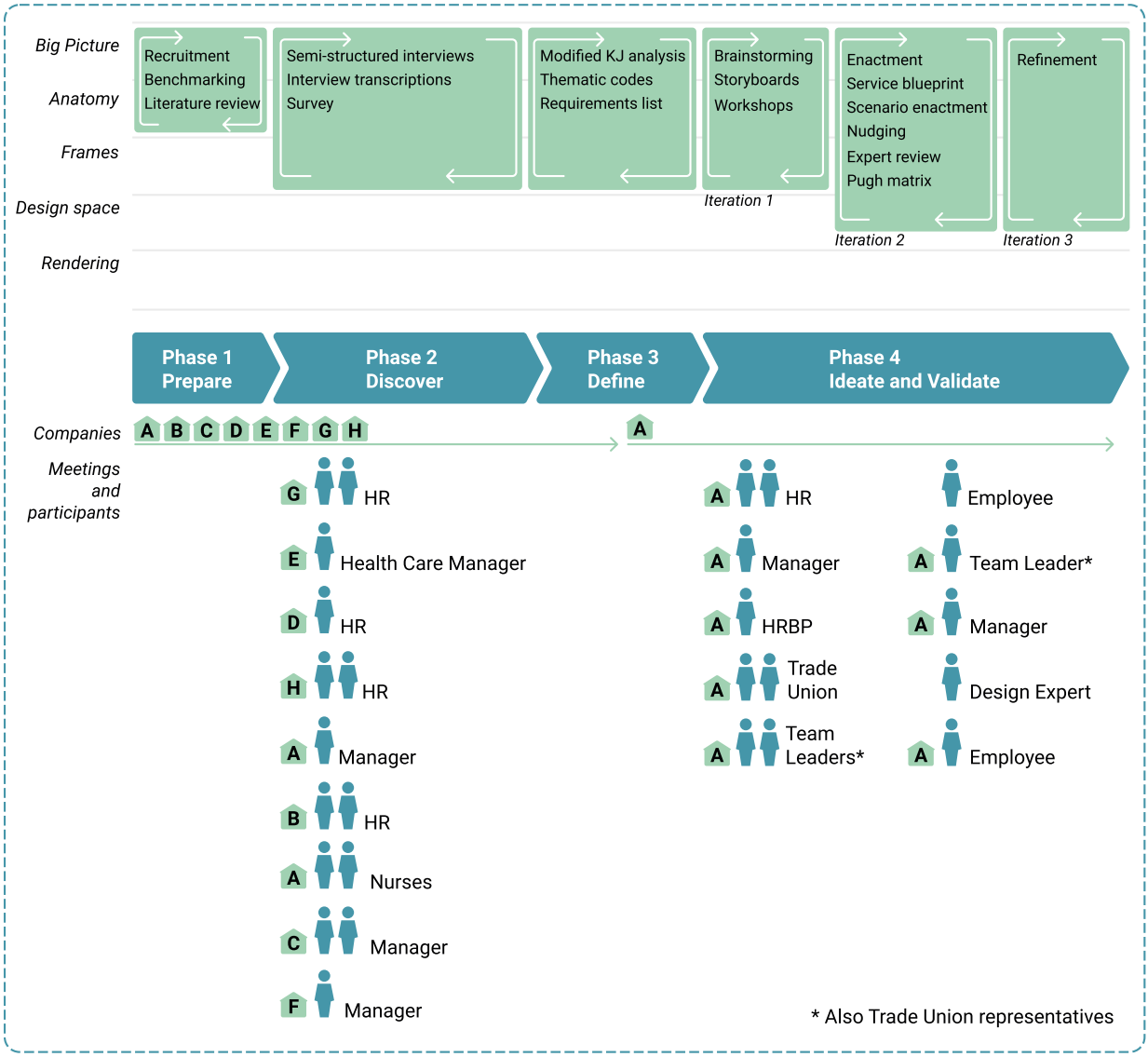


Figure 9 - Design process.

4.3 Phase 1 - Prepare

4.3.1 Recruitment

To get an initial understanding of the general interest from potential customers in the Eyescanner enterprise, several private organisations were contacted in the first step of this study. Emails were sent to 17 private companies, asking if they were interested in participating in an interview. Eight companies responded and wanted to meet for an interview. The majority of the companies were large and they all used drug tests. The sample was chosen to investigate the needs from the potential market, and to get input about experiences from drug testing processes available on the market at the time.

4.3.2 Benchmarking

Benchmarking is defined as a systematic way to compare processes and practices in order to improve an organisation's performance (Roth, 2005). In this work, it was used in the preparation phase with focus on drug testing solutions on the market, to understand their strengths, weaknesses and differences in comparison to the Eyescanner technology.

4.3.3 Literature review

A literature review describes and critically evaluates previous work done on a specific subject. By doing so, it provides context and demonstrates how a research topic fits in a larger study field (Fink, 2014). In this work, the literature review touched upon topics for behavioural change in workplace settings, including health promotion, drug prevention and nudging, as early interview findings indicated a need for preventive interventions in combination with drug tests.

4.4 Phase 2 – Discover

4.4.1 Semi-structured interviews

Semi-structured interviews are interviews containing both open and close ended questions, conducted with one person at a time. The respondent gets to elaborate ideas/information by answering questions such as *why* and *how.* Semi-structured interviews are time consuming and therefore more suitable when aiming for deep understanding and qualitative data, rather than quantitative data (Adams, 2015). Semi-structured interviews were held with representatives from eight companies to gather information about their needs in relation to drug testing. The focus was to start investigate aspects important on the anatomy as well as the frames level of the Enterprise Design framework. The interviews were conducted using interview guides with both open and close ended questions. The interview guide, found in appendix I, was created on the basis of the study questions stated in section 1.2. A prototype of the eye scanning mobile application was used to exemplify how the technology could be used. The interviews lasted from 36 minutes to 1 hour and 45 minutes.

4.4.2 Interview transcriptions

Transcribing is a process where recording of speech is written down. It should be representative and can be used in the process of analysing collected interview data (Davidson, 2009). Initial interviews and later workshop sessions resulted in large amounts of data in recorded audio format. To be able to analyse the information, the material was transcribed. It was also of interest to keep the data for future development of the Eyescanner enterprise.

4.4.3 Survey

An online survey was sent out to explore and get initial understanding of people's attitudes towards drug testing in different situations, as well as towards specific drug testing techniques including the Eyescanner test. Both people who had been subjected to drug tests and people who had not could answer the survey. The survey is to be found in appendix II.

4.5 Phase 3 – Define

4.5.1 Modified KJ analysis

A KJ-analysis is a method using a bottom-up approach to analyse large amounts of qualitative data. Units of data are written down on notes and clustered into groups of affinity. As the groups get larger, an overview of the data is created, and the groups of notes are assigned with titles (Bligård, 2015). A KJ-analysis was used to analyse data from initial interviews, using quotes from transcribed interview material as units of data. However, some conclusions could only be drawn after getting an overall understanding of the context and the whole interview. Therefore, only using text analysis based on quotes was considered an insufficient method. Therefore, additional data/conclusions were added, based on the thesis workers' holistic understanding of the interview situation.

4.5.2 Thematic codes

Thematic coding is a method to assign meanings to segments of collected data. The codes can be created both prior to the data collection in a study and inductively, while the data is analysed (Boyatzis, 1998). The method of coding, both priory and inductive, was used to summarise and structure the findings of the collected data throughout the project. Coding was used when analysing the transcriptions of interviews, when creating and analysing survey questions and responses, to gather input to the list of requirements and when evaluating concepts.

4.5.3 Requirements list

Analysed interview and survey data provided insights about companies' needs regarding prevention of drug use at their workplace. Compiling a list of requirements based on these insights is a common approach when designing a solution in development work (Anh, Nagai & Le Minh, 2019). In this work, the requirements list was created after analysing material from initial interviews, and updated throughout the design process, as more findings emerged. Requirements were given weights, as some of the requirements were considered more important than others.

4.6 Phase 4 – Ideate and validate

4.6.1 Brainstorming

Brainstorming is a creative method used to generate a quantity of different ideas on ways to solve an issue. It should be done in short, unrestrained sessions and often starts with individual ideation, and continues with letting the participants build on each other's ideas (IdeoU, 2020). Based on the identified needs and the benefits with the Eyescanner technology, possibilities were identified in a first brainstorming session. By combining the possibilities with different needs, five areas were identified and selected for further ideation.

4.6.2 Storyboards

Storyboards can be used within the design field to help visualising ideas. It is done by displaying images in a sequence that describes main events of a process (Krause, 2018). In this work, storyboards were used to visualise five initial ideas, generated in the first ideation session.

4.6.3 Workshops

Workshops are sessions where participants collaborate to solve an issue or achieve an actionable goal (Kaplan, 2020). In this work, five separate workshops were held with company representatives to evaluate and further ideate on the five initial ideas, presented on storyboards. The sessions consisted of two parts:

- Interview, to gather needs and understanding of the participants' perspective
- Workshop, where initial concepts were presented, evaluated and further ideated. Questions were used to trigger the participants to give input.

Participants were instructed to write down comments on an evaluation worksheet (see appendix III) and to discuss the benefits and difficulties of the concepts. Participants were also encouraged to modify the ideas and give suggestions on how to improve the concepts to fit their needs. Besides the notes from participants, the workshops were documented using audio recording. The recordings were transcribed and used to summarise needs and give new input to requirements list and to further ideation.

4.6.4 Enactment

As stated by Arvola & Artman (2007), enactment has by some been argued to be vital in design work. During enactment, a person gets to act out the performance of a person or a system component, in order to better figure out how an interactive system should appear or perform in certain situations. The five initial concepts that were pursued further were modified based on the first evaluation. Survey data was also used as input for this iteration. One concept was developed using enactment. Enactment was seen as an appropriate prototyping method since it forces the designer to think through a scenario and make sure there are reasonable solutions to each step. The concept was then visualised on a service blueprint.

4.6.5 Service blueprint

Using a service blueprint, it is possible to visualise the relationship between components in a service. It should help the organisation to get a comprehensive understanding of a service, as well as processes and resources needed to build it (Gibbons, 2017). In this work, a service blueprint was used to visualise the Eyescanner testing process. Given the focus on use scenario and process, it was considered an appropriate way to visualise and be able to explain the drug testing solution.

4.6.6 Online scenario enactment

Due to current circumstances, evaluation of concepts had to be done online. A scenario of the Eyescanner testing process was created, see appendix IV. The participants got to pretend they were employees at the case company (enactment), and the scenario was presented to the participants by reading it out loud and showing visualisations of the process steps. The scenario was followed by questions for the participants to answer. Notes were taken and used in the evaluation of the second iteration.

4.6.7 Nudging

One of the concepts in this work had a preventive approach to minimise drug use. The solution was supposed to increase reflective thinking and promote behavioural change among the employees. In the second ideation of this concept, a brainstorming session was held, inspired by cognitive biases and nudging strategies found in literature. The nudging strategy was used because several cognitive biases were recognised in the findings from interview and survey results. Input from literature on drug prevention and health promotion was also used as inspiration.

4.6.8 Expert review

Expert reviews can be used to evaluate prototypes in various phases of the design process. It is done by letting an expert inspect a prototype and check for issues in the future solution (Harley, 2018). In this work, a designer with experience from working with cognitive biases and nudging acted as the expert during evaluation of an app content, built up partly by nudges that were supposed to increase reflection and create behaviour change among employees.

4.6.9 Modified heuristic evaluation

Heuristic evaluation is a method used to evaluate a user interface based on a set of criteria, heuristics. Commonly, usability heuristics are used combined with other design criterias and findings from user studies, and the evaluation is performed by a usability expert, or an expert within the field of the product (Interaction Design Foundation, 2020). In this work, the method was modified to not focus on the usability of the interface. Instead, criteria related to the intended outcome of the solution were used, such as how it could enable behaviour change and promote health, in combination with a selection of identified needs and problems. To evaluate the concept, heuristics from different sources were identified. These included an expert review with a design expert, feedback interviews with case company representatives, identified needs and secondary data from the literature review. The evaluation was done by the thesis workers instead of by an external expert. The use of the evaluation method was seen as suitable to identify possible risks with the concept.

4.6.10 Pugh matrix

This is a decision-making matrix that enables comparison of different concepts to a reference concept. Criteria that should be fulfilled are listed, and it is stated whether the concepts fulfil those criteria better than (+), equally good to (0) or not as good as (-) the reference concept (Okudan & Tauhid, 2008). A Pugh matrix was used in the second iteration of concept development when

the concepts were described in more detail than concepts in the first iteration. Requirements (criteria) were also given weights, in order for the importance of the requirements to influence the result of the evaluation.

5. Findings

This chapter presents the findings of this work. It consists of findings from initial interviews and the online survey, followed by conceptualisation in three iterations. Figure 10 connects the methods used to its respective findings. A list of requirements was created and updated throughout the work. The requirements list can be found in appendix VIII.

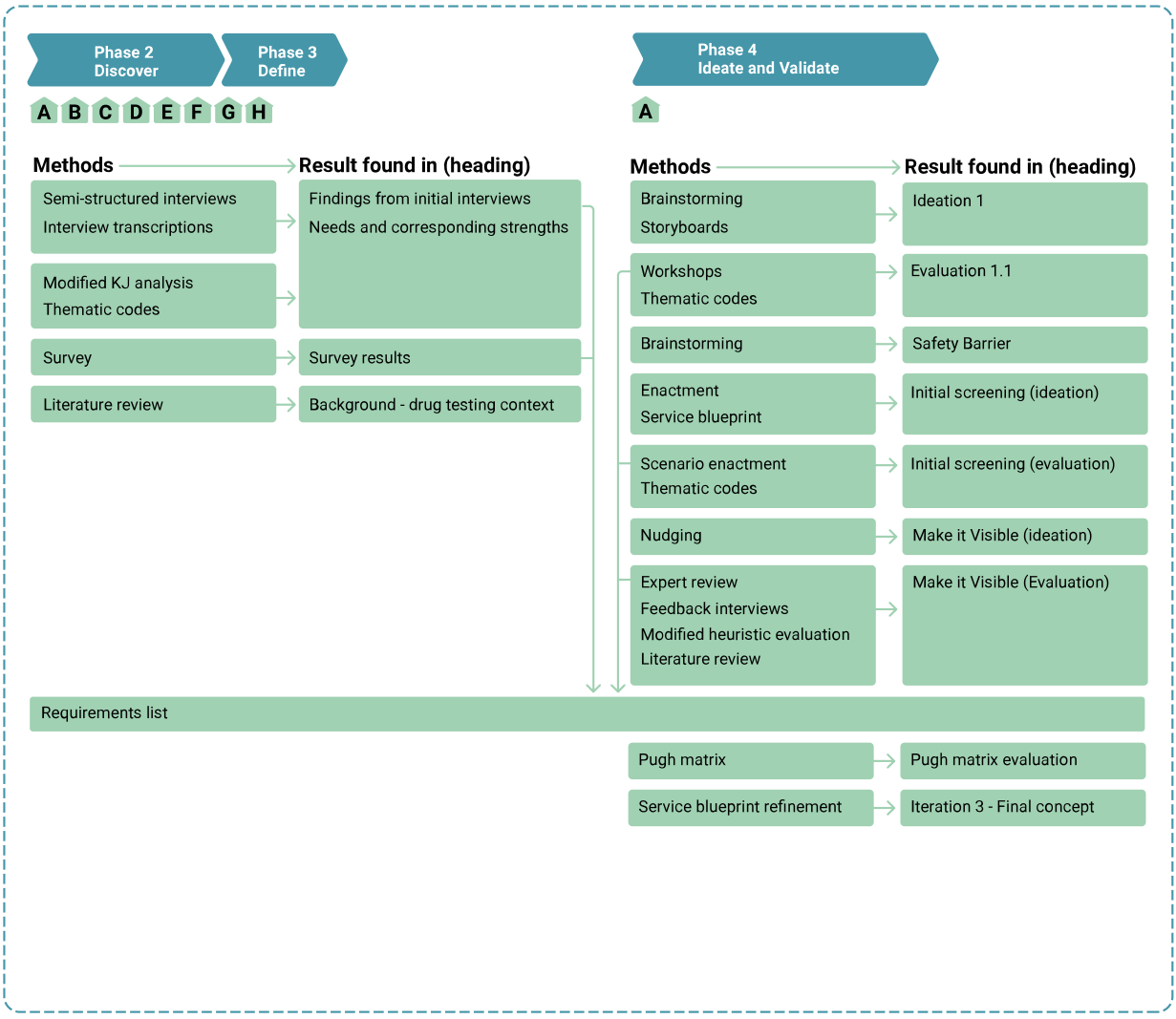


Figure 10 - Connections between methods and outcomes.

5.1 Findings from initial interviews

The findings described in this section come from first interviews held with representatives from eight companies. The information was grouped into categories in a modified KJ-analysis, containing findings and needs related to a common theme. Those categories include:

- Reasons for performing drug tests
- Drug testing on terms of the employees
- Respecting the integrity of the employee
- Facilitated and secured assessment
- Ability to confront
- Having enough knowledge
- Administering the tests
- Technical aspects

The findings described in this section come from companies using urine testing, oral fluid testing or both. All companies used quick tests before sending a sample for verification to an accredited laboratory. Companies used drug test in different situations, including at suspicion, random tests, prior to employment, after incidents and during rehabilitation. All companies used suspicion and random drug tests, but with different frequency, testing up to 25% of the workforce annually.

5.1.1 Reasons for performing drug tests

Justify drug testing

The companies struggled with interpreting laws and regulations. The lack of regulations when it came to drug testing in work life made it difficult to define how testing should be performed, what responsibilities an employer should take and which labour legislative factors to consider after a positive test result. This affected how the companies formulated their drug policies and how they negotiated with trade unions. All companies used random testing in some way, a method where the companies could test for drugs without intentionally selecting employees, as all employees were part of the sampling. This method was preferred by the companies, as they expressed that they had been informed by their drug testing suppliers that random testing was proven to have preventive effects. The sample size was not more than 25% of the employees annually. To assure the quality of the test methods, companies relied on drug testing methods recommended by the occupational health care or external drug testing companies, following industry standards. Some companies expressed that drug testing was a way to care for their employees, and to motivate employees to address their addiction, besides the safety concerns and preventive effects. Suspicion of drug use was also a factor that the companies used to justify drug testing, as all companies tested individuals in case of suspicion. A few companies selected whole departments to be tested in case of suspicion. Drug testing was also used by some companies to avoid being part of criminal activity, and to avoid speculation and eliminate suspicion connected to incidents or accidents. However, most companies justified the use of drug testing mainly to support a safe working environment and to prevent drug use among employees. These reasons are further explained below.

Safe working environment

The main reason for using drug tests as expressed by the companies was related to maintaining a safe working environment. Having a safe working environment was weighed against factors such as the integrity of the individual, avoid creating a controlling environment, and the amount of administration and costs related to drug testing. Physical safety risks, for example handling heavy machines or driving vehicles were mentioned as the main concerns. However, some companies mentioned that the shift towards automation could result in less physical safety risks in the future. Some companies mentioned that achieving a safe working environment was a shared responsibility between management and employees. Achieving a workplace free from drugs was also seen as important since some companies interact with customers, kids and families. Some companies mentioned that it would be preferable to be ensured that no one is under influence of drugs at the workplace, while others were hesitant to monitor their employees as it could create a feeling of distrust. To be able to use the Eyescanner test as a tool to unlock a vehicle before driving was seen as positive by several companies. To use it to gain access to the workplace was also seen as a future possibility by some of the companies. The companies believed that safety should be prioritised even if the attitudes towards drug use had become more liberal in society.

> ***"... We see that society itself is becoming more liberal towards drugs, but as employers, we still have to prioritise safety and cannot have people who can't handle their vehicles or tools." (HR specialist, company H)***

Prevent drug use at the workplace

All companies expressed the need to prevent drug use at the workplace. They used random drug tests to deter employees from using drugs and to communicate that their companies do not accept drug use. Some companies mentioned more specifically that they did not test to find all employees using drugs, but rather to send a signal to discourage use. Some companies used drug tests as a part of the process of recruiting new employees, to clearly state the company's drug policy. Disciplinary actions were also used to deter employees from using drugs. One company had taken it further and decided to start reporting verified positive drug tests to the police. However, the same company mentioned concerns about for how long stricter policies will have effects, and expressed a need for actions to influence the cultural aspects. Some companies reasoned that making it more visible that drug tests are ongoing might have preventive effects. Involving employees and facilitating a dialogue within the companies were also mentioned as possible areas of improvement.

Avoid hiring individuals using drugs

The companies that used drug tests when hiring new employees saw it partly as a way to avoid hiring individuals with drug addiction. On the other hand, some were also doubting the effects of these tests, as the potential employee could make sure to be free of drug influence at the time of the test. There were also concerns about the potentially higher risk to manipulate such a test, compared to the random testing where the employees are less prepared.

Protect the company brand

Drug testing was also used to protect the company brand. Some companies used drug tests to avoid becoming recognised as a company where it is risk-free to get a job as a drug user. One company mentioned that drug tests also were used to uphold their core values. Several company representatives mentioned that it would be harmful to the brand if their drivers would be

influenced by drugs. It would be preferred if the company itself could stop that from happening rather than the drivers being stopped by the police, or in worst case causing an accident. To avoid drugs at the workplace was also seen as important for the brand when for example interacting with customers, to avoid unprofessionalism.

Counteract trend in society

Some companies expressed the need to counteract the societal trend of liberalisation of drugs, as they had a large number of employees and the drug related issues in society were reflected in their business. Therefore, they would like to communicate their zero tolerance towards drugs to their employees, as well as to society. One company included their upper secondary school in random drug testing. Most company representatives did not know exactly what measures that would help, trying to prevent drugs.

> ***"The big challenge, as I believe, is not the disciplinary actions but rather the more preventive work. And that will happen if we stop this shift in attitudes" (Manager, company A)***

5.1.2 Drug testing on terms of the employees

Attitudes towards drug testing

Several company representatives perceived a more liberal attitude towards drug use in society and among their employees. Handling this attitude change was described as a challenge, because it may backfire and lead to greater resistance towards drug testing at the workplace. Some also described situations where employees questioned drug tests, and a few company representatives even stated that there had been cases where employees resigned due to the company drug policy. Those employees were not prepared to quit using drugs and thus, chose to leave the company. However, the company representatives' perception was that the negative attitude was uncommon, and that the overall attitude towards drug testing was positive. Further comments regarding the overall attitude towards drug testing was that in some cases it was questioned whether it was necessary to include all parts of a company in random drug testing. Those arguments were often grounded in personal perceptions regarding in which departments of the company drugs use was more common, as well as which departments of the company included more safety-critical tasks. In order for the general attitude to stay positive, it was considered important to use safe methods and have clear processes and routines for drug testing. It was also important that drug tests were performed by a trained professional, in order for the employees to experience a professional handling.

Attitudes towards drug testing methods

Not only attitudes towards drug testing in general were discussed, but also attitudes towards specific drug testing techniques. Techniques used include taking a sample of body fluid, either urine or oral fluid/saliva. The processes were in all cases more or less supervised, in order to prevent attempted manipulation of test samples. The random testing process was generally less supervised than when testing after suspicion of drug use. Urine testing was seen as the method being most offensive for the testee, in regards to intrusion of privacy. However, the advantages regarding mainly safety and technical aspects lead to many companies using it as the primary method anyways. It was also mentioned that the methods could cause uncomfortable experiences for the testee, regardless if that person had taken drugs or not. Another issue in both urine and oral fluid

drug testing, that could affect the experience for the testees as well as the efficiency of the methods was that it can be difficult for the testee to urinate, or produce a sufficient amount of oral fluid. Possible reasons could be tensions or mouth dryness due to nervosity. Some gave examples where testees could not urinate for 2-3 hours. Not many company representatives mentioned this as a significant problem, however interviewees from one of the companies' occupational health care estimated that three out of ten people had some difficulties during a urine test.

Agreements with trade unions

All companies negotiated their drug policies with their trade unions, whose role when it comes to drug testing includes working for protection of the employee's privacy and a quality assured process, as well as supporting in legal processes and when handling a positive test result. Due to the lack of clear regulations regarding drug tests, companies and trade unions could interpret the companies' legal rights and responsibilities towards their employees differently, and thus, did not always reach agreements regarding for example justified reasons and rehabilitation of employees with drug addiction.

5.1.3 Respecting the integrity of the employee

Not interfere with privacy

A difficulty when it comes to drug testing and drug preventive work in general was to ensure drugs were not present at work, while also making sure not to interfere with the private life of the employee. Many company representatives mentioned the problematic assessment when an employee has been abroad, using drugs in a country where it was legal, and tested positive the week after at work. Some also mentioned the fact that some employees argued it should not be the company's role to decide for disciplinary actions if the employee has used drugs in Sweden in their spare time, as long as it does not affect the safety at work. However, how should one assess whether the remaining drugs affect the employee several days later? This issue is described further in section 5.1.4 Facilitated and secured assessment.

Handle prescriptions

Another issue regarding privacy of the employee was related to prescription drugs. Some companies had reached agreements with their trade unions that the employee was responsible for informing their manager if taking prescription drugs that could affect their ability to perform their work in a safe manner. A few company representatives argued their employees should not have to state their prescription drug to their manager, however, they also questioned their own argument because of the fact that no matter if there is a prescription or not, the affected person may pose a safety risk. Prescription drugs were mainly discussed in relation to work tasks with special safety criteria, such as truck driving or handling of heavy machines. It was also mentioned that the employee could get help assessing whether a prescription drug could affect their performance from the occupational health care personnel.

5.1.4 Facilitated and secured assessment

Quality assurance of test procedures

All companies emphasized the importance of using verified and quality assured drug testing techniques and processes, and they relied heavily on recommendations from their occupational health care. The companies all described clear routines for drug testing, as well as what to do

when a test turned out to be positive. All companies deviated from the recommendations of not using quick tests, which were not recommended because of the 2% risk of false results. However, all companies sent tests for verification at an accredited laboratory after using a quick test. Ensuring a secure process included the steps described in section 2.3 Quality assurance. Many companies emphasized the importance of avoiding tampering with a test, including making sure testees are not able to prepare and to monitor the process, especially if testing because of suspicion of drug influence. Examples of tricks used to manipulate a test was bringing someone else's urine, drinking a lot of water before a test, or pretending not to be able to urinate. Some companies tried to handle these situations by for example having both urine and oral fluid tests available, in case the primary method would not work. Some also mentioned an issue regarding spreading of information about possible ways to cheat on a drug test. The risk of tampering was closely related to handling refusal. Mostly, those situations were equated with a positive test. Some companies also desired safer test methods, with less false results (for quick tests) and methods that cover all drugs, including new drugs.

Confirm impaired working ability

The other aspect regarding facilitated and secured assessment was being able to make a correct and fair judgement of the consequences of a positive test. This was related to the earlier mentioned issue of being able to decide whether a substance remaining in the body affects the employee's ability to perform work in a safe manner. This was considered a difficult and controversial discussion; Using drugs is illegal according to the Swedish law, but because of labour legislative laws, it was not obvious that the employer could terminate the employment for an employee who has been caught with substances of drugs in the body once. Therefore, it was difficult to live by the companies' policy statements of zero tolerance towards drugs. Depending on the company and the circumstances, a positive drug test could lead to rehabilitation and/or disciplinary actions, ranging from temporary leave or change of work tasks, to termination of employment. In order for the manager to decide for fair disciplinary actions and to be able to decide whether or not a person is fit for duty, several companies requested help identifying limit values. There were company representatives who explained that the urine test tells what substance has been used, and what concentration that is still remaining in the body. However, although having a concentration measured, it did not help much in assessing whether or not the person posed a safety risk at the time of the test. According to medical professionals, there is no substance concentration limit over which one can say that a person's ability to work safely is impaired. Then, how should a manager decide for a reasonable consequence of a positive test?

> ***"Well, I will not even enter the dialogue about whether you are affected or not, but you still have some kind of substance left in the body." (HR, company B)***

5.1.5 Ability to confront

Notice the signs

All companies performed drug tests after suspicion of drug use. They all discussed being able to confront someone in the case of suspicion as a major difficulty. It required that someone noticed signs of drug use, decided to act on these signs, and dared to confront the person in question. The desire to create and maintain a trusting organisation with good relationships between the people working there, often delayed the process of suspicion and confrontation. There were examples where an employee had gone many years with heavy drug abuse before it was discovered. The

reasons for this difficulty were many. Firstly, it required being able to notice signs of drug use, which included knowing what typical signs are and being present enough to see the employees. The colleagues were generally more present than managers. Most companies had a lot of educational initiatives for managers, but did not include the employees to the same extent. When someone had noticed the signs, they had to be evaluated and the colleague or the manager needed to decide what to do with the information.

Tell the manager

The company representatives' perception was that colleagues might hesitate to tell their manager or someone else, because they did not want to out the person suspected to be using drugs. Rather than to be seen as a caring act, colleagues could be afraid that it is seen as a punishing act. Some companies stated in their policies that employees were obliged to notify their manager if they suspect that a colleague is taking drugs. Some mentioned the trade union or safety representatives as alternative channels to use anonymously. There were also examples of relatives to employees that reached out to the employer with worries for their related.

Analyse information and confront

When awareness or suspicion of drug use reached the manager, the information had to be analysed and the manager needed to decide whether to confront the employee or not. Several company representatives stated that the manager needs to be sure before confronting, in order to not affect the relationship negatively in case the suspicion turns out to be incorrect. Someone said managers are often a little too careful. They agreed that it can be difficult to take the decision on your own, which is why managers could turn to human resources or occupational health care staff for advice. A few company representatives mentioned that managers can be afraid to confront employees who are suspected to be a part of a criminal group. One company representative also raised the issue of managers not confronting an employee, but instead relying on the random tests to find the suspected person. Further on, some companies had routines to perform drug tests after repeated short-term absence, as that could be a cause for suspicion of drug use. Having such routines might relieve a manager from having to suspect and confront.

5.1.6 Having enough knowledge

Information towards employees

The companies used different channels to try to reach their employees with information about the company drug policy and drug tests. Typically, those channels included policy documents that the employee reads after being hired, intranet and information meetings. Information that the employees should get included for example why and how drug tests are performed and consequences of a positive test. Some said it can be more difficult to reach blue-collars than white-collars since they do not sit by a computer regularly. There were also indications that drugs can be a sensitive subject to discuss at the workplace because companies did not want to create a feeling of mistrust of their employees. Nor did they want colleagues to be walking around suspecting each other to be influenced by drugs when there can be many other reasons for deviant behaviour. However, colleagues see each other a lot, while managers might be more absent and thus, it was considered important that the employees had enough information about what signals to pay attention to.

Information towards management
All companies had continuous information initiatives for managers and leaders to a larger extent than the information directed to employees, regarding for example updated policies, new drugs and effects of different drugs. Some expressed an interest in meeting and learning from other companies, to discuss and improve the drug preventive work.

5.1.7 Administering the tests

Facilitate administration
With processes and testing techniques being used at the time of this study, several practical aspects/requirements could be identified in the interviews. The list below states those that were mentioned and are those who were especially emphasized in addition to requirements placed by occupational health care and accreditation agencies:

- Be able to perform drug tests at the workplace, not to spend time traveling
- Save time - urine and oral fluid tests were sometimes considered too time consuming
- Urine testing procedure was considered troublesome
- It was sometimes considered limiting that drug tests need to be performed by nurses or other trained professionals
- Have an adequate room for testing
- Be able to schedule a test with short notice, for example after accidents
- Have the possibility to test a larger amount of employees/more often
- Be able to test a group of employees in a short time
- Be able to perform test day and night time. Sometimes difficult night time because it requires a manager to be present
- Testing should be worth administration and cost even when done in small scale at a smaller work site
- Be able to handle urination difficulties and/or mouth dryness
- Be able to handle aggressive behaviour from a testee in a testing process
- Cost and administration of tests can sometimes be a limiting factor for not testing more often

Quick test results
Although quick tests were not recommended for quality assurance reasons, companies used them anyways. One reason for this was the possibility of getting a quick response of a drug test, compared to waiting for the verified result. The companies got a preliminary test result from the quick test, however, a positive quick test always had to be verified at an accredited laboratory. No disciplinary actions could be taken until the test result was verified, but the manager had to make a risk assessment to decide whether or not the employee could stay at work with the same or adjusted tasks, or be sent home while waiting for the verified test result. A quick response was important because the employer wants to know that the employees are drug free when at work,

and significantly important after suspicion of drug use. It was also preferable that verified test results would come as quickly as possible. Letting an employee wait for a test result could cause unnecessary worries. A quick response could also be of value during a rehab process, to ensure that the testee has not taken more drugs during that period.

Handle positive results

Dealing with a confirmed positive test result was troublesome from many perspectives. First, there had to be clear routines to ensure anonymity, by only telling the result to those who had to know about it. Second, the situation needed to be analysed to decide whether it has to do with a problematic drug addiction, or occasional use. In the latter case, most companies saw the positive test as misconduct by the employee and took disciplinary actions depending on the severity of the situation. In the case of admitted drug addiction, several companies initiated a rehabilitation process. A few companies did not take responsibility for rehabilitation. Due to the lack of regulations in the law, most companies had difficulties assessing what their responsibilities were when it came to initiating a rehabilitation process or not, as well as deciding whether or not they should try to terminate an employment. However, companies seemed to have in common that an employee who had tested positive for drugs was sent home until the person could leave a negative test result. Follow-up drug tests were conducted during that time, as well as during an ongoing rehabilitation process.

5.1.8 Technical aspects

Detection time

A technique like Eyescanner's, that detects CNS influence but not remaining substances, was seen as both positive and negative by the interviewed companies. One company saw it as a negative aspect, as they wished to detect remaining substances in order to have a better chance of helping people with drug addiction. Another company saw it as a strength that an Eyescanner test would only detect CNS influence, rather than also remaining substances. This could help to evaluate if an employee is affected by drugs to the extent that the person would pose a safety risk. In this case, the company could claim that the employment should be terminated due to the severe misbehaviour. To evaluate and decide if an employee could be considered a safety risk due to impaired ability was a common need among several companies. Not being able to differentiate between CNS influence and remaining substances was a major shortcoming of available drug testing techniques. However, companies stated that the Eyescanner test needed to have high accuracy in order to be usable in legal processes.

Cover all drugs

Some company representatives mentioned that the preventive measures were reached by using random testing even if it the techniques did not cover all drugs. Several companies were concerned by the fact that the quick drug tests did not cover all drugs, but mentioned that testing for every drug at a laboratory is related to high costs and the difficulties to keep up with new drugs was seen as problematic.

5.2 Identified needs and corresponding strengths

Based on the initial interviews, several needs were categorised in a modified KJ-analysis and described in detail in the previous sections. The same categories of needs are also listed to the left in figure 11. The right side in figure 11 represents the benefits of the Eyescanner test. Those were identified both in discussions with Eyescanner and Evolve, as well as during the initial interviews. The benefits were connected with the identified needs, to visualise how the technology could potentially fulfil them. The identified connections were later used to generate the first ideas in iteration 1.

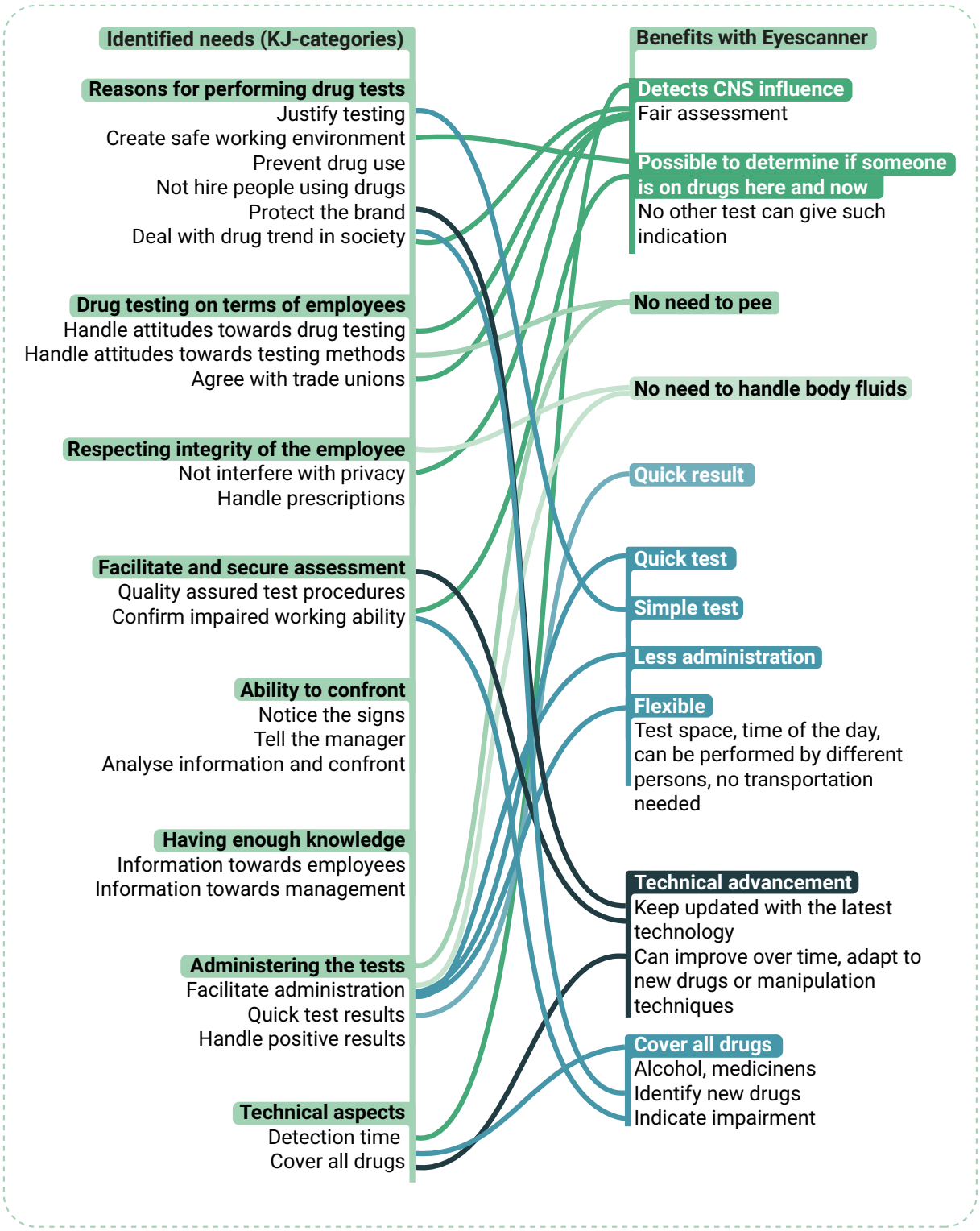


Figure 11 - Needs and corresponding benefits of the Eyescanner test.

5.3 Survey result

The survey that was sent out to the public reached 78 respondents. The majority identified themselves as white-collars, blue-collars or students, see figure 12.

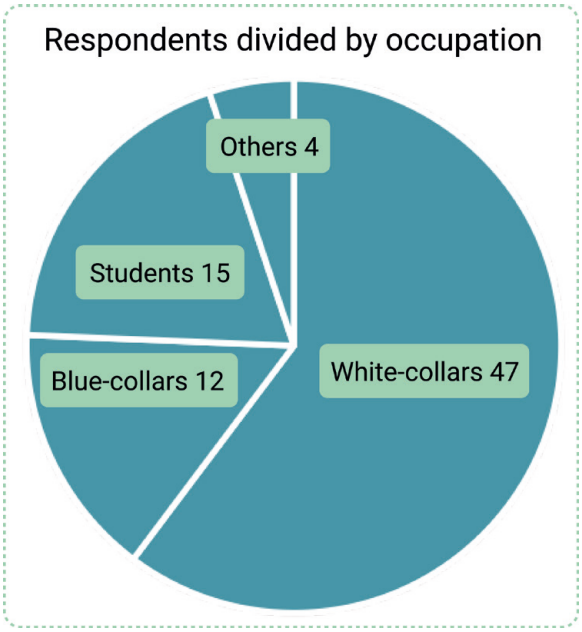


Figure 12 - Survey respondents divided by occupation.

Attitudes towards drug testing in different situations

One of the survey purposes was to find out in which existing and imagined situations drug tests were considered accepted. Alcohol test before driving or other safety critical task was included as a reference, with the hypothesis that it was considered an accepted testing method. This hypothesis was confirmed. As seen in figure 13, a majority of the respondents thought it was *totally fine* to use drug tests at suspicion, during rehabilitation and before safety critical tasks. The use of drug tests prior to employment and random drug tests was not equally accepted. 15% of the respondents said random drug tests were *definitely not ok*, and the corresponding percentage for drug tests prior to employment was 9 %. In order to get an initial understanding of reasons for attitudes towards drug tests in different scenarios, the respondents got to elaborate their rankings in free text questions. Reasons for positive and negative attitudes towards drug tests are listed in table 3. Several of the comments aligned with findings from interviews with company representatives, especially regarding safety and the possibility to prevent accidents and problematic drug use. Some mentioned drug tests should be done on equal terms for everyone, while others said it is only justified if the work task requires it. Respondents also mentioned issues related to integrity and privacy, as well as to difficulties when it comes to suspecting people. The fact that drug tests can indicate a lack of trust for employees and that workplace culture should build on trust rather than control was more emphasized in survey comments than in company interviews. A few respondents said that the ability to manage work is what matters, and that several other things can cause more risks than drugs. These comments indicate that a liberalism towards drug use exists, which was also mentioned in company interviews. One interesting conclusion, that was somewhat clear even after initial interviews, was that many trade-offs need to be made when designing a plan for drug preventive work because there are both negative and positive attitudes towards drug tests in different situations.

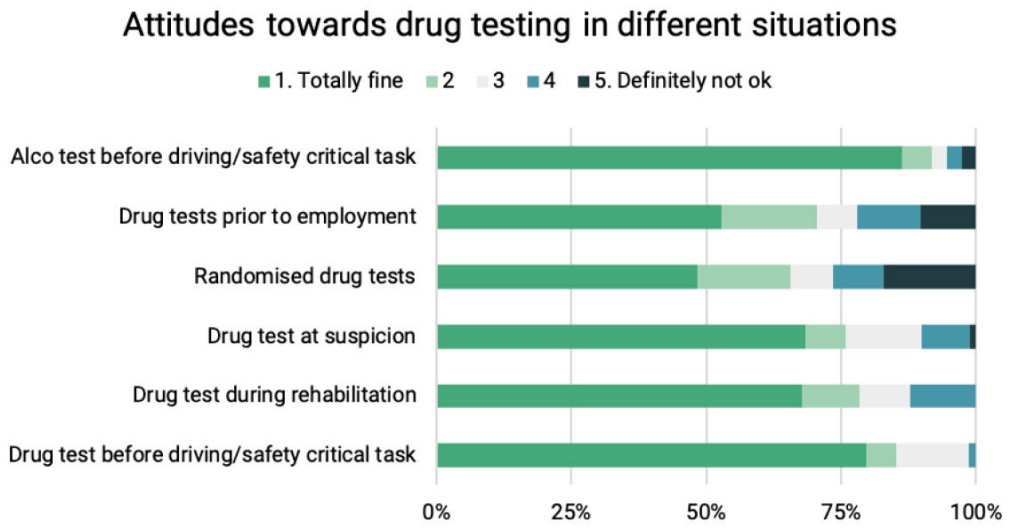


Figure 13 - Respondents' attitudes towards drug testing in different situations.

Positive comments	**Negative comment**
Drug tests are a good way to prevent accidents/dangerous actions.	The workplace culture should build on trust and support, rather than control through drug tests.
Drug test are important in order to prevent future risks associated with criminal connections.	Drug tests are more motivated before safety critical tasks or in safety critical professions (than in professions without direct safety risks).
Justified with drug tests if there is a suspicion.	Drug tests are only justified if there is a valid reason, like suspicion.
Good with random drug tests, difficult as a manager to act upon suspicion or rumours, and you are not always there to see it. Suspicion can also be wrongly directed.	Wrongly directed suspicion of drug use could cause an uncomfortable situation between people at the workplace.
Good if it can be a way to prevent drug use and problems for people.	The employer should not interfere with what the employee does outside of work.
Good. Companies should test everyone equally as much.	Integrity should go first if it is not a safety critical task/work.
Good if the work tasks require it, but should be done carefully according to a routine. You should be informed before and there should be continuity.	Employees could feel uncomfortable being selected, even if he/she has not taken any drugs.
If you offer rehabilitation and help the person, drug tests are a good way to find people using drugs.	Being able to manage work is what matters, drugs might not cause more safety risks than medicines, tiredness, hangovers etcetera.
	Drug tests at suspicion or during rehabilitation can indicate a lack of trust.

Table 3 - Positive and negative comments related to drug testing.

Further on, it was considered interesting to see whether any differences could be seen regarding attitudes towards drug tests between white-collars, blue-collars and students, see figure 14. Blue-collars had, according to the survey results, a slightly more negative attitude towards drug testing in most scenarios compared to students and white-collars, except drug testing at suspicion of drug use. However, the differences were not significant, and the respondents were fewer from both blue-collars and students than from white-collars. Therefore, the differences between respondent groups were not taken into much consideration during the design process.

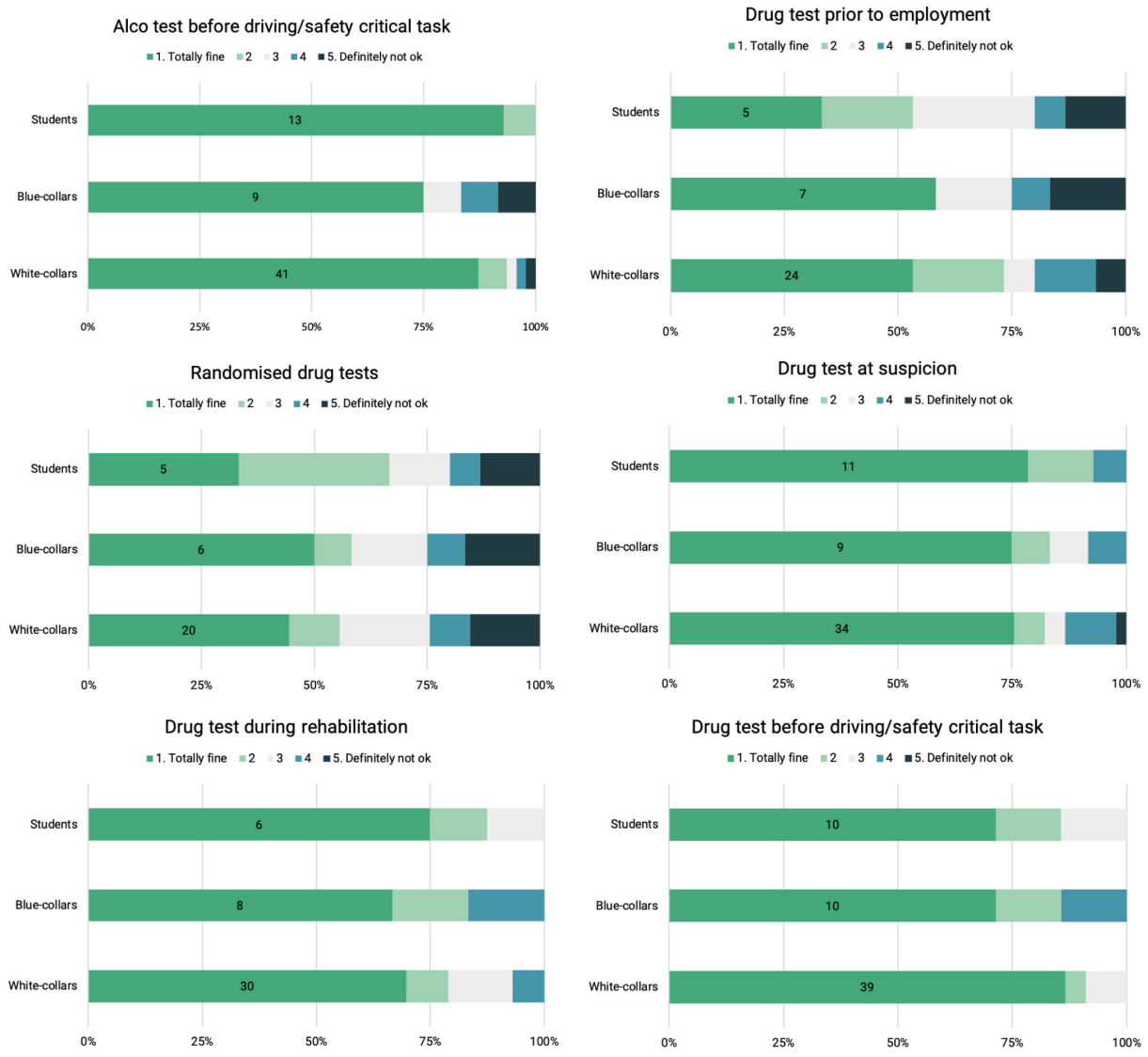


Figure 14 - Attitudes towards drug tests in different situations, divided by occupation.

Ranking drug testing techniques

In order to confirm or reject the hypothesis that an Eyescanner test could be perceived as a more accepted testing method than urine testing and other methods, the respondents got to rank seven different techniques based on what they would prefer. The techniques were illustrated and shown to the respondents as in figure 15. The result from the ranking is shown in figure 16. The Eyescanner test ended up in fourth place, after exhalation, saliva and buccal swab tests. Blood test in finger, urine test and blood test in arm were ranked lower than the Eyescanner test.

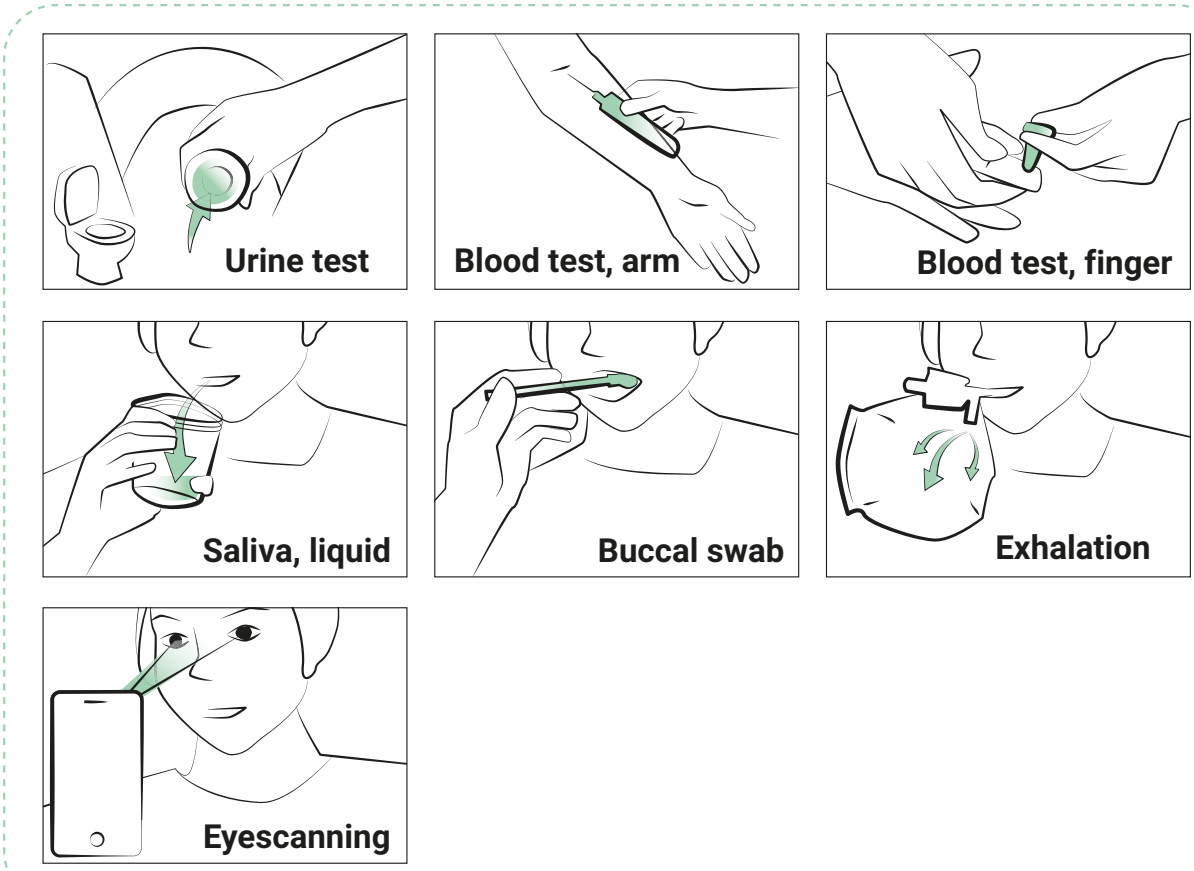


Figure 15 - Image used to evaluate different drug testing methods.

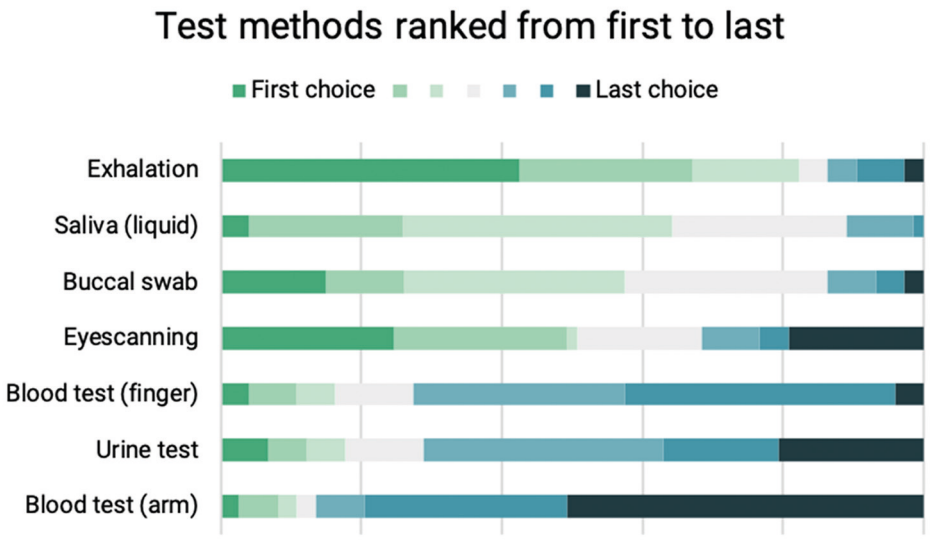


Figure 16 - Result of the ranking of different test methods.

The respondents also got to explain in text why they ranked the alternatives as they did. Most people ranked what they considered the least uncomfortable test as their first choice, followed by the second least uncomfortable, and the last choice was the test method that was considered most uncomfortable. The second most common argument for the ranking was that a test should be quick and easy to perform. A third argument for a preferable test method was whether or not it was believed to give a trustworthy and secure result. Some said specifically that the Eyescanner test seemed like an insecure method, and therefore it was ranked lower than other methods. The

arguments for ranking the test methods were compared between the different respondent groups (white-collars, blue-collars and students) but no differences could be seen. Reasons for ranking are summarised in the list below, the numbers indicate the number of respondents giving each comment.

1. Least uncomfortable/intrusive to integrity (23)
2. Quick and easy to perform (15)
3. How secure result they give (9)
4. Eyescanner test seems insecure (5)
5. Scanning could only detect drugs for a short while (1)

Reactions to being subjected to Eyescanner test

As a last task, the respondents got to explain in words how they would react if they were to be screened for drugs at work by scanning the movements and the reaction of the eyes. The most common comments were (1) that it would be ok, (2) that they would not trust the accuracy of the method and (3) would accept it because it seems like an easy method. Less common comments were both test method specific and not. Respondents who had test method specific comments said they would accept it if it is trustworthy, that they would assume it is followed by another test, and that the test method does not seem scientific/serious. Some would also be surprised, would want an explanation of how the test works and what it measures, or think that eyes could be affected by other things than drugs, for example bad sleep. Single comments said it would feel fair because the test shows the status at that time (rather than small remaining substances), that it would feel intrusive to integrity and that they would not want someone to be standing too close when performing the test. Out of comments that were not obvious to be test method specific were that they would take it personally, or question why they were chosen and why tests are being performed, and that they would feel guilty even if they were innocent. One person said it would be ok if the workplace had problems related to drugs, while another said he/she would resign if having to do a drug test at work. The full list of comments from white-collars, blue-collars, students and others respectively is to be found in appendix V. Some of the comments were formulated as requirements and added to the list of requirements. The opinions did not differ substantially between the different respondent groups.

6. Conceptualisation

At this stage of this work, the case had been defined and any further data collection came from the case company (A). In this section, three iterations of possible concepts are presented. The case company was part of the ideation and evaluation steps.

6.1 Iteration 1

6.1.1 Ideation

As shown in section 5.2 Identified needs and corresponding strengths, needs were linked to possible benefits with the Eyescanner test. This material constituted a basis for a first ideation session. Brainstorming led to several brief ideas of applications for an Eyescanner test, see appendix VI.

Five ideas were further developed, without being described in detail or carefully illustrated. Those were called (1) Complementing test, (2) Initial screening, (3) Safety barrier, (4) Make it visible and (5) Fit for duty evaluation, and are illustrated in figure 17-21, respectively. The five ideas were composed by combining the strengths of the Eyescanner technique in different concepts.

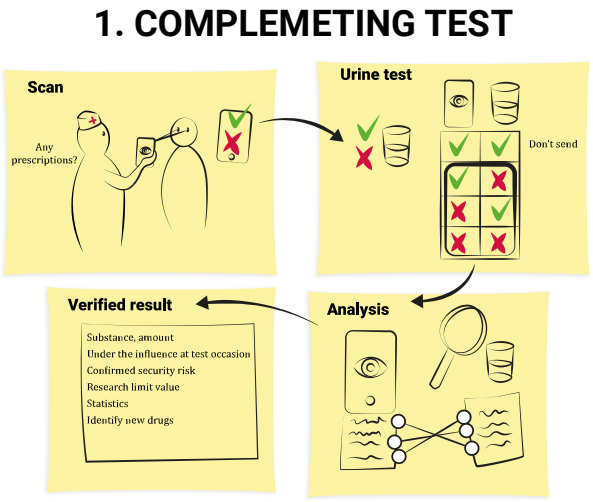


Figure 17 - Idea "Complementing test".

Features of idea "Complementing test"

- Use Eyescanner test before a urine test. Send urine sample and Eyescanner result for verification if one, or both test results are positive. If both tests are negative, the testee can go back to work and there is no need for verification at the laboratory.
- Using the Eyescanner test as a complementing test gives the opportunity to find drugs that cannot be identified through the urine test.
- The Eyescanner result gives an answer to whether the CNS of the testee is influenced at the time of the test. This information is helpful when taking

decisions regarding consequences of the test. A positive Eyescanner result equals a confirmed safety risk.

- The combination of the two tests results gives a measured substance concentration (from the urine test) and confirmed CNS influence/safety risk (from Eyescanner test). This data in combination could be used for further research, for example research trying to find limit values for substance concentrations in urine tests over which a person poses a safety risk. The data combined also allows for continuous improvement of the eye scanning technique.
- If the Eyescanner result is positive, but the urine test is not, laboratories can work to identify new drugs. The Eyescanner test can detect both known and unknown drugs, since it detects all substances influencing the CNS.

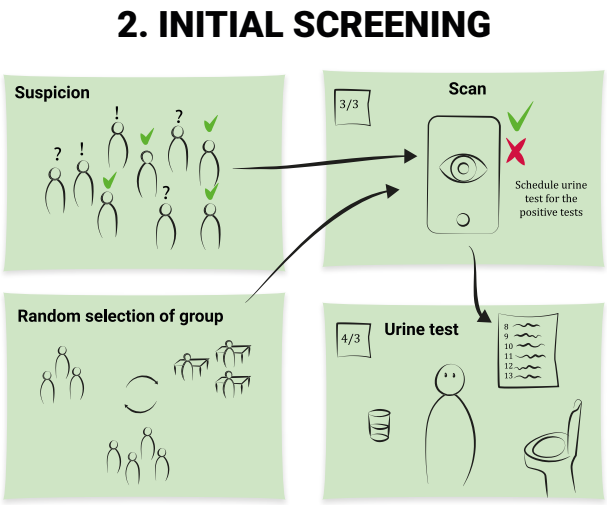


Figure 18 - Idea "Initial screening".

Features of idea "Initial screening"

- Based on random testing, but randomly select a whole department instead of individuals.
- Or, after several cases of suspicion within a department, all employees at that department can be subject to testing. (Some companies used suspicion tests directed towards departments).
- Use the Eyescanner test to scan/screen the employees in an efficient way close to the work site.
- Testees with positive results are scheduled for a urine test the day after, at different times to ensure anonymity.
- Even if the Eyescanner test does not identify remaining substances, a preventive effect is thought to be achieved as employees become aware that some do get caught, and because of the clear signal that the whole department will be tested after several cases of suspicion.

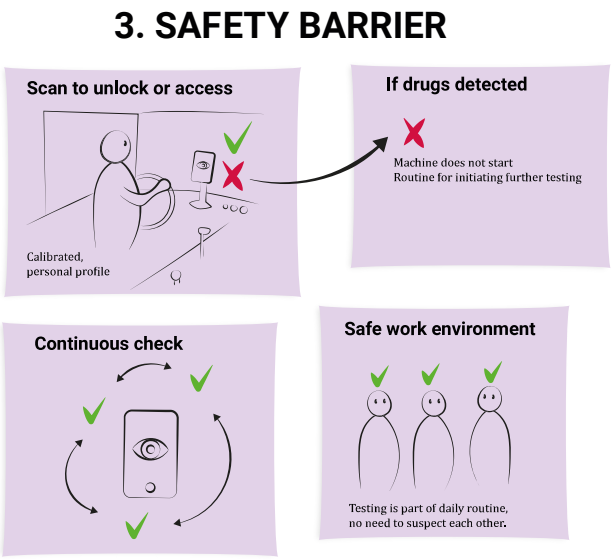


Figure 19 - Idea "Safety barrier".

Features of idea "Safety barrier"

- Use eye scanning as a safety barrier in vehicles (or at other places such as in connection to machines, entrances etc.)
- Personal calibration of Eyescanner test could cover small deviations that are within the general normal distribution of pupil size, reaction to light, and other parameters, to give a more accurate result.
- The idea includes continuous testing, to make the tests become part of a daily routine and hopefully become more accepted (like breathalyzers).
- Less suspicion tests are needed if instead having continuous checks, resulting in less uncomfortable confrontations.
- Routines need to be established to handle a positive Eyescanner result.

4. MAKE IT VISIBLE

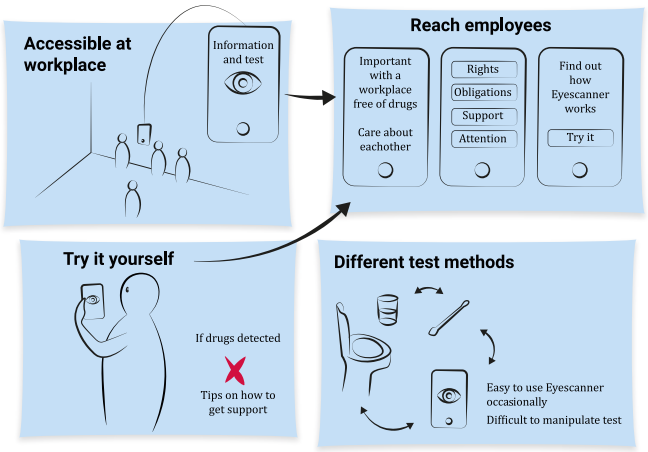


Figure 20 - Idea "Make it visible".

Features of idea "Make it visible"

- Tablets/phones are present at the workplace. To raise awareness and let employees get information about and discuss the theme of drugs with each other. Create an easy-going attitude towards drug tests.
- An app with the same content can also be downloaded for individual use.
- App contains:
  - Information about the importance of a drug free workplace. To pay attention to someone's drug problem is a helpful act.
  - Information about support, rights and obligations.
  - Self-test. To know how Eyescanner test works (If positive - no consequences, but guidance on what to do).
- Eyescanner test is used as one of several testing techniques. To ease the attitude towards drug testing by sometimes using a quick and easy method (and by not always using urine tests). It also makes it more difficult to prepare/try to manipulate a test.
- Maybe possible to increase the test frequency, by using a technique with less intrusion of privacy.

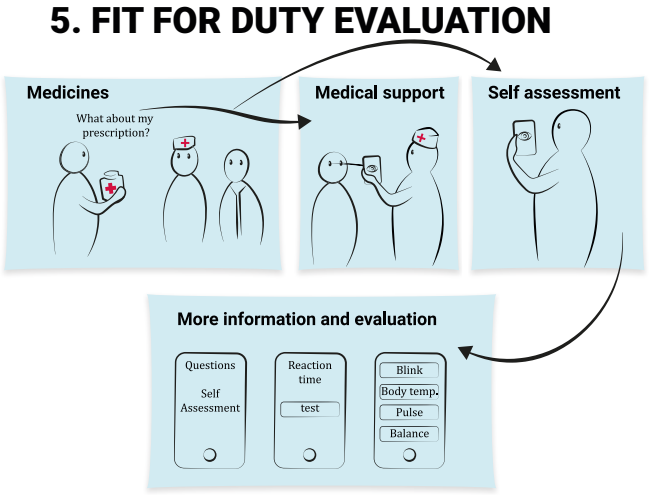


Figure 21 - Idea "Fit for duty evaluation".

Features of idea "Fit for duty evaluation"

For people with prescription drugs, help to assess if the medication affects the working capability, or if it brings safety risks.

- The employee can go to the manager, HR or occupational health care to be assessed.
- Fit for duty evaluation involves Eyescanner test and other tests built into the app, for example questionnaire, balance test, reaction test, blinking, pulse etc.

The five ideas targeted different aspects of the identified needs. Figure 22 shows how the ideas are linked to the needs (KJ categories) found during initial interviews.

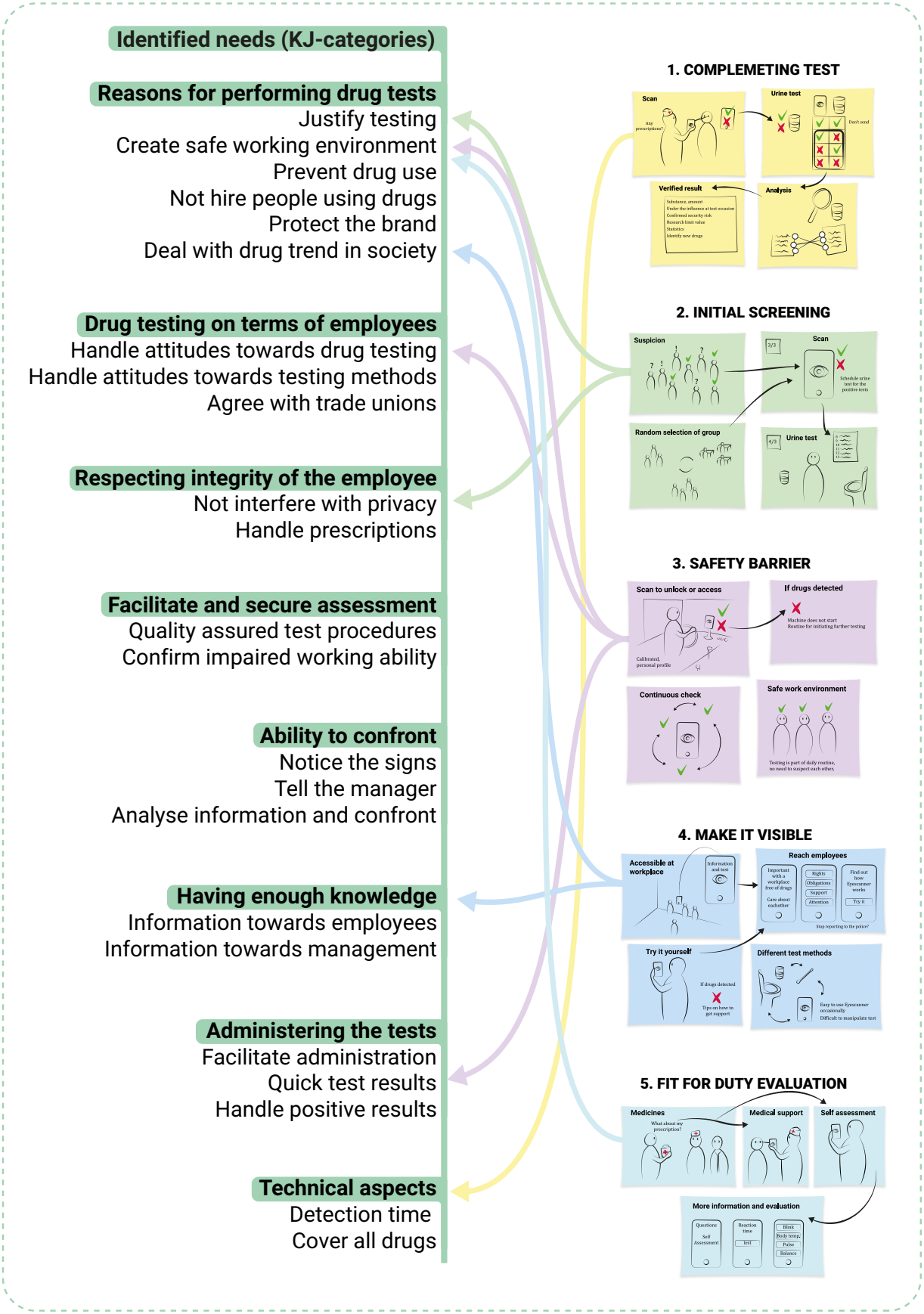


Figure 22 - Connection between needs and the five initial ideas.

6.1.2 Evaluation

Thematic coding was used to evaluate the five ideas based on feedback and further ideas given by seven case company representatives during combined evaluation and workshops. A concluded list of comments about strengths, weaknesses and ideas for modification for all five ideas is to be found in appendix VII.

Complementing test

The case company representatives were positive towards parts of this concept, mainly the fact that this could help them detect drugs that were not covered by the urine quick test used today. They also saw major strength in the fact that the Eyescanner test detects drug influence at the moment, that is, affected CNS and thus, confirmed safety risk (although this strength would apply to other ideas as well where a positive Eyescanner test is followed by a urine test). The method could also help to eliminate suspicion in a situation where an employee is suspected to be on drugs. However, even though they saw it as a possibility that the concept could help finding drugs that are new on the market, those drugs would not yet be illegal and thus, not something that they could ban from their workplace. They also saw downsides such as that difficulties with urine tests would remain and occupational health care resources could be limiting for this concept. However, from their perspective, the strengths with this concept could easily be combined with the idea Initial screening.

Initial screening

The case company showed great interest in the concept and it was likely that other companies would be positive as well, since it provides them with an easy method for testing a large group in a quick and easy way. The method could be adjusted and used in smaller scale for those who did not want to increase the number of tests. It was also believed that it would be easier for the company to increase the number of tests, because the Eyescanner test could be more accepted among employees. Case company representatives clearly indicated that the number of tests performed today was not enough to prevent drug use and accidents occurring because of it. It would likely also have a better preventive effect since it would be more visible, and people would be aware that drug tests are carried out. Another strength was that the Eyescanner test could be performed outside of office hours. The selection of departments or larger groups was seen as a positive aspect as this method would not point out individuals, and thereby reduce the risk of threats towards managers as it becomes more clear that the selection is part of the company routines. An increase in random testing was also seen as positive as this could reduce the need for pointing out individuals for suspicion tests. On the downside, case company representatives were concerned it might be difficult to ensure anonymity when testing a whole group. They were also unsure of the legal basis for testing all individuals in a department based on suspicion, and also afraid that testing a department after suspicion could have negative consequences if the suspicion was misplaced.

> ***"Unfortunately, the manager is to blame for everything bad that happens to the employee, although he is only representing the company policy - even though he was not the one inventing the rules." (Team leader, company A)***

Safety barrier

The Safety barrier concept was seen as a natural implementation of the Eyescanner technique at first glance. It could be thought of as a natural way to use the technique, probably because of the concept's resemblance with a breathalyser alco-lock. It would clearly state the company drug policy, and could be installed either in vehicles, at entrances or connected to a computer account and be used to unlock the computer. It was emphasized that not only tasks with direct safety risks should be targeted by the safety barrier, but also tasks involving for example handling of money, taking decisions or similar. An important strength was the decreased need of suspecting employees, since a positive safety barrier Eyescanner result would make it impossible to start a work task. The likelihood that someone is working under the influence of drugs decreases. This could in turn make it easier to protect the relationship between manager and employee. The personal profile was seen as a good addition, given that it would result in an even better and faster technique. However, personal profile also brought doubts regarding data sharing. According to interviews in this study, an employee could be let go from work after having refused to perform a drug test. However, it was not clear whether or not an employee could be let go from work for not giving their consent for a data program to handle their sensitive information. Thorough legal investigation would be needed to investigate this aspect. Implementing this idea might also lead to a situation where the company is forced to handle a large amount of positive tests at the same time. There were doubts of whether or not the case company had enough resources to do that. Another issue with this concept was that it would require large investments in hardware, so that all people could be tested without time delays. An employer could not demand that an employee would use their private phone to perform drug tests on behalf of their employer. There were also some issues related to anonymity, as it could become more visible if a person for example could not start the truck due to a positive test result. There would also be a need for personal identification to avoid manipulation of the test, for example if one person who tested negative could unlock the safety barrier for others. Lastly, although this concept was welcomed at first glance, some company representatives realised that there would be many practical issues in need of solving. For example, the test would likely need to be performed several times of the day, or at random times. Otherwise it would be safe to use drugs as soon as the barrier has been passed.

Make it visible

Overall, the company representatives were very positive towards working more with preventive strategies and involving employees in combination with conducting drug tests. They emphasized the possibilities to create increased awareness and opinion formations among the employees. It was also seen as a need to increase the knowledge and a feeling of shared responsibility of the issue at the workplace. To provide employees with information was seen as a positive aspect of the concept. They also saw several risks with involving employees and making an app available to them, especially if a self-test would be available, since it might lead to fake copies of the app, or to people using it as a check to see when it is risk free to go back to work. The latter case could also lead to increased drug use outside of work. Attempting to change the workplace culture to the better could also come with a risk that it gets a negative effect, and lead to a greater liberalism towards drug use. It was not an option to use the Eyescanner test as the only test method, since the result could not be acted upon unless the substance and amount was known and confirmed (by a urine test). Rotating test methods was associated with a lot of administrative work and thus, not a welcomed idea. There were several ideas for contents of the employee interface, such as information, which indicate that this concept is something that the case company representatives have been missing.

"I have never come across anyone who has said they need help openly. Even after getting caught in a drug test, most people say it was a one time thing." (Trade union representative, company A)

Fit for duty evaluation

The Fit for duty evaluation concept was seen as an interesting idea and it was considered positive that it focused on the ability to work, rather than detecting drug use. The comments from company representatives were not that many, which might be due to the fact that they did not see a great need for this implementation, because of the relatively low number of employees with prescription drugs that would use this evaluation. If anything, the concept could be implemented after thorough research to support occupational health care staff in their work. It was decided that the fit for duty evaluation concept would not be pursued further in the conceptualisation.

Implementation phases of concepts

During the evaluation process, the ideas were discussed in regards to reasonable implementation phases, see figure 23. The idea Complementing test was placed first on a timeline, as it was assumed to be possible to implement the concept without major changes in the current drug testing process. It built on always using both Eyescanner test and urine test and thus, it could be implemented during an early development phase of the Eyescanner technique, to help verifying the tool.

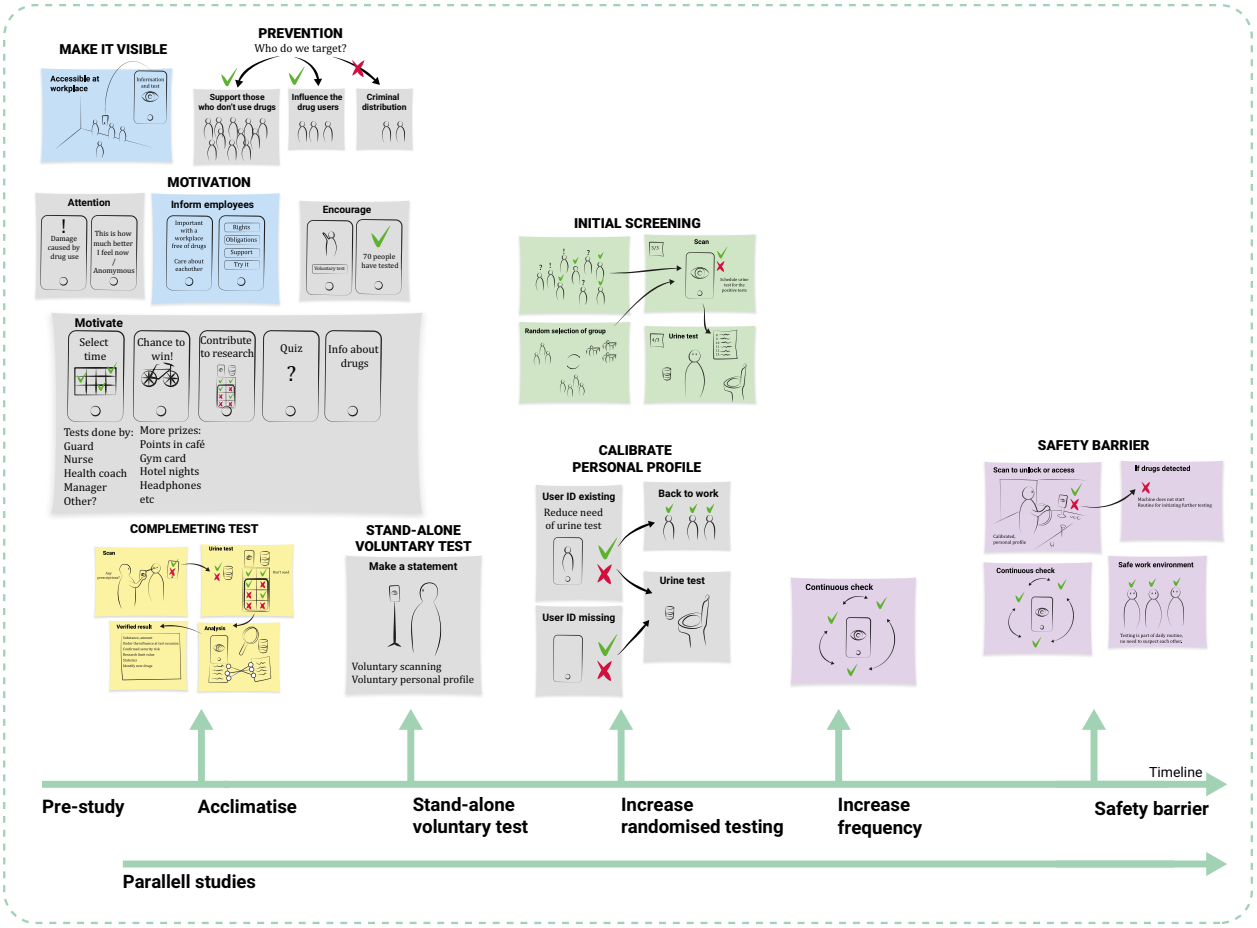


Figure 23 - Possible implementation timeline for the ideas.

Discussions based on the timeline and further review of feedback from case company lead to the decision to not pursue Complementing test as a stand-alone concept in this case study since it had great similarities with Initial screening. This decision was influenced by the fact that for the case company, who were interested in increasing the number of tests, the Complementing test process

would become quite expensive since they would have to pay for both the Eyescanner test as well as many urine tests. The idea Complementing test could however still be useful for companies who were not interested in increasing the amount of test, but want to detect both remaining substances, as well as CNS influence at the time of the test. Also, because of the large similarities, the motives for choosing complementing tests could be achieved by instead implementing the concept Initial screening, but with smaller adjustments of the process and by using it in smaller scale.

Summary of evaluation

- Fit for duty evaluation was discarded, as it did not fulfil the main needs within the company.
- Complementing test was discarded due to its great similarities with Initial Screening, and the fact that double test methods would cause high costs.
- Still remaining from the first iteration of ideas were the concepts were the ideas Initial screening, Safety barrier and Make it visible.
- The remaining ideas need to be complemented with processes and routines, especially Safety barrier as it differs the most from the current drug testing process.
- Case company representatives were positive towards concepts enabling increased testing in an objective/natural manner, as well as using more preventive measures to target drug related problems.

6.2 Iteration 2

Based on the received feedback the concepts that were pursued further were adjusted and developed to a level with more details. This section describes the second iteration of Safety Barrier, Initial screening and Make it visible.

6.2.1 Safety Barrier

Ideation

In this step, the safety barrier concept was developed further through brainstorming. A possible scenario was ideated based on previous feedback, which lead the formation of the following attributes/requirements. Figure 24 shows a possible use scenario of the Safety Barrier concept.

Unlocking device

The concept is likely to function as an unlocking device when starting a vehicle, collecting a key, starting a computer or entering a safety zone, etcetera. Hopefully, this will become a natural part of a daily routine and thus, become accepted by employees. It should be used for both blue-collar and white-collar contexts, in order to ensure that a person is not under drug influence when performing a task.

Sufficient frequency

One early idea was to install safety barriers at entrances. However, that would likely not be the most secure system, since it would be safe to use drugs once the barrier has been passed. Testing would need to be done with sufficient frequency, otherwise people could use drugs soon after a test, and the effect might pass before the next test.

Personal profile

Each employee would have their own calibrated personal eye profile, see figure 25. It builds on machine learning, and each time the test is performed, the technique gets slightly more accurate and faster for the person in question. The personal profile means that the Eyescanner technique can take into account personal deviances that exists due to for example abnormal pupil sizes or prescription drugs, and therefore give an even more accurate result and likely detect drugs for a longer time than the technique without personal profiles.

In case of a positive test result

When a safety barrier Eyescanner test turns out positive, it will not be possible to start the vehicle, collect the key to an operating table, nor log onto a computer. Through the Eyescanner system, a message will be sent to the manager, who will need to take action on the positive test.

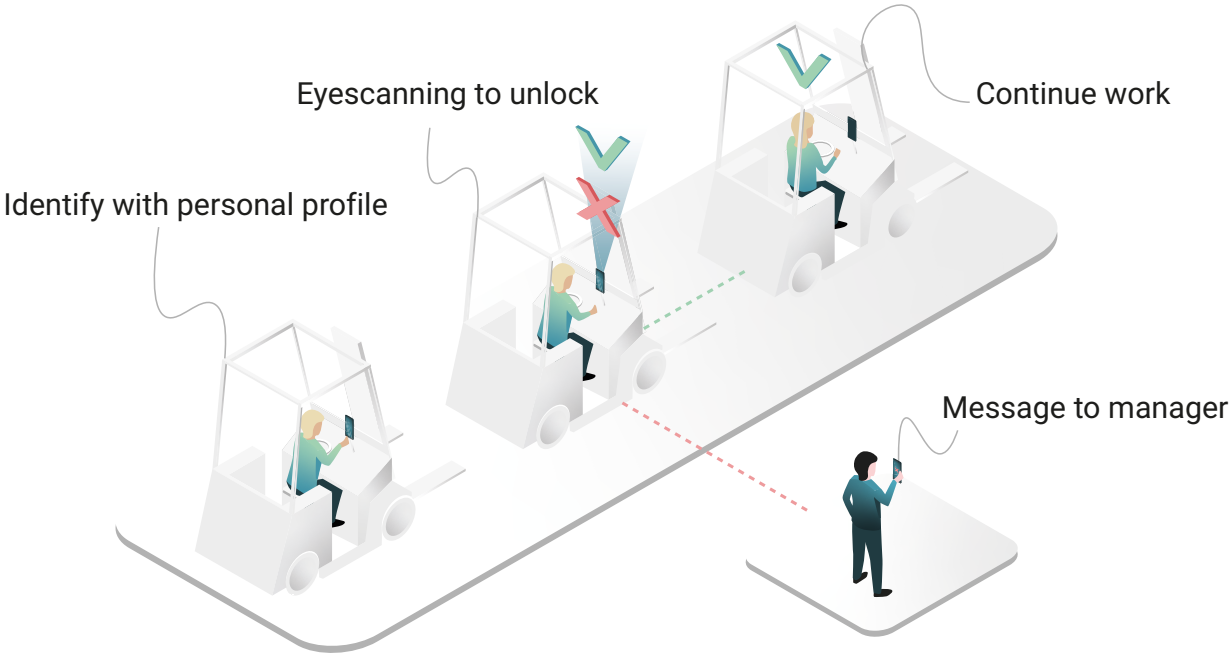


Figure 24 - Second iteration of the concept “Safety barrier”.

Figure 25 - The employee has a calibrated personal profile and scans the eyes to unlock a vehicle.

Evaluation

The concept Safety Barrier got positive feedback in the first iteration, mainly because of its potential to ensure that all people at a workplace are free from drug influence. However, it would require more extensive changes of today's drug testing process, extensive investigations of legal aspects regarding for example GDPR and heavy investments in hardware if it were to be placed at many locations in a workplace. In addition, feasibility issues regarding access to the workplace made it impossible to study the context of implementation. Technical experts also concluded that a function including a personal profile would require more research and technical development and thus, is likely not the first concept for implementation. Therefore, a decision was made to conduct a second ideation of this concept based on given feedback and evaluate it based on the list of requirements, but not evaluate it further during the course of this work.

6.2.2 Initial screening

Ideation

The ideation of the concept Initial screening was done though service blueprinting on a white board and enactment, with input from evaluation of the first iteration. The service blueprinting process is shown in figure 26. The service was divided into five phases; Selection, Eyescanning, Urine test, Assessment and Verified result. The phases are explained below and visualised in figure 27. All content visualised on the service blueprint is a result of the ideation.

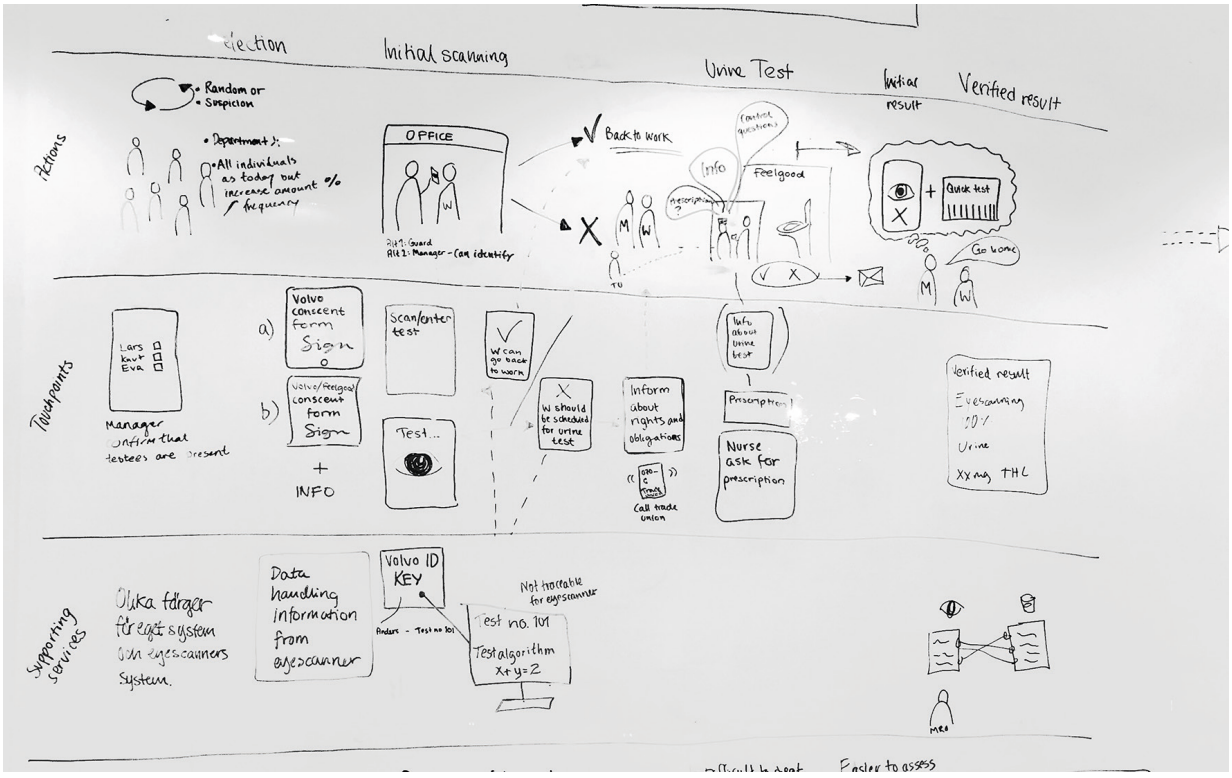


Figure 26 - Service blueprint draft sketches on a whiteboard.

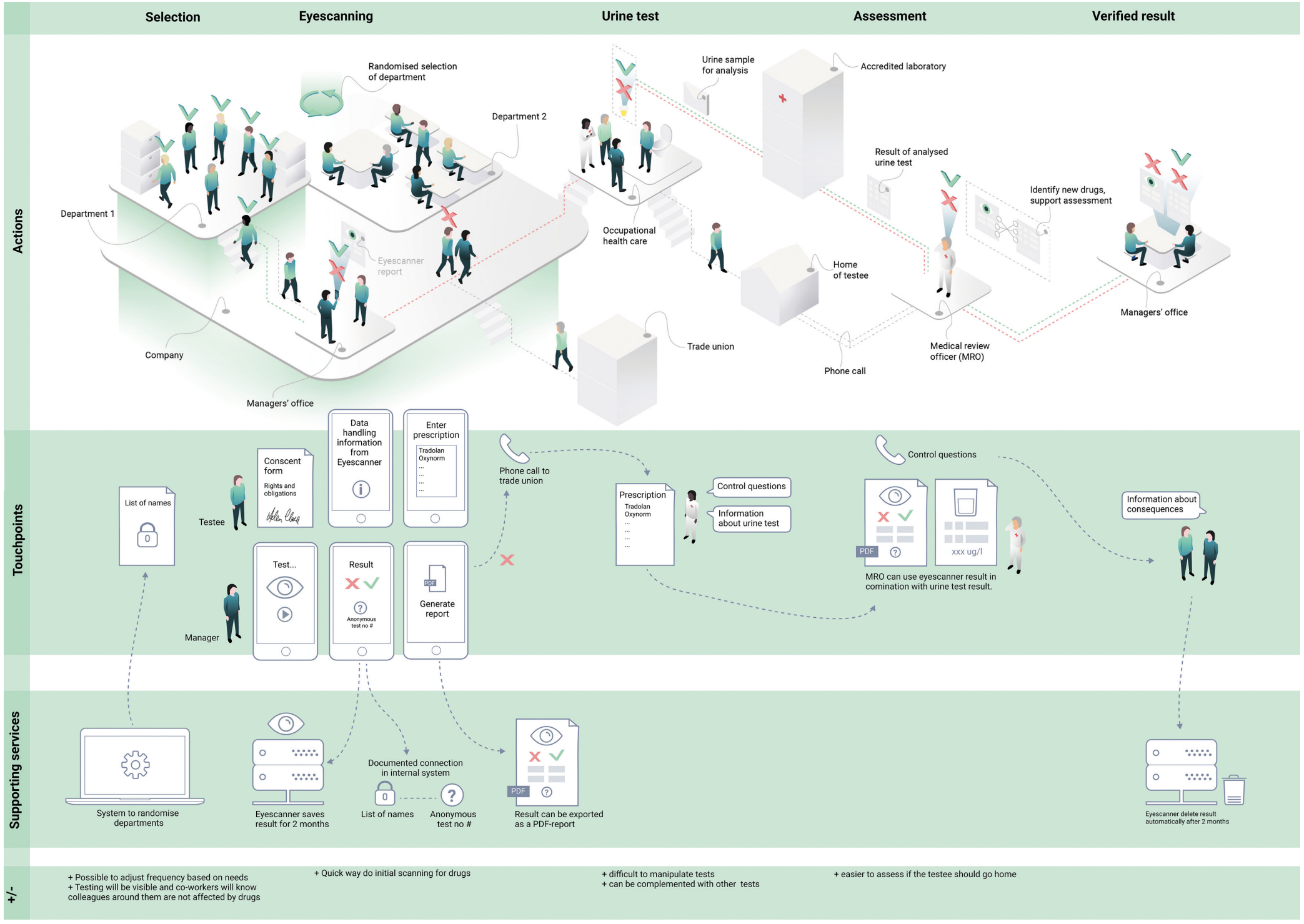


Figure 27 - Second iteration of concept "Initial screening" illustrated on a service blueprint.

Selection
The process should build on random selection of departments or whole teams, rather than individuals. There were several reasons; (1) Trust and safety, co-workers in a team would be ensured that people around them are not under influence of drugs. (2) It would decrease the risk that an individual feels pointed out. Instead he/she knows that all co-workers should perform the test. (3) The testing becomes more visual and hopefully brings a greater preventive effect.

A team member from Evolve was consulted regarding data handling in this concept, and it was concluded it would be preferable if Eyescanner would not save any personal data. Therefore, the selection of department would be done through the case company's own data systems and servers.

It should be possible to select the same department more than once during a year, otherwise the preventive effect was thought to decrease, since people using drugs would know it is unlikely that they will be selected for a test again. All employees at one department should be tested within a limited time frame, to make sure that those who use drugs are not warned in advance, and the effect of potential drug use will pass before the test. Randomly chosen departments should be all departments, including groups of managers. Clearly showing that also managers are tested could be a way of increasing acceptance of drug testing among employees. The test frequency should be discussed further, with the case company and its trade unions. One question needed extra attention during evaluation:

- Is it reasonable to randomise test departments rather than individuals? There is a risk that there is an issue related to anonymity, since people will notice if one person does not come back immediately after the Eyescanner test.

Eyescanning
The employees are then individually called to the manager's office for the Eyescanner test. Once there, the employee gets information about the test, how the result and data is being handled, and get to know that in case of a positive test, a urine test has to be performed. The testee signs consent to perform the Eyescanner test. The manager then takes over the testing device (phone) and performs the test on the testee. If the test is negative, the testee returns to work. If, however, the Eyescanner test is positive, the test is assigned with an anonymous test number that the manager registers in the employee's file. The manager can also export a pdf report of the positive eyescanning result. The manager then follows the employee to the occupational health care for a urine test. The testee also gets the offer to be supported by a trade union representative.

The testee can register a prescription drugs in the Eyescanner app before performing the test. In this step, the manager does not have to see what the testee enters. In case a prescription drug has been taken, the Eyescanner test will give a positive result. The Eyescanner result will tell if the result matches the effects of the entered substance, but cannot say what substance that has been taken, nor if it is the only substance that has been taken. In order for this testee to not have to undergo a urine test after each Eyescanner test, the testee can go back to work while the manager contacts a nurse at the occupational health care to compare the test result to previous test results. Here, the Eyescanner technique also helps assessing whether the prescription drug causes impaired ability to perform a safety critical work task. Although the employee has the right to take that substance, it is still reasonable to assess whether the ordinary work task can be done in

a safe manner, or if the employee should be transferred to a task that is less safety critical. If it is the first time the employee has tested positive while taking a prescription drug, a urine test should be performed. Two aspects were considered especially important to discuss during evaluation:

- Should it be the manager who performs the test? Based on needs from interviews, it was seen as preferable to decentralise the role of the manager, in order to create a more natural relationship between the manager and the employee. However, if a test would turn out positive, the manager has an important role to listen to what the employee has to say, and assess what the consequences should be.
- The Eyescanner software could also randomly select some of the people who get a negative test result to perform a urine test, if the company has an interest in detecting remaining substances. This could make it easier to detect and help people with rehabilitation, and to prevent problematic use, but can also be sensitive because some employees argue the employer should not interfere with the employee's life outside of work. If choosing to randomly select people for a urine test, people with both positive and negative Eyescanner results would continue for urine tests. This could be a solution that makes it less obvious who gets a positive Eyescanner result.

Urine test

The testee who has tested positive in the Eyescanner test continues to occupational health care for a urine test. Once there, the testee gets information about the urine test according to the company's routines. In case the testee has entered a prescription drug, the nurse can see this information in the Eyescanner app, and asks to see the prescription that the testee is obligated to bring. The testee also gets control questions that aim to find a first explanation from the testee to the positive test result. The testee then undergoes a urine quick test. If that urine quick test is negative, the nurse can take out another urine quick test or a saliva quick test, that covers other substances. The testee is sent home according to the company's routines. A positive Eyescanner result confirms drug influence and thus, the safety risk involved if the testee would continue working. A urine sample and the Eyescanner result are then sent to an accredited laboratory for verification, this happens even if no drugs have been detected in the urine quick test, since it likely means that a substance not covered by the urine quick test has been used.

Assessment

When the test result has been verified at the accredited lab, the MRO gets access to both the substance and substance concentration from the urine test, as well as the Eyescanner result. The MRO then calls the testee to further ensure the validity of the test. If the MRO concludes the test has been accurately handled, and that the testee is guilty of using drugs, the manager gets the result.

Verified result

Since the MRO has been supported by a positive Eyescanner result, the manager will get a confirmation that the testee has been under drug/CNS influence during work hours. This would not have been possible by using only a urine test, since there are no limit values separating remaining substances from CNS influence. With this information, it is easier to assess and decide for fair consequences. Since the positive Eyescanner test confirms CNS influence, the drug use will likely be seen as a severe misbehaviour. It could, in worst case lead to termination of employment.

Evaluation

The evaluation of the concept Initial screening was done through online scenario enactment with both case company representatives and others (one manager at the case company, one manager/trade union representative at the case company, one employee at the case company and one person who had been employed in a company in the same industry.) The scenario material used, as well as the questions asked can be viewed in appendix IV. Below are evaluation comments on questions/statements given to the participants who got to go through the scenario.

Random selection of departments rather than individuals

It was seen as preferable to randomly select departments rather than individuals, because it would decrease the risk that an employee would feel pointed out. Some also mentioned that the visibility is a strength, so that people are aware that tests are going on and thus, the process might have a better preventive effect compared to today's process. One testee stressed the importance for people to know that their department can be selected more than once during a year, otherwise they might feel safe (to use drugs) once they have gone through one test. The selection method would have to be agreed upon with trade unions. However, the trade union representative who participated in this evaluation thought it would be accepted, since it builds on a random selection method. Another strength with selecting whole departments would be the possibility to confirm or reject rumours regarding widespread drug use at a specific department.

The Eyescanner test is performed by your manager

It seemed like the participants agreed that a person with a more neutral position towards the testee than the manager should perform the test, although different opinions could exist depending on the individual. Some would likely think it is okay if their manager performs the test, but others will not. Reasons for not choosing the manager to perform the test was that the testee can feel a dependence towards the manager, that some might not trust their manager, and that the manager in some cases could experience threats when dealing with similar situations. It was more likely that the tests would be performed by a nurse from the occupational health care, although one person also suggested human resources personnel. Since the Eyescanner test was seen as an efficient process, occupational health care would likely have enough resources to spare, despite the fact that they had limited resources to perform today's tasks.

The Eyescanner test is performed at the manager's office

It became clear that this was more of a practical issue, since not all managers have their own office. However, an available office where you cannot be seen by others, and that is located reasonably close to the workplace, would not be a problem to find and use.

Register prescription drugs

There was a comment regarding the idea that a person with prescription drugs could register the prescription in the app before a test, in order to not have to perform a urine test after a second or third time performing an Eyescanner test. There was a doubt that the Eyescanner software could tell if the Eyescanner result matched a specific substance, and therefore considered safer to let the testee perform a urine test. If, however, the Eyescanner software could make a distinct difference between substances, the idea could be welcomed.

Randomly select people to also perform urine tests

Selecting departments instead of individuals could come with the risk that it becomes visible for the co-workers, who gets a positive Eyescanner result and thus have to leave work to go to the occupational health care unit for a urine test. One participant thought this was problematic, while another said it should not be a problem, as long as the Eyescanner test has a small margin of error. If the Eyescanner device was to randomly select some people to continue with a urine test after a negative Eyescanner test, the visibility of a positive Eyescanner result will likely be less of an issue. However, the manager who got to evaluate this scenario thought it might be difficult to get an agreement to continue with both quick urine tests and Eyescanner tests as initial screening methods. It could however be possible to begin with, while the Eyescanner technique is still under development, to further verify the tool. Other participants thought it was a reasonable solution. It was decided that Eyescanner should offer a solution that randomly selects Eyescanner testees for urine tests. However, it should be up to the customer to choose whether or not to use this solution.

> ***"For me, since I'm not using drugs, it doesn't matter if my manager sees the Eyescanner result. It might even be a good thing" (Scenario participant, employee)***

Manager or someone else who accompanies testee to the occupational health care?

Most participants agreed that the manager should accompany the testee to the occupational health care unit. It is the manager's responsibility to assess for consequences if a test is positive, and thus, the manager should accompany the testee. However, a testee should not be treated as guilty until the verified urine test result is assessed and confirmed by an MRO. Involving for example a guard at this stage, was thought to be a sign of suspicion. One participant (employee) said it would feel safer to walk with the manager, while the other was more unsure.

Verification tests

Since quick urine tests are not recommended to be used in company settings, due to its 2% margin of error, the introduction of the Eyescanner test as an alternative quick test could mean that the case company stops using urine quick tests, and instead sends a urine sample for full analysis at the accredited laboratory. However, this decision is one for the case company, and probably depends on the margin of error of the Eyescanner result. The decision should not have a large impact on the Eyescanner process and the concept presented in this work. However, in order not to limit the laboratory analysis to drugs covered by the urine quick test, and to follow the guidelines for quality assurance, Eyescanner should recommend always sending a urine sample for screening of all potential drugs.

The (case) company saves the data

This was seen as positive, both from a data protection viewpoint and from a practical viewpoint. The case company, as well as Eyescanner preferred that all data that could be traced to an employee should be handled by the case company. From a practical viewpoint, there were existing systems both for personal files at the case company, as well as medical records at the occupational health care, and thus, it would not be much of an issue to integrate the handling of this new process. Further on, negative test results should be deleted, but counted in order to keep statistics. A verified positive result should be saved at the case company servers, but be deleted from Eyescanner's servers. It was also discussed what level of detail that should be generated for the pdf report. The likely solution was that managers should only have access to clear results, like "positive" or "negative", while personnel with medical competence could get to view more details, for exam-

ple size of the pupil, or reaction speed to light. People without medical knowledge should not be given the opportunity to discuss medical details with a testee.

Impression of the concept as a whole
With smaller changes according to comments above, the concept as a whole was seen as a well thought through process with the potential to work fluently when implemented. It would provide the case company with the opportunity to increase the number of tests, something that was perceived as a strength.

Test frequency
As mentioned earlier, the test frequency with this concept was not clear. It would depend on what results the case company gets when starting to use it, and can be adjusted based on the need. Since Eyescanner provides a simple process, the frequency could easily be increased if there is need for it, as well as decreased if the problems are decreasing. One scenario participant was surprised by not having had to perform a drug test during two years of employment at the case company. However, the managers wished to increase the number of tests compared to today, and also said it should be possible for the same department to be selected more than once in a year. Ideas for modification included selecting smaller parts of a department in order to be able to perform tests more often, and to perform more test in departments with more safety risks in the work. The issue of not feeling trusted if tests are performed too often was lifted as well.

Summary
With smaller adjustments, the concept would likely be implementable in the case company work environment. One important change was that the test should be performed by a nurse, rather than a manager. Some questions related to frequency of tests, handling of prescription drugs and whether or not the Eyescanner test should be followed by a quick urine test before a urine sample is sent to a laboratory remain. These decisions are mainly decisions that need to be taken by the case company, once it is clear how secure the Eyescanner result becomes. As mentioned, Eyescanner should recommend sending a urine sample for screening of all drugs, in order not to be limited to urine quick test results, and to follow safety assurance recommendations.

6.2.3 Make it visible

Ideation
The input to the second ideation of Make it visible was data from the survey and feedback from case company representatives who got to evaluate and give suggestions for further development. Ideas were also generated by looking into health promotion strategies and nudging.

The concept Make it visible targets the majority of people at a workplace, non-drug users and those who use drugs, see figure 28. People who engage in criminal distribution of drugs are not targeted, since it was believed that those would not be susceptible to a preventive approach. The hope was that the intervention would lead to greater resistance towards drugs at the workplace and thus, a less advantageous situation for people who might sell drugs.

The concept was presented as a mobile app that includes general health related topics, to be used as a tool to support a positive working environment. The app could be downloaded to the employee's private phones, and used during breaks or out of office hours. It included different functions, where some of the content were to be provided by Eyescanner, and some by the case company.

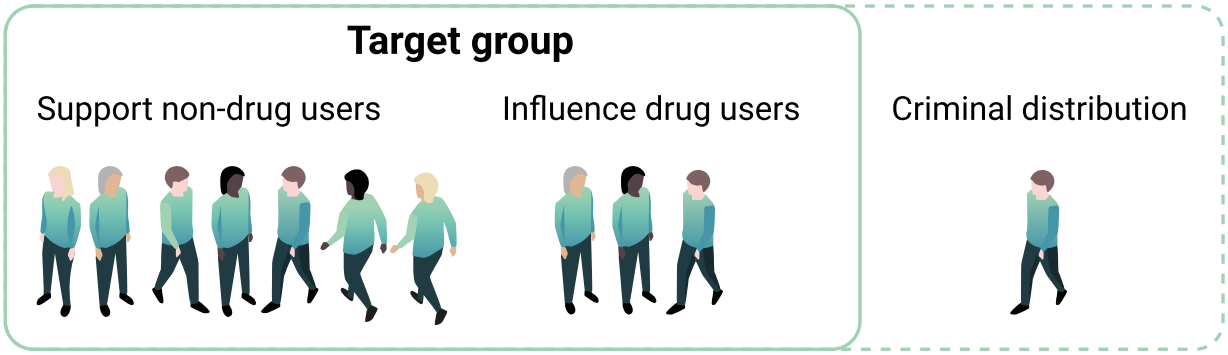


Figure 28 - Target group of the concept "Make it visible".

Evaluation

In this section, the different parts of the app interface are presented and evaluated, see table 5. The evaluation was done through a modified heuristic evaluation, where heuristics were included from several data sources as defined in table 4. The start page of the app was not included in the evaluation because the evaluation focused on the different functions and their effects, rather than the usability of the interface. The start page is to be seen in figure 29.

Data source	**Primary/ secondary data**	**Heuristic**
Identified needs/problems (from all study phases)	Primary	What needs does it aim to fulfil?
Expert review Design Expert	Primary	Are the parts of the interface believed to give effects in behaviour change?
Feedback interviews Manager and Team Leader (case company)	Primary	Do they believe that the intervention is of interest for the case company, and will it give effect?
Nudging literature Caraban et al. (2019) Sunstein (2014) Lindhout & Reiners (2017)	Secondary	What nudges does it fulfil? Transparent or not? Risk for unexpected effects?
Health promotion Crosgrove, et al. (2016) Rojatz et al. (2017) Reynolds & Lehman (2008) Harden et al. (1999) EMCDDA (2019)	Secondary	Which health promotion factors does it fulfil?

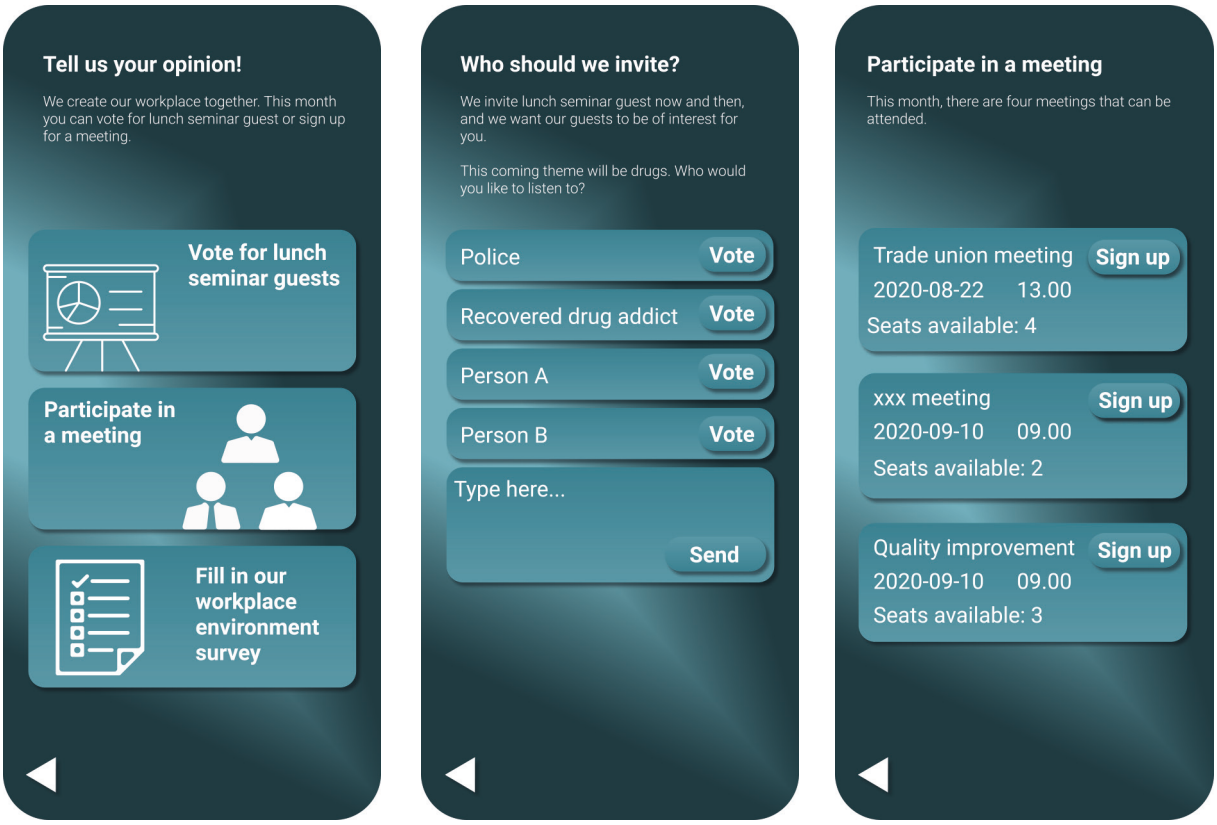
Table 4 - Data sources and heuristic criteria.

Figure 29 - The start page in the app interface.

Drug testing
Here, the employees can learn about the purpose of the drug testing, the process and the methods used at the company.

Identified needs/ problems	***There is some resistance to random drug testing.*** The survey showed that the attitude towards random testing was partly negative. By clearly explaining the reason for the testing and how the selection is done, this attitude can hopefully be targeted. ***Support the company to counteract societal trend.*** The company representatives expressed a struggle with a liberal attitude towards drug use. Companies need to maintain a safe working environment, and by presenting information in a positive light the hope is to increase the knowledge among employees that drug testing is done for everyone's safety. ***The Eyescanner test can be perceived as a less trustworthy method.*** The Eyescanner test faced some scepticism both in the survey and from interviews. It is important to give information about how the method works and why it can be trusted. This will likely be less of a problem once the technique is available and known in the industry of drug testing.

Connection to literature	***Nudges*** N/A	***Health promotion*** Employees should understand why drug testing is used. By emphasizing the safety of everyone rather than the individual targets liberal attitudes by (Crosgrove et al., 2016).
Transparent nudge?	N/A	
Risk for unexpected effects?	Risks seen as minor. Could too much information about the drug testing methods risk that more people learn how to manipulate the tests? Technical information should therefore be limited.	
Comments from design expert	I think it is important to highlight that the safe working environment is something that we create together. Perhaps show some statistics, to get the feeling of "Aha - everyone else..?".	
Comments from case company representatives	Good to make it clear that it is for the best of all.	



Tell us your opinion!

This part in the app was made to help the company involve their employees in the preventive work. This could send a clear signal that the company value the opinions of their employees. Three examples of main functions are found in this part; vote for lunch seminar guests, participate in a meeting and access a workplace environment survey.

Identified needs/ problems	***Workplace culture should build on trust rather than control*** Everyone should be involved in building a trusting workplace. Employees should know they can make an impact, and that management value their contributions. ***Facilitate a continuous learning process for the company*** The case company expressed the need to improve their understanding of their employees. Most information and education were directed towards management, although employees are often the ones who notice the problems related to drugs at the workplace. An increased knowledge within the company could also contribute to a fair understanding of the magnitude of the problems, and avoid potential exaggeration and rumours.

Connection to literature	***Nudges*** Messenger - information presented by someone that people have a positive feeling towards are more likely to be listened to, as cited in Lindhout & Reiners (2017). Educational effects - the nudge includes some educational aspects, that could help avoid failure according to Caraban et al. (2019).	***Health promotion factors*** Include employees in the development of interventions – this is a recommended strategy by Harden et al. (1999). Intervention approach/concept/format - a participatory approach can be a facilitator for promoting a healthy workplace (Rojatz et al., 2017).
Transparent nudge?	Yes – because employees are part of deciding who to invite to the lunch seminars. The messenger nudge targets the automatic system during the lunch seminar, but it requires a reflective thought to choose who to vote for.	
Risk for unexpected effects?	Yes – employees might have inappropriate suggestions for the seminars. If the suggestions are not in line with the company policy, they might not be accepted and the motivation among employees might drop if they feel that their opinions are not listened to. It will be important that the management use the "participate in a meeting" function in a good way, so that employees feel welcomed and can have an actual impact on decisions, or employees might develop a negative attitude towards the employer.	
Comments from design expert	Very good, I think that the voting function can be used to attract people to use the app, it could also show updates for what people have voted for. If I want the police to come, I might open the app to vote for that option. If employees want to participate (in meetings), the function is probably good. Be clear with how it is expressed, "we want your opinion, we need You". And perhaps specify the content of the meetings, what will it be about and what do they need input on? Make it a default to participate?	
Comments from case company representatives	It is important that the employees listen to the one who is talking. Today, we have a survey about attitudes with including one very important question "does my manager listen to my ideas?". For the meeting function, I think it is good and very important to listen to everyone, even the quiet ones. Perhaps the meetings should not involve too many people so that everyone feels comfortable to express their opinions. Very good that the employees can vote, and that they can be involved in meetings. I like the function tell us your opinion, we talk a lot about our employees, but we have to find ways to include them in the work.	

Win!

This is a function where employees have a chance to win a prize by completing different tasks. They can fill in a commitment where they promise to do certain things, answer a quiz or fill in the workplace environment survey.

<table>
<tr><td>Identified needs/ problems</td><td colspan="2">Promote a healthy workplace environment
By focusing on health in a broader perspective than drug use, the solution could potentially motivate employees to participate and contribute to a healthy workplace culture.

Interventions should target the majority of the employees
Employees have to feel motivated to contribute to a positive workplace culture. With this solution, it would be possible to adjust the themes on quiz-questions, prizes and commitments, and hopefully find something that can be of interest for different groups of employees. Employees should also have the opportunity to give their opinion and thus form the content into something that interests them.

Employees do not know if people around them are liberal towards or against drugs
The result of the commitment function should be anonymously displayed to other employees, for example on screens in the office or in the “Did you know” function of the app. This is done to ensure employees that many colleagues want to contribute to creating a safe workplace environment.</td></tr>
<tr><td>Connection to literature</td><td>Nudges
Commitments – to make a promise, or a commitment to do something, increases the likeliness for that behaviour (Sunstein, 2014). As cited in the article by Lindhout & Reiners (2017) commitment is an appropriate nudge to target employees with a casual attitude towards compliance and those who consider rules to be unnecessary.</td><td>Health promotion factors
Motivate different sub groups - According to Reynolds & Lehman (2008) prevention programs should be tailored to fit different sub groups of workers. This could be done by adapting the prizes or the themes of the information.

Marketing and promotion of interventions – a facilitator from Rojatz et al. (2017). The success of an intervention could depend on how well it is promoted. By using some incentives the aim is to create interest in the app.

Motivation to participate - a facilitator for a successful intervention (Rojatz et al., 2017).</td></tr>
<tr><td>Transparent nudge?</td><td colspan="2">Yes – Commitment is transparent and targets the reflective mind. The intention is that employees should reflect about their promise.</td></tr>
</table>

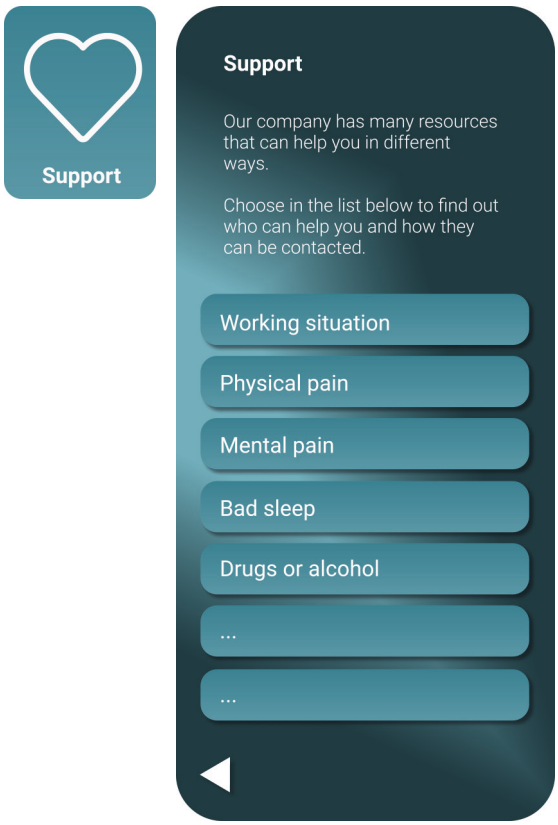
Risk for unexpected effects?	Yes - If no one participates in the commitment, this could have a negative effect, if the numbers are shown. Therefore, numbers should be displayed first when the majority have made the commitment ("80% of your colleagues have made a commitment to always support their colleagues"), alternatively, in the format "yesterday, 30 employees promised to never use drugs at the workplace".
Comments from design expert	The quiz could also be something that attracts people to use the app. Could have a negative effect if no one is participating, so perhaps don't show numbers until a large amount has "promised".
Comments from case company representatives	About Hereby I promise... We had an idea, me and a colleague, that all team leaders should do a drug test to set a good example. Other prizes could be to rent a car over the weekend.

Our safe workplace

This part includes information about the workplace policies in a simplified, understandable format.

Identified needs/ problems	***A solution should enable all employees to become aware of the company drug policy*** Employees get information about the drug policy at employment, but whether or not they are well informed about the contents of the policy is not clear. Interviews with company representatives indicated that there is lack of knowledge.

Connection to literature	***Nudges*** Framing – the information can be presented either in positive or negative wording. Even though some argue that a negative framing is more effective (Lindhout & Reiners, 2017), the information in this concept is framed in a positive way to make the information more attractive to a broader target group. A negative light was also believed to be associated with the risk of fueling the liberal attitude towards drugs.	***Health promotion factors*** N/A
Transparent nudges?	No – the framing nudge is seen as non-transparent. It targets the automatic mind. As long as the company policy is fair, it might not be an ethical problem. However, it is seen as acceptable as the drug policies mainly states that drugs are not allowed at the workplace, which could be considered positive for the employees' health.	
Risk for unexpected effects?	No risks identified.	
Comments from design expert	The policy becomes easy to reach, perhaps it could be combined with reminders to read it, the latest updates?	
Comments from case company representatives	-	

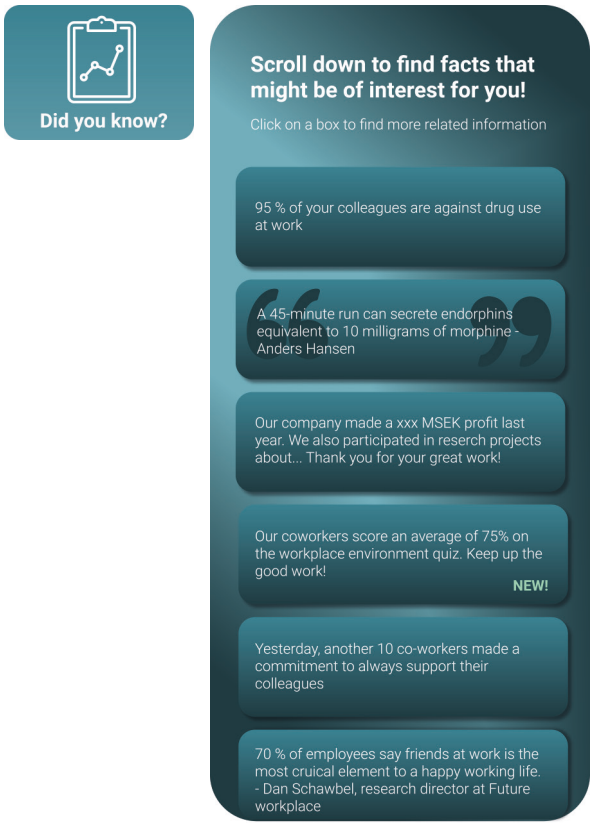


Support

This function helps employees to get in contact with different support resources that exists within the company. The idea is to help the company communicate that they care about their employees, and to make support resources easier to reach and find for the employees.

Identified needs/ problems	***Difficult to reach out with information, it is unclear if employees are aware of the possibilities to get support via the company*** The company has communicated the policy and the consequences of a positive drug test, but the information about available support did not seem to be well known among employees. The company want to encourage employees to seek help before the problem escalates and the employee gets caught in a drug test or causes an accident.	
Connection to literature	***Nudges*** Simplification – Reducing the complexity and making existing programs easier to navigate can increase the number of participants (Sunstein, 2014)	***Health promotion factors*** User friendliness of intervention – a facilitator for a successful intervention according to Rojatz et al. (2017). By providing a more user-friendly support process, the concept aims to help employees find the support they need.
Transparent nudges?	Yes – by simplifying the access to support, the employees can easier find a suitable channel, and it enables them to become aware of the company's resources.	
Risk for unexpected effects?	Yes and No – more employees than expected might use the support channel, which can increase the costs for the company. But if more people dare to ask for support should be seen as a positive outcome.	

Comments from design expert	Good because it might be easier to click through an app than to start a conversation.
Comments from case company representatives	The resources exist at the company, and we suspect that other addictions are increasing as well (not just drug addiction), such as gambling.



Did you know?
This part of the concept aims to provide interesting information to employees, and to strengthen the employees that are against drugs by showing that they are not alone. This is done for example by showing that the majority of employees are against drug use at work (data collected from workplace environment survey and commitment function).

Identified needs/ problems	***Facilitate a dialogue to improve workplace environment*** This function is supposed to facilitate a dialogue by presenting facts related to health promotion. The app content could be viewed for example in lunch rooms as a conversation starter, scrolling through the interesting facts. Facts could be related to workplace environment results, physical activity, strengths of teamwork etc. The information is presented in a short format that is easy to scroll through and read.

Connection to literature	***Nudges*** Social norms/standards - inform about the behaviour that most people are engaged in. This is claimed to be one of the most effective nudges (Sunstein, 2014). The nudge takes advantage of people's strive to be part of a group (Lindhout & Reiners, 2017). Framing effect – the information will be presented in a positive light, as described in the function "Our safe workplace". The information will not include effects of drugs, because of the risk of scepticism from the more liberal attitudes. Educational effects – the nudges include educational aspects, providing facts related to health promotion. Educational effects could help avoid a failed nudge according to Caraban et al. (2019).	***Health promotion factors*** Strengthening cohesion and support among groups, to influence social norms towards becoming against drug use. This is a universal strategy from EMCDDA, (2019).
Transparent nudges?	Yes – by showing for example that most people promise not to use drugs, employees can feel more safe, and drug users can reflect about their own behaviour. No – framing of the information is not fully transparent, similar as to "our safe workplace".	
Risk for unexpected effects?	Yes – if it turns out that most people support drug use (unlikely) at the workplace, this can have a negative effect. This could be handled by not showing any numbers until enough people have stated that they are against drugs. However, the idea could still fail if not enough people are engaged.	
Comments from design expert	I see that this is more of a wellness at work-app, not just about drugs. I think it is smart to not only focus on drugs, to combine it with other aspects feels good.	
Comments from case company representatives	If employees know that 95% are against drugs, then maybe it will be easier to discuss it during breaks, and then we know that we have come a long way... It is good to highlight the positive aspects so it does not become like "no-no".	

Table 5 - Modified heuristic evaluation of the concept Make it visible.

The concept as a whole

Interesting for the case company?

The concept was received positively by the case company representatives. They were positive towards taking a broader perspective than just drug related issues, in that way the issue could be targeted without focusing on the negative aspects of the problem. They were also positive towards not including information about effects of drugs, and they liked that the concept does not contribute to a culture of suspecting each other.

> ***"Some people don't think that we should give any information at all, we should not make it a bigger issue than it is... But it is probably better to do something before the issues arise. Framing it in a positive way is good, so it does not focus on the issues we have." (Trade union representative, company A).***

Anything specific in the content that you believe will make a difference?

One of the most appreciated functions in the app was "tell us your opinion!". The case company representatives wanted to find ways to include their employees in the preventive work. The study by Rojatz et al. (2017) mention resources as a barrier for companies to implement health promotion interventions. This was confirmed in several of the interviews in this project as well, the company lack resources to spend on preventive actions.

> ***"Yes, we want to work more proactively, but at the same time when ... It is not possible to say that "No, I can't work with this urgent case because today I work proactively, it must wait until next week" (...) There is a danger and a tendency that we are always occupied with the urgent matters, the daily work." (Interview with HR rehab, company A).***

The need for continuous updates of the content

The case company representatives saw it as a possibility to provide some content specifically based on information from their company, for example displaying workplace environment survey results. Other content would be fully managed by Eyescanner, and be the same for all Eyescanner's customers. They also referred to other similar services that they currently used where some of the content was specifically designed for their company. They expressed that this app should be part of the licence cost of the Eyescanner drug test solution. Therefore, it was seen as an opportunity that Eyescanner could lead the development of such a tool. Functions such as "tell us your opinion!" will however require time and engagement from the company, but it will likely be more efficient with support from Eyescanner.

The chance to win prizes as motivation

An important aspect of this concept was the aim to reach the majority of the target group. This was also found to be a barrier for health promotion interventions (Rojatz et al. (2017), if the participants cannot be accessed, the intervention is likely to fail. The format was chosen to be a cell phone application, as this could be equally accessed by white-collar and blue-collar employees. Another aspect of the concept was to make the content changeable, and thereby increase the chance of making it interesting for a variety of people. This was represented in the concept by using different prizes and themes. One of the case company representatives was a little hesitant to using prizes, based on experience of other interventions that had been down prioritised in bad economic times. It could also be difficult to provide prizes in a fair way for all employees. The representative suggested that it might be used to promote a certain survey, and that other aspects

could increase motivation, such as comparing your quiz-result with others. It was discussed with the design expert that other things could motivate people to use the app as well, like the function of voting for lunch seminar guest or getting access to some interesting statistics, maybe showing which departments that have been tested to make it clear that the selection is random, or even to get feedback on your drug test result. Prizes could also be less costly options, such as the manager inviting for lunch if everyone answers the survey, as one of the case company representatives suggested.

Summary
The need for this concept was confirmed by the case company representatives. The content was reviewed by a design expert with experience from nudging, who were also positive to the concept. Several of the nudges were supported in literature, and health promotion literature was guiding when forming the concept. It was seen as a strength that the app covers a wider health promotion theme, rather than just being a drug prevention app. However, further studies are needed to shape and limit the content.

6.3 Pugh matrix evaluation

The three remaining concepts Safety barrier, Initial screening and Make it visible had been iterated in two steps. All concepts had promising potential based on evaluations, although Safety barrier was seen as more suitable for future implementation of the Eyescanner technique rather than as a first implementation due to reasons listed in the evaluation section. As the concept Make it visible did not include drug tests, the idea was to offer it as an additional feature to a drug testing solution, rather than offering it as a stand-alone concept. The idea pursued to the third iteration was therefore, at this stage, thought to be a combination of the concepts Make it visible and Initial screening. To further validate the suitability of this decision, the three concepts, as well as the combination of Make it visible and Initial screening were evaluated against requirements in a Pugh matrix.

The Pugh matrix evaluation clearly showed that the two concepts Make it visible and Initial screening combined fulfilled more needs than any of the concepts alone. This was not surprising, as Make it visible targeted different needs, compared to the other concepts. Mainly, it was needs related to having enough knowledge, as well as to preventing drug use/promoting a healthy workplace environment that were better met by that concept. Another clear difference was that Safety barrier scored higher on needs related to creating a safe working environment. Nor this was surprising, as the Safety barrier concept built on a continuous control to make sure no person is under influence of drugs while performing a task. Other than that, the concepts involving drug testing through Eyescanner test did not have notable differences, according to the Pugh matrix evaluation. The full evaluation matrix can be found in appendix VIII. Looking at the total score, where the weight of the requirements was taken into account, Safety barrier scored 137 points, Initial screening scored 139, Make it visible scored 148 and the combination of the two latter scored 266 points. With this in mind while also considering the fact that Safety barrier was more suited for a later implementation phase, it was decided that the final concept in this work would be a combination of Make it visible and Initial screening. This meant a combined approach using both drug preventive/health promoting interventions and a controlling intervention through drug tests, in order to try to solve drug related issues at the case company.

6.4 Iteration 3: The final concept

6.4.1 The solution

Creating a safe working environment requires several interventions. The majority of people at a workplace do not use drugs at work. There are some who use drugs while at work, and some who even engage in other criminal activity, such as selling drugs at the workplace. Since drug use exists, it is important for the company to take action, to prevent accidents from happening and to make sure all employees can feel safe among their colleagues. Therefore, Eyescanner provides an efficient and easy drug testing solution and use process. The Eyescanner technology scans the eyes of a testee, and a positive result equals CNS influence and thus, a confirmed safety risk. Drug testing is only a small part of needed interventions to achieve a safe working environment and this study has shown that several companies lack a solid health promotion program with drug prevention included. Therefore, in addition to a drug testing process, this work also resulted in a proposed health promotion app. The drug testing process and the health promotion app are presented below.

Initial screening

The suggested process for drug testing with Eyescanner test is presented on a service blueprint, as seen in figure 30. It shows actions, touchpoints and supporting services on rows, and the different phases of the process in columns. Departments are randomly selected, rather than individuals. This makes it clear that all people are tested on equal terms, and assures employees at one department that all their colleagues are free from influence of drugs. It also makes the drug testing process more visual and thus, likely leads to greater preventive effect. For the process to be secure, no testees should know when drug tests are going to happen. All employees in one department should be tested within a limited time frame, not exceeding the detection time of drug use.

Using Eyescanner tests as the method for initial screening means less people will have to undergo a urine test. The positive Eyescanner test is followed by a urine test, from which the sample, together with the Eyescanner test result report is sent to an accredited laboratory. If the laboratory confirms the previous, preliminary result, it is sent to an MRO, who acts as a final control organ. The MRO contacts the testee to make sure the preliminary positive result is correct. After that, the result is verified. Having the Eyescanner result as a complement to the urine test analysis, can help identify new drugs, as Eyescanner detects CNS influence and thus, covers all drugs. Therefore, Eyescanner recommends that the urine test is not preceded by a urine quick test, as the quick urine test can limit the analysis. Since the positive Eyescanner result confirms CNS influence, it equals a confirmed safety risk. Having the safety risk confirmed makes it easier for the manager to assess for appropriate and fair consequences of a positive test result.

Eyescanner does not save any personal data. Positive results are instead saved at the customer's internal servers, in order to not risk any data handling safety issues.

Actions

Touchpoints

Supporting services

Selection

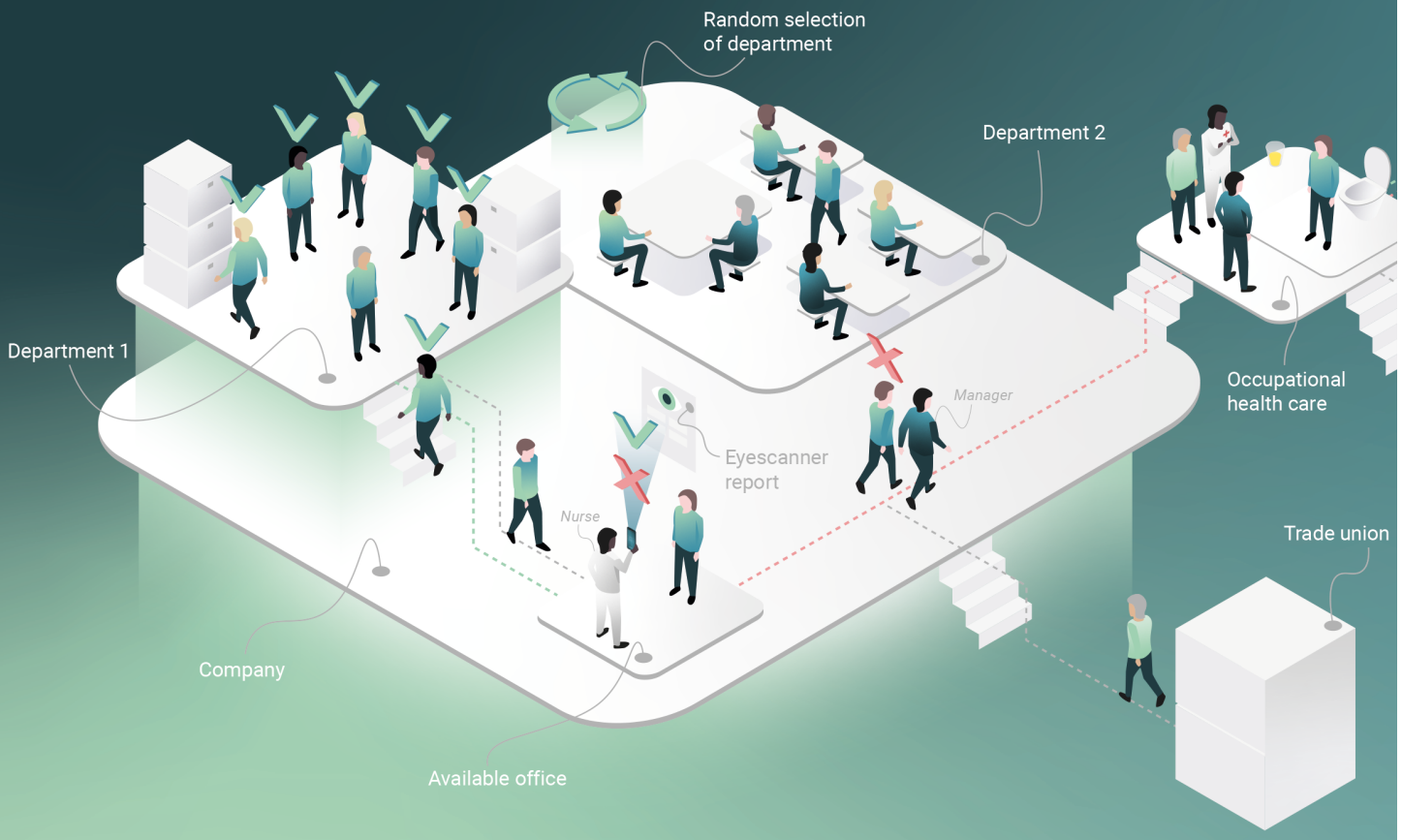
The selection is handled by the customer's internal system. Departments are generated in a random selection.

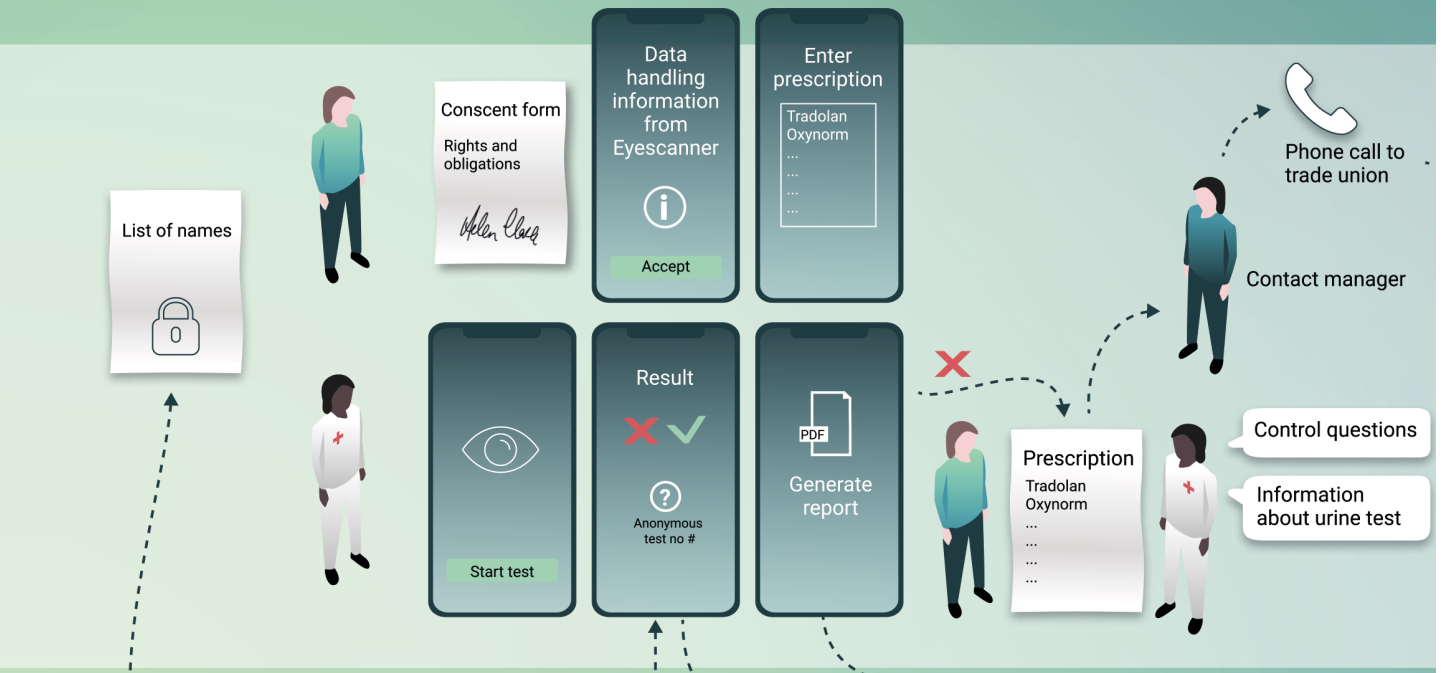
Eyescanning

Tests are performed by a nurse. If the Eyescanner result is negative, the employee returns to work. If the test is positive, the manager is contacted.

Urine test

A positive Eyescanner result must be complemented with a urine test to specify substance and amount of the detected drug.





System to randomise departments

Eyescanner algorithm generates a result

Anonymous test number is connected to the testee ID in customer internal system

Positive Eyescanner result is exported as a PDF-report

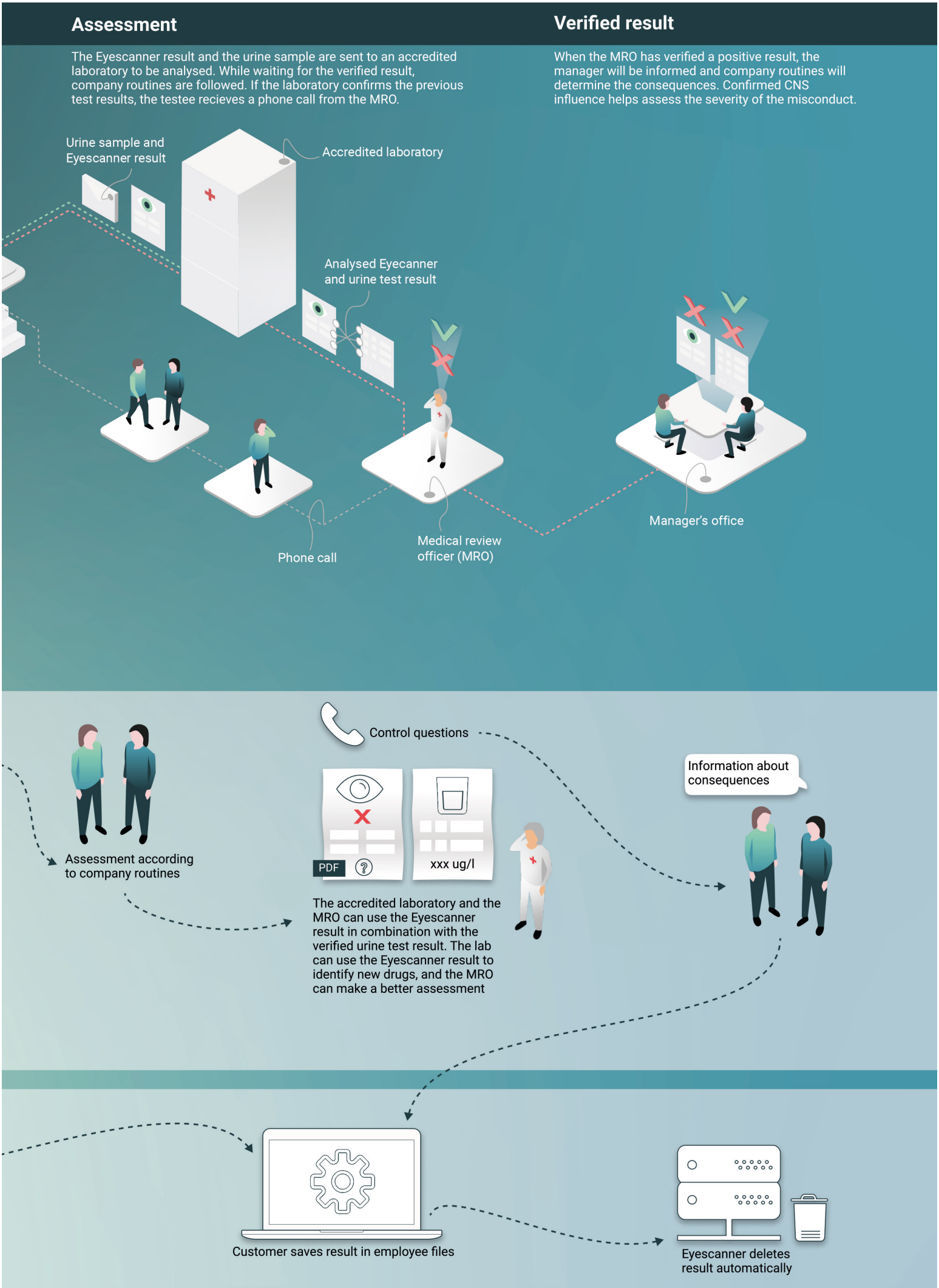


Figure 30 – Service blueprint for the drug testing process "Initial screening".

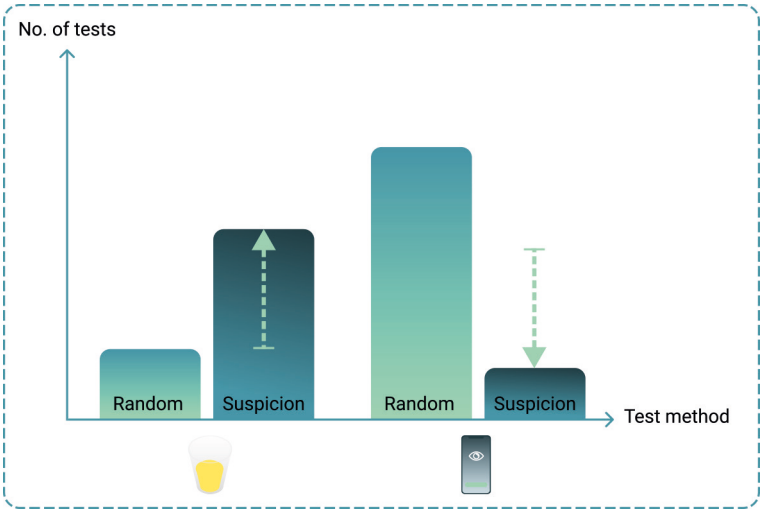


Figure 31 - Cause - effect diagram, increased random testing with Eyescanner tests is believed to reduce the need of suspicion tests.

Implementing the Eyescanner test hopefully allows for an increased number of random drug tests, compared to urine quick tests used today. The idea is that an increased number of random tests will decrease the need of suspicion drug tests, see figure 31. Note that the figure does not have accurate proportions, but rather shows the principle of cause and effect. Increased testing will likely detect more people influenced by drugs and give a better preventive effect, compared to a low testing frequency. Confronting someone suspected to be influenced by drugs can damage the relationship between the suspected person and the confronter. In extreme situations, confronting can even cause a threatful situation. It is important for everyone's sake that suspicion situations are avoided. Conducting drug tests requires a trade-off between creating a safe working environment and respecting integrity of the employees. The survey results indicated that the Eyescanner test was more accepted than urine tests and thus, an increased number of tests can be allowed with higher acceptance than urine tests.

> ***"It is a bit dangerous to base tests on suspicion, there is a risk for subjective opinions that are not always correct or motivated in a fair way". (Trade union representative, company A)***

The drug testing process is created for random tests, and as mentioned, the hope is that the number of suspicion tests will decrease. However, depending on how much the total number of tests will increase, it is possible that some suspicion tests will be needed. In case of suspicion, the same process for drug testing can be used, but it will be preceded by a process similar to today's process, meaning that the manager informs and brings the suspected employee to an available office or directly to the occupational health care.

As results from initial interviews indicated, not all companies wanted to increase the number of tests. However, they were intrigued by the flexibility and simplicity of the Eyescanner technology. The same process can be used at those companies. Using Eyescanner tests instead of urine quick tests might lead to a decrease in suspicion tests, even if the number of tests is not increased. This is thanks to the assumed preventive effect of the Eyescanner test, due to the fact that it detects all drugs, as opposed to urine quick tests. It will not be possible to use drugs that go undetected by the Eyescanner test.

Figure 32 - The health promotion app.

Health promotion app

As previously mentioned, successful drug prevention requires preventive incentives in combination with drug tests. This study resulted in needs related to health in general, which is reasonable, because using drugs is not just an illegal act, but can also be associated with an illness, or unstable work-/life situation. To help companies to always prioritise the health of their employees, Eyescanner offers a health promotion app. The app has several functions, including:

- To give information about health interventions. The aim of the function is for the employees to understand the purpose of different interventions and policies existing at the workplace.
- To present facts related to health promotion. The facts are shown in a positive light, in order to make employees motivated to make healthy decisions.
- To help the company involve their employees. The hope is that the employees want to engage in workplace environment related questions. Knowing that they have a say, it is more likely that they will engage.
- To collect data, in order to learn about their workplace environment. At a large company, it can be difficult to get a grasp of how the employees feel, what they want, or how widespread a problem is. The app should make it easier to understand such things.

The health promotion app can be interacted with in different places and situations, see figure 33.

A. Screens on walls in common areas of the workplace. The content comes from the app and is ever changing, in order to attract different groups of employees. The aim is that they should want to download the app to their own device. Figure 34 shows an example of such a screen.

B. Being able to download the app to their own device gives the opportunity to interact with the content at any time, and to use it as a help when dealing with personal issues. It could be searching for support, or fill in the workplace environment survey.

C. Some of the app content is created to facilitate a dialogue about the workplace environment, for example facts related to health promotion or information about results from the workplace environment survey. In order to facilitate this dialogue, devices, such as surf pads are placed in common areas, for example in lunch rooms. Colleagues can use them as conversation starters, and hopefully motivate each other to engage in workplace activities.

D. Another way to introduce the app to employees is during the drug testing procedure. The occupational health care nurse can tell the testee about the app, and about the different content. This could also give an opportunity for the employees to bring up any issue they have and want help with. The app can also be introduced by other professionals, for example health coaches, team leaders or trade union representatives, in other situations.

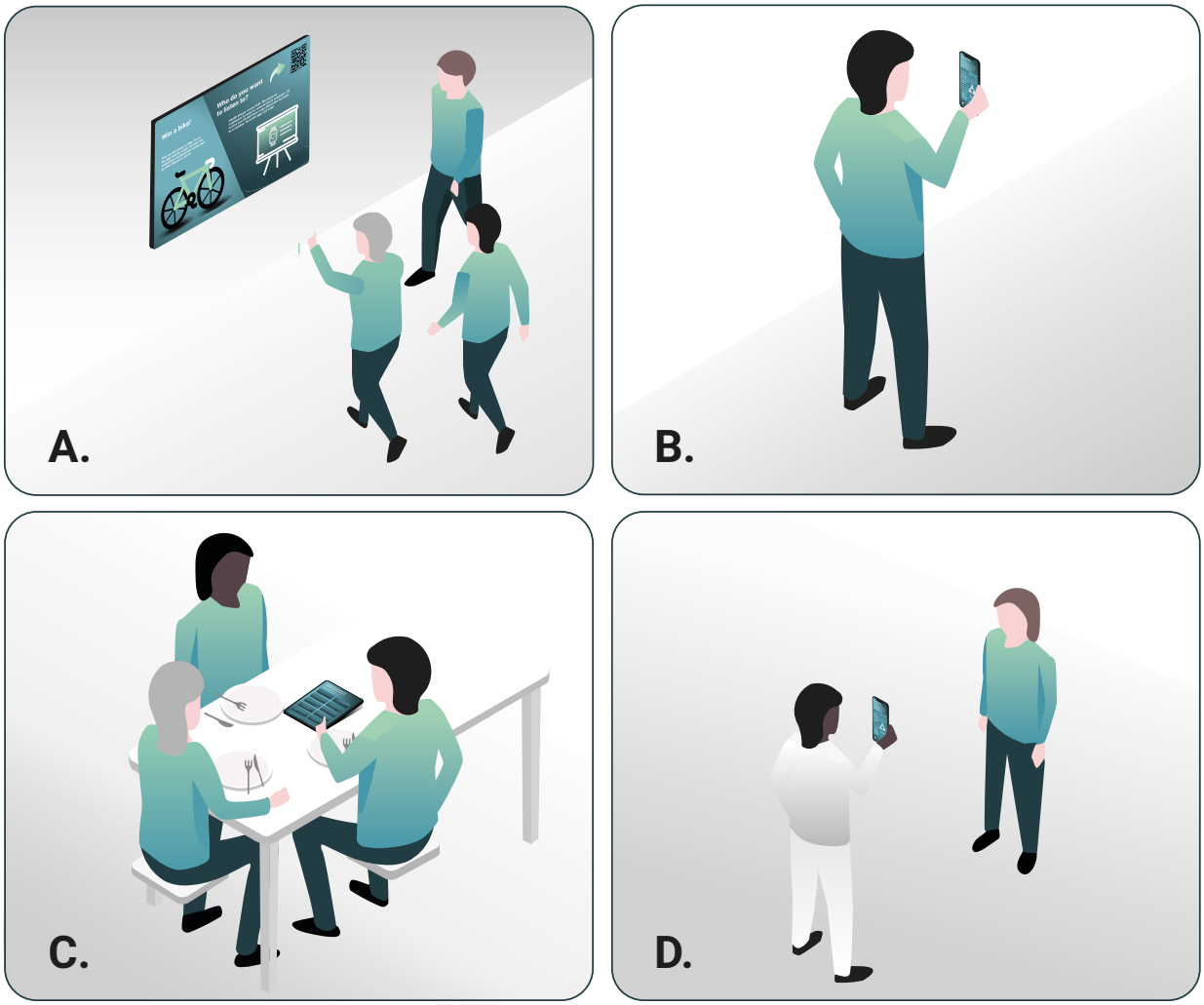


Figure 33 - Touchpoints where employees can interact with the health promotion app.

Figure 34 - Screens on walls show content of the app to attract employees to download the app.

6.4.2 Enterprise Design

In this section, the solution is presented in terms of the included scope from the Enterprise Design Framework. Figure 35 shows an overview.

Figure 35 - An overview of the included scope of the Enterprise Design framework.

Big picture, Identity

What do people think and feel about your enterprise, and how does it appear in their minds?

Eyescanner is a company that provides fair tools for creating a safe workplace environment. Even though the goal is to not have any problems related to drug use at work, they exist. Eyescanner is a company that has understood that it can be uncomfortable to perform drug tests, especially for someone who does not use drugs. That is why they provide a less uncomfortable method for performing drug tests, along with a health promotion app that tackles the issue with more preventive measures. Eyescanner helps companies to prioritise their employees.

The Eyescanner solution is unique, and its brand needs to communicate this advantage. Based on the extensive response during recruitment of companies to participate in the initial interviews of this work, there is a clear interest for a new, digital method. To emphasize the benefits of this new method compared to traditional ones could be an effective way of creating a strong identity. The technological aspect as well as the respect of personal integrity was seen as positive by most companies. Eyescanner should aim to build an identity based on its technological advancement and its respect of integrity.

The method is new to the market and faced some scepticism regarding how accurate it will be. Eyescanner should tackle this by clearly communicating the connections to research, and be transparent with its accuracy and usage. Since Eyescanner tests detect all drugs, the method has the potential to be more difficult to manipulate compared to for example urine tests. Therefore, Eyescanner has the possibility to be more transparent on how the test procedure is carried out, compared to other methods where companies do not want to provide information due to the risk of manipulation. The digital solution from Eyescanner also has the benefit to improve over time, as compared to other tests that are not as easily updated.

Eyescanner should be honest with the complexity of the drug related problems; Drug testing is one part of the solution and helps customers to signal their zero tolerance of drugs at the workplace. However, drug testing itself does not necessarily contribute to promoting a healthy workplace or target the attitudes among employees. Therefore, Eyescanner should strive to build their identity as a company that has a more holistic approach to the problem, helping companies by providing a solution for drug testing as well as other preventive interventions.

Eyescanner should be identified as a company that helps customers create a safe, drug free work environment by tackling drug related issues with preventive and controlling interventions, in a way that is modern, flexible and that respects personal integrity.

Big picture, Experience

What do people get out of your enterprise, and what role does it want to play in their lives?

There are several factors to consider in the context of drug testing at a workplace. First, the workplace is for work, and a drug testing method should not interfere too much with the activities of the company. Many problems were identified related to this in today's drug testing methods, as urine tests are time consuming. The Eyescanner process will allow for an increased testing that can be done quickly so that people can return to work, and less uncomfortable urine tests will be

needed. Second, a workplace should not only focus on issues related to drugs, as the majority of employees are not part of the drug related problems, and there are other issues that can occur at a workplace that an employer needs to address. By promoting health in a broader perspective than just drugs, Eyescanner can help companies create a healthy workplace culture.

Overall, the employees should feel like they are respected and involved in creating a safe and healthy workplace. All should be treated equally, and it is recommended that the random tests are performed by a nurse or other neutral person to make this clear. All employees are tested on the same terms, managers as well as employees.

For a testee who is not influenced by any substances, drug tests are no longer very uncomfortable. It does not feel like a great sacrifice to conduct a drug test, as the new method is not just fast and fair, but also modern, high tech and a little exciting. As a testee, I understand that I do not have to take a drug test because my manager does not trust me. Instead, by taking a drug test, I can help assure my colleagues that they can feel safe. I also make a clear statement that for me, drug use at work is not accepted. As I have many colleagues, it is difficult to get to know everyone personally, and therefore, it is good that there are other ways to make my standpoint clear. I do not accept drug use at work, because it is a safety risk.

Anatomy, Actors

Who are the stakeholders taking part in your enterprise, and what are their roles and relationships?

Stakeholders found to be relevant in this study are the customer companies' management, trade union representatives, employees and occupational health care units. Management have the decision mandates, but take big consideration of the trade unions' opinions when it comes to interventions that affect employees. Different HR roles within the customer companies are involved in handling drug policies and making decisions about the processes and routines, and they are likely the first contact when promoting the solutions from Eyescanner. Occupational health care plays an important role when it comes to health interventions, as the companies follow their recommendations. All mentioned want what is best for the employees, and thus, it is important that solutions offered are accepted by the employees. Other stakeholders are accredited laboratories and the MRO (connected to occupational health care), who work with analysis and verification of positive drug tests.

One actor that is likely to have an impact on the enterprise is the press. Many companies were concerned about protecting their brand and did not wish to be associated with drug related issues. Therefore, it is believed that a combination of health promoting interventions and a less intrusive drug testing method could support good relationships both internally within the customers' companies as well as externally towards the media. A new drug testing method is likely to attract some media attention, and it is important that Eyescanner is not perceived to be a surveillance company, but rather as a company who wants to do good for society.

Additionally, important stakeholders are authorities and associations that are involved in approval processes of new methods for workplace environments. In general, both the drug testing process and the health promotion app should be in line with legal aspects (AML (1977:1160); AFS (1994:1)) since they aim to help the employer to prevent risks of ill-health and accidents

at the workplace. However, the drug testing process will have to go through thorough approval processes to become supported by the Swedish government (likely preceded by approval from EWDTS and others).

Anatomy, Touchpoints

When and where do people interact with your enterprise, and in which individual contexts?

There are several touchpoints in which actors will interact with the Eyescanner enterprise.

Encounters, brief contacts with the enterprise:

- During Eyescanner drug testing in an available office, where an occupational health care nurse performs the test on a testee using the Eyescanner test app.
- At acute events, such as accidents or incidents where it is necessary to eliminate suspicion of drug use.
- The health promotion app has several interfaces on different devices that can be interacted with at work or anywhere via the employee's own device, as seen in figure 33.

Dialogues, short term journeys lasting from minutes to hours:

- At the accredited laboratory, analysts use the Eyescanner result (pdf report) to help identify substances.
- The MRO uses the Eyescanner result to assess how severe the misconduct has been.
- The health promotion app provides several functions to interact with, and one of the intentions is to contribute to a dialogue between employees.

Episodes, long term journeys, part of a larger activity:

- The Eyescanner result will be used by the customer company to decide for consequences. Such a process can be long, and the Eyescanner report will likely be part of it. The report is therefore stored internally by the customer, not by Eyescanner.
- The health promotion app is aiming for a cultural change at the workplace, and for the company to learn from its employees, acting as a touchpoint with changeable themes and goals, promoting health in general.
- Continuous dialogue between the customer company and Eyescanner, to update the custom made content of the health promotion app.

Relationship lifespan, the overall journey:

The Eyescanner enterprise as a whole strives to be part of creating a safe work environment for their customers. This is done by providing access to efficient drug tests, and preventive interventions in the health promotion app. By combining the two solutions, there is an opportunity to evaluate the preventive effects and adjust the frequency of drug tests based on the problem magnitude.

Anatomy, Services

What are the value propositions the enterprise makes available with its activities and their results?

Eyescanner offers access to a drug testing method, and preventive interventions. For the drug testing service, most activities will be handled internally by the customer company and its occupational health care. It is likely that Eyescanner will interact with the customers initially to support them with the set up and routines. One of the services provided by Eyescanner is the possibility to perform drug tests. The Eyescanner algorithm will automatically deliver an anonymous test result, that the customer can export and save internally. The customer will not have access to the Eyescanner algorithm, only the test result. Eyescanner does not save any personal information. The idea is that the Eyescanner drug testing application itself should not require any customization for specific customers, and thereby reach a large number of customers. The Eyescanner test needs to be complemented with a urine test that will be performed at the occupational health care, and is therefore not an independent service in the context of drug testing at a workplace.

The health promotion app will be a more interactive part of Eyescanner's services. Employees will be able to use the service to participate in different activities and take part of information. The companies can use the app to learn more about their employees' attitudes and ideas, as a tool to improve the workplace environment and culture. This service will require some collaboration with the specific customer to develop relevant features.

Anatomy, Content

What are the content elements that are produced, exchanged and consumed in the enterprise space?

The content provided by Eyescanner's drug testing method intends to give a result if a person is under the influence of drugs. It will be used to guide decisions about consequences for the employee. Exactly how the result will be presented has not been defined in this work, but findings implies that company representatives without medical expertise are mainly interested in a result that gives a simple yes or no answer to the question whether an employee is under the influence of drugs at the time of the test. Medical professionals could get a more detailed report.

Eyescanner as an enterprise would benefit from some feedback from the laboratory analysis, to improve the accuracy of the drug testing algorithm. This will be done in validation projects to build the needed accuracy, but the opportunity to cooperate with the laboratory and the MRO should be further investigated. One argument for cooperation is that Eyescanner could support research projects and contribute to new knowledge regarding substance concentrations corresponding to affected behaviour/CNS influence.

Eyescanner updates the health promotion app to be custom made for the customer. The customer provides content that should be included. The app will need to gather data from surveys, quizzes and other functions, and translate it to valuable insights both towards management and employees.

Frames, Business

What business model drives your enterprise, and how will your design work contribute to its success?

The results of this case study were mainly based on information from large companies, and naturally, large companies are therefore the primary target customers. Not all companies use drug tests today, especially not smaller companies. Likely, they do not experience drug related problems to the same extent as larger companies, and therefore, they are not primary target customers.

The uniqueness of the Eyescanner drug testing service constitutes of several things:

- The Eyescanner drug testing solution can be used in an efficient way, without the need for the testee to leave work to go to the occupational health care unit. Tests can be performed in any available office and therefore, it saves valuable work time.
- A positive Eyescanner test equals confirmed safety risk. That makes the assessment of consequences easier, since no other drug testing method can provide that confirmation.
- The drug testing process is performed on equal terms for all employees, and by randomly selecting departments rather than individuals, no one feels pointed out. When all employees at a department have been tested, their colleagues can feel safe.

Not all customers wish to increase the number of tests, which is why different licenses should be offered. For a lower yearly price, a limited number of tests are available. A higher yearly price could give access to an unlimited number of tests. What package the customer choses is based on its size and how many drug tests they wish to conduct, which in turn is based on safety requirements and how widespread their drug related problems are. The levels will be carefully calculated so that large companies will want to choose the more expensive package to get an unlimited number of tests. In the future, Eyescanner should give recommendations on a suitable test frequency. There could be a risk that unlimited access to tests leads to excessive use.

The ultimate goal is that drug related problems should not exist at companies. Increasing the test frequency hopefully leads to decreased problems and in turn, less need for the drug testing service. However, it is not likely that the customer stops performing drug tests. Instead, the frequency is likely to vary based on a varying need.

Further on, the health promotion app helps companies to prioritise prevention and health promotion work, something that the results of this study showed is commonly down prioritised by companies in favour of more acute errands. It helps them to get informed and engaged employees, which in turn, creates a better opportunity for a good workplace environment. The health promotion app should be included in the licence cost for the drug testing application, and therefore increases the total value of the Eyescanner service package.

The customer and its employees interact with the services of the Eyescanner enterprise through apps. No personnel from Eyescanner is needed for the service interactions. Eyescanner needs to continuously develop the drug testing technique and update the health promotion app.

Implementing Eyescanner's services will require effort from the customer company, in terms of changing the drug testing process and getting an agreement with all relevant parties. The health promotion app is custom made and can therefore increase in value over time, as more investments are made from the customer company, in terms of effort to create the content included. These things together are likely to create a high switching cost, increasing the likelihood that the customer will stay with Eyescanner even if competitors with similar solutions emerge on the market.

Frames, People

Who are the people you are designing for, how do they live their lives and what makes them tick?

Employees in the customer companies are the majority of those who are directly in touch with the services of Eyescanner. They want to feel safe at their workplace, in which they spend a large amount of their time. The majority of those people are not using drugs at work, but are aware that the problems exist. It is difficult for them to get a good grasp of how widespread the problems are. It is important for Eyescanner to know that those employees constitute the majority of people who will be in touch with the Eyescanner services. By offering its services, Eyescanner should help their customers to strengthen these people in their aim to achieve a safe working environment.

The health promotion app will only give effect if people interact with it. It is therefore important to have a varied content, as there are many different groups of people in a large company. There should be contents that can attract different groups of people. Some of them will likely be interested in engaging to improve the workplace, while others are more interested in content that is of value for themselves. Some employees are likely to prefer interacting with the app on their own, while others want to discuss it with co-workers.

The Eyescanner drug testing app will be used primarily by occupational health care nurses, and possibly by other professionals in acute situations. For them, it is important to not cause intrusion of privacy of the testee and to feel like they can trust the technology being used. Standing too close to the testee could potentially cause such intrusion. The use scenario should go smoothly and not cause discomfort for the people involved. It is important for the people performing the tests to be comfortable using the app. Nurses will use it often and thus, learn and become comfortable using it. If nurses are not available, selected people (managers or guards) should perform the test in their place. If using the app only a few times per year, it is unlikely that the person becomes comfortable with handling the process in a good way.

Note: The employees have not been accessible to a large extent in this study. Therefore, more studies should be conducted to shape the services based on their viewpoints.

Frames, Function

What are the goals and activities your enterprise supports, and what is required to make this happen?

The two services target the drug related issues with different approaches. Drug testing is partly a controlling intervention, but with some preventive effects, while the workplace health promotion app is a preventive intervention. The services include different functions that should help lead the customer company towards this goal.

Eyescanner test:

- Enables initial screening for drug influence in a quick and efficient way.
- Screening of whole departments assures co-workers that they can feel safe among their colleagues
- A positive Eyescanner result equals confirmed safety risk, since it means the CNS is affected. It becomes easier to take the decision to not let a person with a positive result go back to work until it is safe.
- Eyescanner detects CNS influence, and therefore detects all drugs that can cause safety risks. That includes illegal and legal (prescription) drugs.

Health promotion app:

- Gives information about drug testing and the reason it is performed, with the aim to get the employees to understand its purpose so it becomes more accepted.
- Motivates the employees to learn about health promotion aspects, by letting them take quizzes and enter a competition to win a prize.
- Motivates employees to engage and give their opinion about workplace environment related questions.
- Provides accessible policy related information, so that more people read and get updated on the information.
- Provides guides on how to get help with any work related or personal issues, so that things will be dealt with in time. It should be clear what kind of support can be offered.
- Gathers data that allows for the customer company to learn about their employees and how they perceive the workplace environment, for example through surveys.
- Gathers data that allows for continuous evaluation of preventive measures, for example by including questions about attitude towards drug use, and compare results over longer periods of time.

Frames, Structure

What things are relevant to your enterprise as a design context, and how are they interrelated?

The most relevant structure of objects needed for the Eyescanner test process are:

- The device used for the test
- The person performing the tests on a testee
- An office in which the test is performed
- The software building the contents of the app
- An algorithm calculating the result based on image sequence of eyes
- A report showing the result
- Link to customer internal server, so that the report can be saved in the customer's system (Eyescanner later deletes the result)

The most relevant objects that structures the health promotion app are:

- The device(s) through which the interaction happens
- The user (customer company employee)
- The software building the app and its content
- A channel between the customer company and Eyescanner, where the parties can agree on and deliver customer company specific content for the app
- Programs needed to enable employees to fill in sensitive information (for example in a workplace environment survey). This information should be handled by the customer company's servers, not Eyescanner's.
- Eyescanner employee updating the health promotion app

7. Ethical considerations

According to sociological inquiry principles, ethics can be discussed on three analytical levels; the micro-, meso-, and macro-level (Blackstone, 2012). The different levels have different focuses, the micro level puts the individual in focus, the meso level focuses on groups, and the macro level focuses on society as a whole. The sociological principles for ethics were relevant because they apply to the context of this work, a workplace environment includes individuals, groups and societal aspects. Throughout this work, some ethical aspects emerged and decisions had to be made by the thesis workers. This section describes some of those ethical aspects as well as reflections in relation to the analytical levels.

Micro level; the individual

The ethical considerations on this level includes the experience of being tested. The drug testing method suggested in this work relies on increased random testing. One potential benefit for the individual with this method could be that less urine tests would need to be performed when using the Eyescanner method for drug testing. If the Eyescanner test does not identify any drug influence, a urine test will not be needed. The result from the survey indicated that an Eyescanner test is preferred over a urine test, and several issues related to personal integrity were associated with urine tests. On the other hand, it is likely that more Eyescanner tests will be performed. This work did not thoroughly investigate the Eyescanner test scenario, other than who should be responsible for conducting the test. It is likely that other aspects will influence the individual's experience of the test scenario. This should be further investigated to design the final test scenario.

The Eyescanner drug testing method will identify CNS influence, meaning that the central nervous system of an individual is affected by drugs. This can be seen as a more serious offense than remaining substances of a drug in the context of a workplace. The Eyescanner test result could therefore help companies to assess the consequences, and the consequences could be stricter when an individual tests positive on an Eyescanner test. This could be considered as a more fair assessment resulting in consequences that reflects the seriousness of the misbehaviour. From an individual's perspective, the Eyescanner process could be perceived less intrusive to integrity, as the company will not be able to interfere with the individual's private life, since the method does not detect remaining substances.

One aspect that is important to consider is transparency, the drug testing method should be transparent with how the individual's data is handled. In this work, it was suggested that Eyescanner should not save any personal information. The result will be stored internally by the customer company. The result is sensitive information and should be handled with care by the customer. However, it is difficult for Eyescanner as a company to fully control this aspect as it relies on internal routines and systems. Eyescanner can provide recommendations for how to handle the result, as well as routines on how to perform the tests. The findings in this study showed that companies handle such information with care and negotiate frequently with trade unions to ensure that the new drug testing processes will be accepted. The risk of mishandling is therefore seen as low.

The suggested Eyescanner drug testing method aimed to reduce the need of confronting someone based on suspicion. This was seen as positive as it could support a good relationship between

employees and managers. Less suspicion tests will reduce the risk of threats towards the individual who confronts, as well as reducing the risk of mistakenly suspecting individuals based on biases.

There will likely be situations where the Eyescanner test cannot be applied, for example if an individual has some medical condition that means the Eyescanner test cannot be used. Such a scenario could be handled by offering another less intrusive method, for example oral fluid tests rather than urine tests.

By providing other preventive interventions with the health promotion app and not just focusing on drug tests, the solution as a whole aims to be accepted as more ethical and inclusive from the individual's perspective.

Meso level; the group

This work focused mainly on the group level. In the context of a workplace, it was seen as important that everyone should feel safe at work. Based on the findings in this work, the drug testing that companies used did not achieve this. With the suggested solution as a whole the intention is to create a safe work environment where colleagues can trust each other to be free of drug influence at the workplace.

The method will increase the number of tests, which means that more people will be tested than with prior methods. The number of people who actually use drugs at a workplace is a minority, and one could argue that testing a larger amount of people is not justified. However, the Eyescanner test will be a quick procedure, and the intention is that the test method should be an acceptable step for most people to achieve a safe workplace environment. The frequency of the Eyescanner tests can also be adjusted based on the actual problem rather than just a fixed percentage, with the hope to lower the frequency when the problem decreases.

In this work it was found that companies cannot rely on drug testing as the only preventive measure, and more complementing interventions were needed to achieve a positive workplace environment. In a large company, it can be difficult as an employee to get to know everyone and to build up trust towards everyone. By increasing the tests, it will be easier to trust that colleagues are free of drug influence at the workplace, and thereby reduce the mistrust among employees. However, there is a risk that the increased testing can make employees feel that the company does not trust them. Large companies argue that it is difficult to rely on trust, as the problems in society were reflected in their organisations. Without drug tests, they would risk being accused of not taking their responsibility to ensure a safe working environment for their employees.

Macro level; the society

Drug testing at the workplace is not likely to solve the drug related problems in society, but the workplace is an important part of people's lives. Large companies have a chance to impact the society. By supporting companies to create a positive workplace culture and promoting health, Eyescanner could be part of making a difference.

The Eyescanner method cannot detect remaining substances of drugs, an aspect that can be seen as less intrusive to private lives of the individuals. However, the method might make it more difficult for companies to identify drug use outside of work. One company clearly stated that they wanted to detect all drug use to be able to help employees with drug addiction. This company

was therefore hesitant to the Eyescanner technique, as fewer individuals might be offered rehabilitation services from company resources. On the other hand, today's low frequency of drug tests and the risk of manipulation of tests make it difficult for companies to detect problematic use. Drug addiction is more likely to be detected through other processes such as increased screening with Eyescanner tests, preventive interventions or suspicion tests. Some functions in the health promotion app specifically aimed to make it easier for individuals to get in contact with appropriate support channels. For companies that want to continue with random urine tests, Eyescanner tests can be used as a complement to evaluate if the urine test only detected remaining substances or if the individual was affected by drugs at the time of the test. Eyescanner could suggest a random selection of tests that should be complemented with a urine test, or let the company handle this internally.

Most companies claimed to use drug testing as a preventive measure. They wanted to secure the work environment, but it was also clear that the tests did not aim to find all employees that use drugs. The tests were rather supposed to deter employees from using drugs. Instead of focusing on deterring drug use, the Eyescanner method aims to be more transparent with the purpose of the testing. The Eyescanner tests are meant to secure the work environment, and by supporting companies to clearly communicate the purpose, the hope is to achieve a more accepted drug testing process.

8. Discussion

In this chapter several aspects of this work are discussed. It includes discussion of research approach, methods as well as results. It ends with suggestions for future work.

Confirmation of literature findings

The findings of the empirical research in this work confirmed one of the findings from the literature review; Companies generally do not put much emphasis on drug prevention. They argue that random drug testing is a preventive measure, however, one can questions this argument. This work suggests that other interventions, such as the health promotion app is a more holistic way of working with drug prevention, and that random drug tests are only partly preventive, but also a controlling intervention.

Single case study design

This work was structured as a single case study with embedded units of analysis, meaning that one company was in focus throughout the work. Other companies were treated as embedded units of analysis. Another option would have been to structure the work as a multiple case study, which could have provided a more comprehensive view of the problems related to drug testing and drug prevention. However, a multiple case study would have required more resources, especially if embedded units would have been included. To be feasible, a multiple case study would have needed to be limited to a single unit of analysis, meaning that it would not have provided the same understanding of the different stakeholders in the drug testing process. It was seen as favourable to prioritise the embedded units of analysis within the case company such as management, team leaders, occupational healthcare, HR and trade unions to get an understanding of how the drug testing process could be designed within their context. With the other companies in mind during the conceptualisation phase, it was believed that the process could still be implemented at other companies as the initial interviews resulted in an understanding of their most relevant issues. However, the final concept with the health promotion app and the drug testing process was only verified towards the case company. Since the other companies were treated as embedded units of analysis, the solution could have been verified by them as well. This would have given a more comprehensive evaluation of the solution and a better understanding of the potential future customers for Eyescanner as a company.

Enterprise design

The Enterprise Design framework was used as guidance throughout this work, meaning that the design process provided was adapted, and that the levels described in the framework were used to keep a visionary and conceptual focus, rather than an applied one. Using the description of levels was helpful in order not to get stuck in details. The framework is extensive, and the aim was not to describe all aspects of the included scope in detail. However, the data gathered gave enough insights to be able to describe a direction for the levels included in the scope. Future work should focus on complementing those levels, as well as defining the two applied levels called Design space and Rendering. More stakeholders need to be involved to be able to define all aspects of the framework in detail, for example authorities.

Employee's point of view

Throughout this work, employees at the case company could not be included to a large extent. This was partly due to the fact that drugs can be a sensitive subject to discuss, and managers had ethical considerations. Managers also wanted to be careful with spreading the rumour about implementing a new drug testing method, before it had been decided. Another reason was the current Corona pandemic, limiting the access to the case company during the second half of the study. Involving employees was desirable, in order to get a nuanced perception of the situation in relation to drugs. Future solutions should be based on opinions from all people affected by it, in order to decrease the risk of unwanted effects or ethical issues. However, it was not possible, and the discussed potential effects are described below.

In order to compensate for a lack of employee involvement in phase two, where initial data was gathered, a public survey was sent out. Since the case company was a large company, one could assume that their employees fairly well reflected the public.

Another way to compensate for a lack of employee involvement was to involve trade union representatives. Considering the limited access, this was thought to be a good approach in terms of getting a comprehensive understanding of employee attitudes and opinions. Many employees would have been needed to get the same overview as the one given by four trade union representatives. It would however have been desirable to be able to confirm some of the findings with employees. One example of such finding would be that employees are afraid to talk to each other about drug related problems. It is likely that these problems exist, but in order to shape the content of the health promotion app, more studies should be conducted to get a better understanding of the size of the problems found.

The lack of employee involvement was not believed to have a negative effect on the design of the Eyescanner test process, since the process was not described to a level of detail that would require employee involvement. A detailed test scenario should be developed further, with involvement from testees and nurses performing the test. The same goes for the user interfaces of both Eyescanner apps.

Problem magnitude

Most people involved in the study, such as managers, team leaders, HR, nurses and trade union representatives all had positions that meant they were involved in the drug preventive work, and they were all aware of the problems existing at the case company. Although the thesis workers were aware of the approximate percentage of people using drugs, it is possible that the large emphasis on drug related problems could have led to thinking that the problems were larger than they really were. Risks from this potential bias may have affected decisions made during the development of the drug testing process and the health promotion app.

For one, it was believed that employees have a perception that a large percentage of colleagues are liberal to drug use at work, even though the reality is probably that a smaller percentage of colleagues are liberal to drug use at work. Therefore, it was recommended to use the health promotion app to be more transparent with attitudes and problem magnitudes. This recommendation was believed to help employees feel safer, and less suspicious of people or departments of people. If however, the thesis workers were biased, and the employees had a more correct image of problem magnitude and attitudes towards drugs, the function could be questioned. Being

open about problem magnitude can also damage the brand, which seemed to be a worry for management. The employees should also verify this aspect before it is decided to which extent all information should be transparent or not.

A second risk of potential overrated problem magnitude was that increased testing would not be accepted among employees. It might seem unfair to let many employees go through drug tests, in order to find more people using drugs. However, it was clear that letting a lower percentage of employees go through urine tests, did not reach the wanted effects. Those who frequently used drugs often knew how to manipulate tests, and the relatively high number of suspicion tests required were considered to be problematic. Assuming that the thesis workers' perception of the problem magnitude was correct, it was therefore recommended that the number of random drug tests with Eyescanner should be increased. If however, the perception of problem magnitude was incorrect, the drug testing process would also work for a lower frequency. Therefore, it was not believed that the risk of an incorrectly nuanced understanding would affect the solution in a way that makes it unwanted by customer companies.

Survey data collection

The survey generated both qualitative and quantitative findings that were used to draw conclusions. The survey questions were seen as suitable to investigate the study questions related to user acceptance, and provided relevant input to the findings. It would however have been preferable to be able to deeper investigate why the Eyescanner test was preferred over a urine test. Other methods, such as enactment, would have been more suitable to investigate that aspect. The survey indicated that the Eyescanner test was seen as a less trustworthy method, but the free text answers did not in detail describe why. Since the solution in this work is partly based on the indications that an Eyescanner test is less uncomfortable than a urine test, the work would have benefited from a deeper understanding of the actual experience of an Eyescanner test. However, the test scenario was also dependent on technical aspects not yet defined at the time of this work, and it was therefore seen as too early to define and investigate a specific test scenario.
The survey was public, and therefore the results could not be assumed to give the exact same results as a survey directed to employees at the case company would have given. However, results were seen as representative for attitudes in general. It would have been preferable to get more blue-collar respondents, as the majority of the respondents identified as white-collars. A more even distribution would have contributed to a more reliable result, even though no major differences in responses were found.

Target group

The target group for the health promotion app did not aim to include employees who were involved in criminal distribution of drugs. The company had other interventions that aimed to target this group, and it was seen as more relevant to focus on a solution that would strengthen employees that were against drug use, as well as potentially influence the drug users. However, one could question if the right problem was chosen to solve. For example, it is likely that the criminal distribution causes many of the problems related to threats when confronting someone at suspicion of drug use, and if the criminal distribution would have been targeted instead, other solutions could have emerged. It was seen as unlikely that a solution from Eyescanner could solve the complexity of this problem. Also, a solution for health promotion was believed to be more attractive for companies as it would be relevant for the majority of their employees, rather than a solution that would target the minority of employees who are involved in criminal distribution.

Future direction

For future development of the Eyescanner enterprise it is recommended to focus on the perspective of the employees, both for developing the content of the health promotion app as well as for the future Eyescanner test scenario. Studies should investigate how Eyescanner tests are experienced and how they should be designed to cause minimal intrusion of integrity. This work did not investigate potential collaboration with laboratories and MROs. A collaboration could generate valuable insights for research in general as the Eyescanner drug testing method could provide opportunities to study how drugs affect the CNS. Eyescanner as a company could also benefit from continuous learning together with other actors in the drug testing process.

9. Conclusion

This work aimed to investigate and suggest how the Eyescanner test with complementing service offer could be used as tools for achieving a safer work environment in private sector companies. In order to do so, the following study questions were investigated and answered.

Q1: Why and how do companies perform drug tests today?

On what grounds are drug tests performed today? What is the wanted situation like?

All the interviewed companies used random drug tests, based on random selection of individuals. In most companies, this was done by generating a percentage of employees to be tested on a yearly basis. In addition, all companies used drug tests in case of suspicion. It could be done to eliminate suspicion in general, or after the event of an incident at the workplace. Lastly, some companies used drug tests before employment to prevent people using drugs from being employed at the company, as well as during rehabilitation processes For future drug testing, an objective, efficient, and non intrusive method based on a fair selection is wanted.

What are their main reasons for performing drug tests today?

The reasons for performing drug tests were several. Among the frequently described reasons were obtaining a safe workplace environment and preventing drug use among employees. As large companies, some also mentioned their possibility and responsibility to help counteracting the trend of increased drug use in society. Other reasons for performing drug tests were related to the company brand. They wanted to make a clear statement that they do not accept drugs at the workplace, and in some cases drug tests were considered an important tool to avoid connection to criminal activity.

What is the use frequency of drug tests today and what is the wanted situation?

All companies relied heavily on recommendations from drug testing companies, saying that testing 25% of employees is enough to achieve a preventive effect from drug tests. The actual percentage varied among the companies, depending on their agreement with trade unions. The interviewed companies agreed that urine and saliva drug testing were used to achieve a preventive effect, rather than finding all employees influenced by drugs. However, they also agreed that it was essential to make the workplace free from drugs. Since drug tests can be intrusive to integrity, trade unions argued they are motivated if the work is safety critical. Further on, they should be performed on equal terms for all employees to the largest extent possible. So, for the company management, deciding the frequency was a trade-off between obtaining a safe working environment, and respecting the integrity of the employees, but it was also a trade-off between creating a feeling of trust, or a feeling of control.

Q2: How can Eyescanner provide a valuable solution for achieving a safe work environment?

What is needed for private companies to implement the Eyescanner test?

A new drug testing method should be of value if it assures a safe working environment, while also respecting the integrity of the employees. Performing a drug test should not be uncomfortable, in order for it to be accepted among those who do not use drugs. Allowing increased testing also requires an efficient process, not requiring employees to leave work for long. In

order for Eyescanner to be able to differentiate from other methods, the positive result should equal a confirmed safety risk/CNS influence. If these things could be accomplished, it was likely that company management and trade unions can agree upon implementing the new drug testing process suggested in this work.

Are there other complementing services needed in order to create a valuable solution?
It became clear that preventive measures against drug use are often down prioritised by more acute errands. Most companies experienced a lack of knowledge for both employee and management, related to effects of drugs, signs of drug use, and how widespread the drug related problems at the company were. Drugs were seen as a sensitive subject to discuss, and most company representatives witnessed that employees do not often speak about the drug related problems. Nor did they believe that employees were aware of available support from the company. In order to solve these issues, preventive interventions were believed to be a valuable complement to drug tests. Preventive measures should be educational and engaging, targeting different groups of employees and hopefully facilitate a dialogue that contributes to a better workplace environment, to prevent drug use at the workplace and thereby, in society. It was believed that this could be achieved by implementing the health promotion app suggested in this work.

Q3: How can user acceptance be achieved?

Why is drug testing seen as a threat to personal integrity?
Three main aspects were found when discussing integrity aspects of drug testing. Firstly, urine tests were often experienced to be uncomfortable. It was a more or less monitored procedure and the testee had to leave a sample of body fluid. A second reason for intrusion of integrity had to do with selecting an individual for a test. No matter if it was a suspicion test or a random test, the testee could feel pointed out. The employees could feel offended and get a feeling of not being trusted by their manager. A last sensitive issue in relation to integrity, was whether or not the company should differentiate between drug use at work and outside of work. When it came to disciplinary actions, most agreed that consequences should be different. However, they differed in opinion of whether the company should detect only drug influence that affects work (CNS influence), or if they should also detect remaining substances. Some argued that drug use outside of work, not affecting work tasks, should be left to civil right authorities. If the company tried to detect remaining substances, they intruded on the employee's private life. However, detecting remaining substances also gave better opportunity to help an employee who wanted help with a problematic situation. With existing drug testing methods, it was not possible to differentiate between remaining substances and ongoing drug influence.

How can the drug testing scenario with an Eyescanner test be developed with minimised intrusiveness of personal integrity?
According to the survey conducted, the Eyescanner tests was preferred over urine tests, mainly because it was considered less uncomfortable. Therefore, it can be assumed that the threat to personal integrity may decrease, if Eyescanner tests are used instead of urine quick tests as initial screening method. Further on, the Eyescanner test process builds on random selection of departments. One of the reasons for this was to make it clear that everyone is tested on equal terms and that no one should feel pointed out. With a method which only detects drug influence at work, it is no risk that the employer interferes with life outside of work against the will of the employee. Lastly, it was believed that clear explanations of the drug testing tech-

nique, the process, as well as the purpose of the testing will further increase the acceptance of drug testing.

This explorative case study involved eight companies of which the majority were large in the initial phases, and continued focusing on the context of one of those companies as the main unit of analysis. By studying the drug prevention context and its difficulties, the study questions could be answered. The work can be used as a foundation for further work on the subject, conducting more studies or developing solutions for drug prevention in workplace settings. Needs found were translated to a requirements list, that should be considered in Eyescanner's future development. The proposed concepts for drug testing process and health promotion app had confirmed interest from the case company, and based on initial interviews, potential interest from the other participating companies. The consideration of the Enterprise Design framework throughout this work can help Eyescanner to shape not only its service offers, but also other aspects of the enterprise, such as identity, touchpoints, stakeholders and business model.

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Appendices

Appendix I – Interview guide

Intervjuguide 1

Inledning:

Hej, vi studerar sista året på Chalmers Teknisk Design och skriver vår masteruppsats i samarbete med Eyescanner Technology Sweden AB. Tack för att du tar dig tid att prata med oss!

Innan vi startar vill vi tydliggöra syftet med studien och hur vi behandlar informationen som samlas in. *Fyll i GDPR*

Vi vill också tydliggöra att samtycket bara gäller för dina personuppgifter. Uppgifter kopplat till företaget som inte kan kopplas till dig personligen omfattas inte av GDPR, vilket innebär att sådan information kan komma att sparas under en längre tidsperiod än personuppgifterna, (om behovet finns). Det är helt frivilligt att delta i intervjun och du kan välja att inte svara på alla frågor, det går också bra att avbryta intervjun när som helst.

Vi skulle också vilja spela in ljudet, Känns det ok? Då börjar vi!

Arbetsplats

1. Beskriv kortfattat företagets arbete
    a. Vilken bransch?
    b. Vilka fackföreningar?

2. Din befattning?

Drogtester idag, vid vilka tillfällen, kvantitet varför

3. Vilken typ av drogtester använder ni? (urin, saliv, etc?)

4. Vid vilka tillfällen görs drogtester idag?
    a. inför anställning
    b. vid misstanke
    c. slumpmässiga
    d. vid rehabilitering
    e. övrigt:

5. Vilka riktlinjer/avtal har ni att förhålla er till gällande drogtestning och drogförebyggande arbete?

6. Kvantifiera
    a. Hur många drogtester/år? (Vid olika tillfällen, procent av anställda)
    b. Hur mycket pengar lägger ni på drogtester? (per år?)
    c. Hur många positiva tester? (per år?)

7. Vad är främsta anledningen till att ni gör drogtester? (Varför inte?)
    a. vid anställning?
    b. vid misstanke?
    c. vid slumpmässiga?
    d. vid rehabilitering?
    e. övrigt?

8. Varför är det viktigt med en drogfri arbetsplats hos er?

9. Beskriv hur processerna går till för de typer av test som används?
    a. Hur initieras processen?
    b. Vem/vilket företag utför testerna?
    c. Var utförs testerna?
    d. Hur hanteras ett eventuellt positivt svar?
    e. Hur lång tid tar processen? (Totalt till svar samt testtillfället)
    f. Erbjuds rehabilitering?

10. Beskriv vilka svårigheter ni stöter på i arbetet mot droger?
    a. Fler svårigheter?
    b. Hur vet ni när man ska genomföra tester?
    c. Hur informeras anställda om företagets drogpolicy?
    d. Hur informeras anställda inför ett drogtest?
    e. Misstänker ni att det förekommer fusk?
    f. Konsekvenser vid positivt test?

11. Hur upplever ni attityden mot drogtester bland era anställda?

Drogtestning i framtiden

12. Hur skulle ni vilja jobba med drogförebyggande arbete och drogtester i framtiden?
    a. Finns det något ni önskar vore enklare i framtiden jämfört med idag?
    b. Skulle ni vilja göra fler tester än ni kan göra idag? Varför, varför inte?

Visa Eyescanner-prototypen, kort demo. förklara:
Vi har haft lite mailkontakt och som sagt så undersöker vi vilka behov som finns hos svenska företag idag kring drogtester, för att utveckla Eyescsanner som är ett digitalt verktyg som ska användas för att **upptäcka** drogpåverkan. Metoden utgår från polisernas sätt att upptäcka drogpåverkan. Med hjälp av mobilens kamera mäter verktyget fyra värden i testpersonens öga. Första tanken är inte att Eyescanner ska ersätta tester på laboratorium utan snarare fungera som ett sållningsverktyg och ge stöd i en första objektiv bedömning för att upptäcka drogpåverkan, och därmed minska behovet av till exempel urintester. Men detta är inte något som vi vet hur det ska fungera, utan det beror på hur ni på företagen ser på det. Oavsett vilket är målet är att utveckla det nya verktyget på ett sådant sätt att det sparar tid och pengar, och att det kan användas på ett mer naturligt och mindre integritetskränkande sätt än drogtester som finns tillgängliga idag.

13. Vad är era tankar kring ett sådant verktyg?
    a. Hur skulle det kunna integreras i ert arbetsmiljöarbete? (av vem, i vilken situation?)
    b. Din första reaktion: Sållningsverktyg eller ersätta laboratorietester?

14. Föreställ er Eyescanner som ett första sållningsverktyg för att upptäcka drogpåverkan. Hur tror ni att det hade kunnat användas hos er?
    a. Hade processen för drogtestning kunnat ändras på något sätt? Hur?
    b. Vad ser ni för fördelar med ett sådant verktyg? Ändra syfte? Skulle synen på drogtest hos anställda ändras? Hur?
    c. Vad ser ni för svårigheter?
    d. Bra eller dåligt med kort detektionstid?

15. Vad skulle krävas för att ni skulle köpa verktyget om det fanns på marknaden idag?

16. Har ni några övriga tankar eller frågor kring Eyescanner eller drogtestning i allmänhet?

Avslutning:
Tack för samtalet!

- Vårt exjobb pågår fram till juni och vi skulle gärna komma på fler besök och ha med er i utvecklingen av Eyescanner för att täcka in era behov i utvecklingen, eventuellt prata med era anställda. Är ni intresserade av att vara med i fler intervjuer/workshops? Behöver inte svara nu, utan vi kan ta det när du har fått tänka igenom och diskutera med dina kollegor.
- Ska skriva en offentlig examensrapport om detta arbete. Hur kan vi referera till uppgifterna som du gett oss i denna intervju?
    - Med din yrkestitel samt företaget
    - Avdelning samt företaget
    - Endast företaget
    - Stort svenskt företag i xxx-industrin
    - eller annat förslag?
- Vi hör av oss!

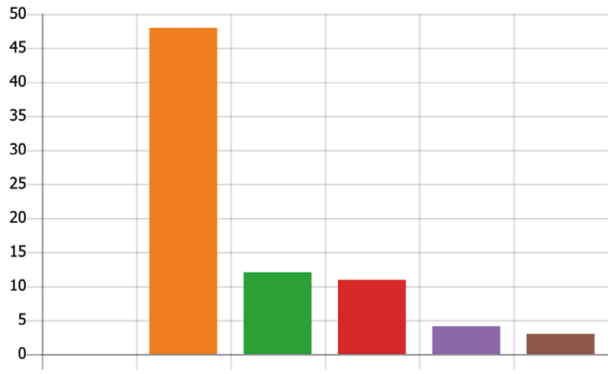
Appendix II - Online survey

Narkotikatester i arbetslivet

78
Svar

1. Hur gammal är du?

Yngre än 21 år	0
21-30 år	48
31-40 år	12
41-50 år	11
51-60 år	4
Äldre än 60 år	3



2. Vad är din huvudsakliga sysselsättning idag?

Tjänsteman	45
Arbetare	12
Studerande	15
Annat	6

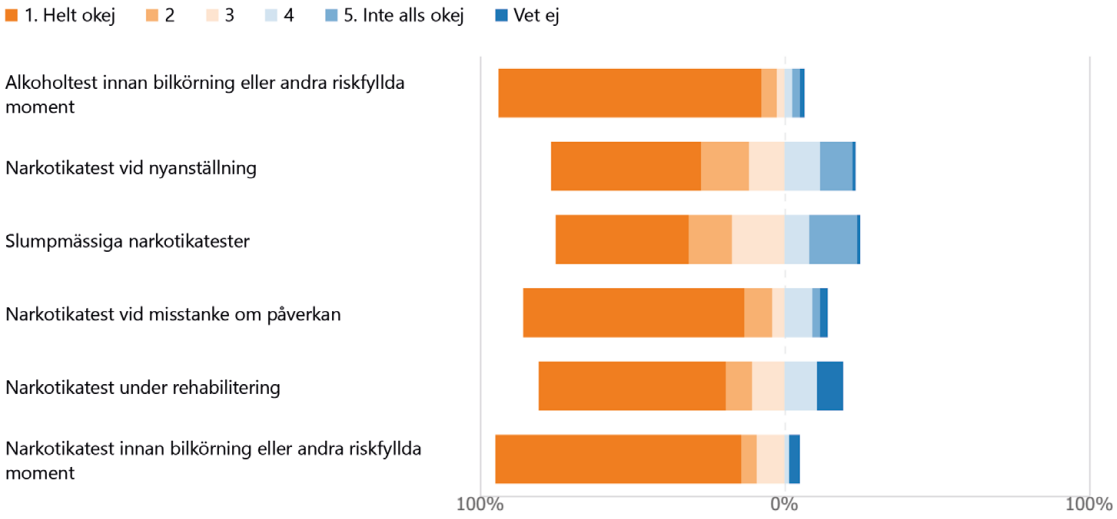
3. Har du jobbat på en arbetsplats som testar sina anställda för narkotika?

Ja	29
Nej	38
Vet ej	11

4. Har du blivit testad för narkotika på jobbet?

Ja, genom urinprov	12
Ja, genom salivprov	5
Nej	25
Vet ej	0
Annat	1

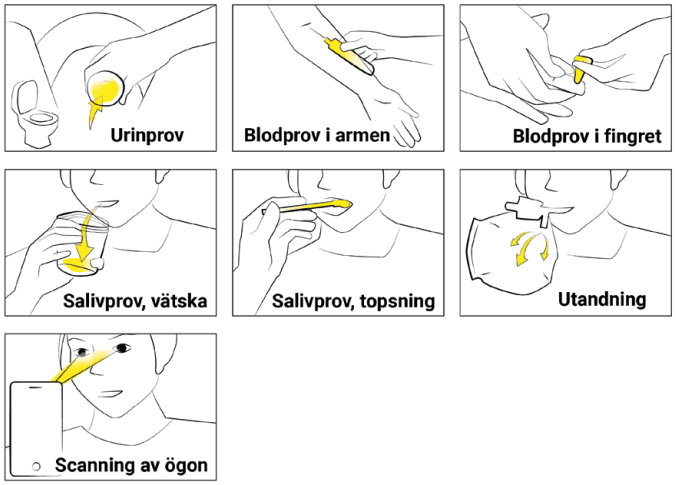
5. Vad är din generella inställning till att arbetsgivare genomför drogtester på sina anställda?



6. Utveckla gärna ditt svar på föregående fråga.

39
Svar

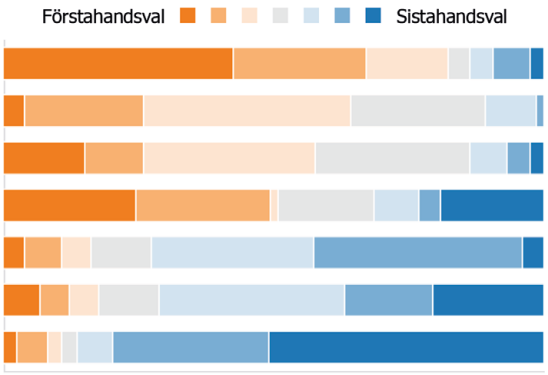
Senaste svar
"Det handlar om autonomi och ledarskap. Om ens arbetssysslor sköt..."
"Generellt är det hemskt! Det väsentliga är ju hur arbetet sköts. Vad..."



Bilderna visar exempel på hur det kan gå till vid provtagning.

7. Vilken testmetod för narkotika skulle du föredra? Rangordna alternativen.

Ranking	Alternativ
1	Utandning
2	Salivprov (gurgla vätska, spott...
3	Salivprov (topsning)
4	Scanning av pupillstorlek och ...
5	Blodprov i fingret
6	Urinprov
7	Blodprov i armen



8. Förklara gärna varför du rangordnade som du gjorde.

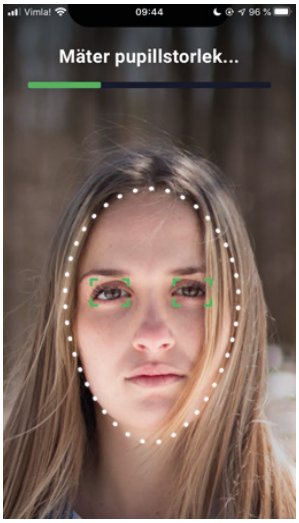
48
Svar

Senaste svar
"Blodprov känns som det mest medicinskt säkra, och jag upplever in..."
"Kronologisk ordning efter det som är minst förnedrande"

8. Förklara gärna varför du rangordnade som du gjorde.

48
Svar

Senaste svar
"Blodprov känns som det mest medicinskt säkra, och jag upplever in…
"Kronologisk ordning efter det som är minst förnedrande"



Bilden visar hur ett test skulle kunna gå till. Ögonrörelser och pupillstorlek scannas med en mobilkamera.

9. Hur skulle du reagera om du ombads göra narkotikatest på jobbet genom scanning av dina pupiller och ögats reaktioner?

67
Svar

Senaste svar
"Det skulle kännas lite osäkert. Finns det saker som ger felresultat? …
"Jag hade sagt upp mig om jag tvingades göra narkotikatest. Men ö…

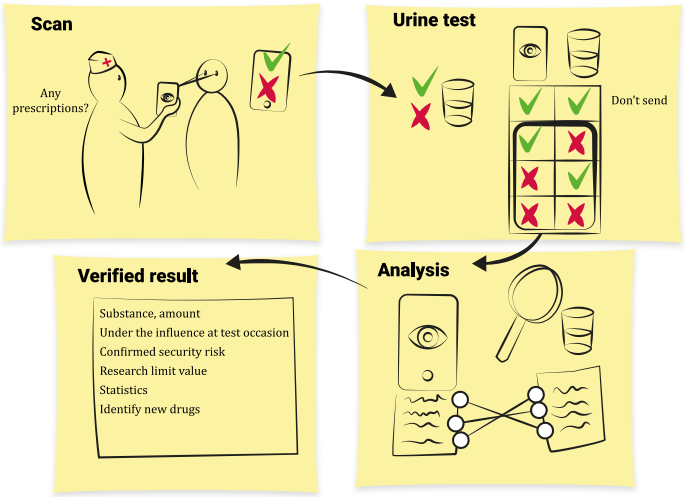
10. Har du några övriga tankar kring narkotikatester i arbetslivet?

31
Svar

Senaste svar
"Önska bara att man visste bättre och bara använde det för att mini…

Appendix III - Evaluation worksheet

COMPLEMETING TEST

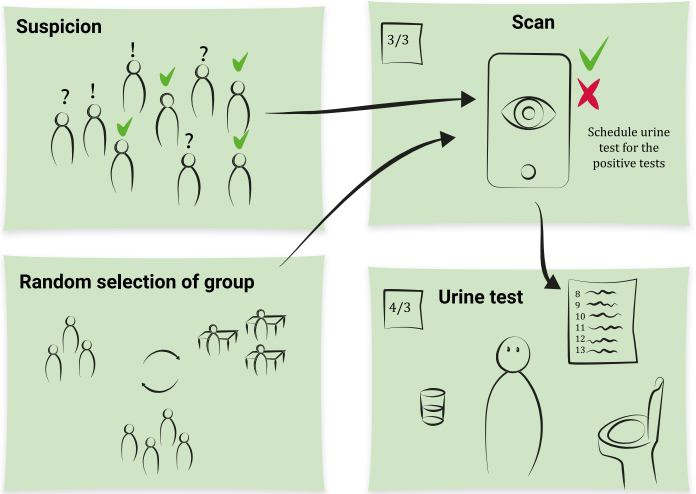


My thoughts

Benefits

Difficulties

INITIAL SCREENING

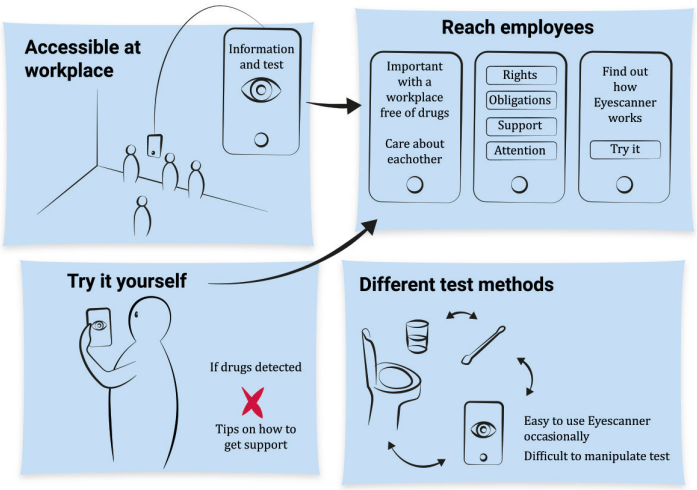


My thoughts

Benefits

Difficulties

MAKE IT VISIBLE

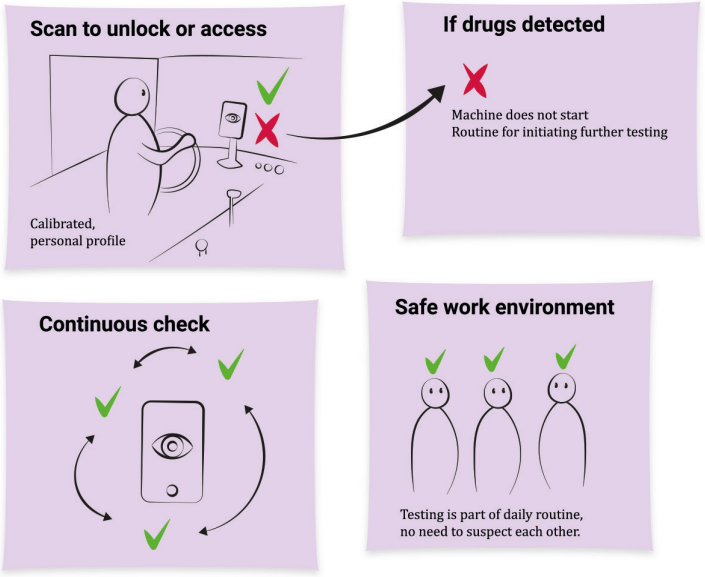


My thoughts

Benefits

Difficulties

SAFETY BARRIER

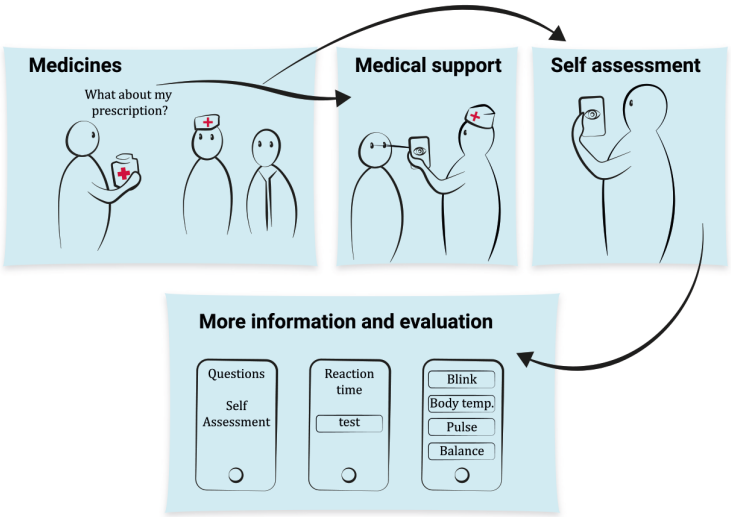


My thoughts

Benefits

Difficulties

FIT FOR DUTY EVALUATION



My thoughts

Benefits

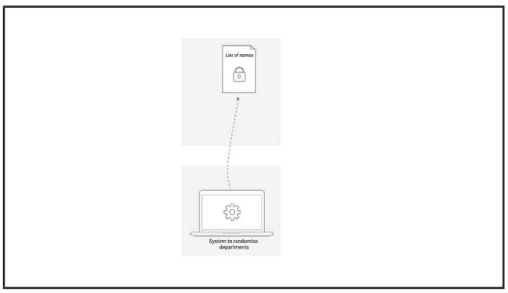
Difficulties

Appendix IV – Online scenario enactment

Evaluation of Eyescanner concept

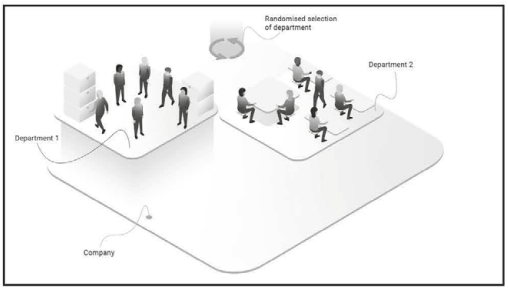
1

Inledning: Vi kommer presentera ett av koncepten som vi jobbat vidare med. Vi går igenom det steg för steg, och pausar efterhand för att ställa frågor. I slutet går vi igenom helheten.



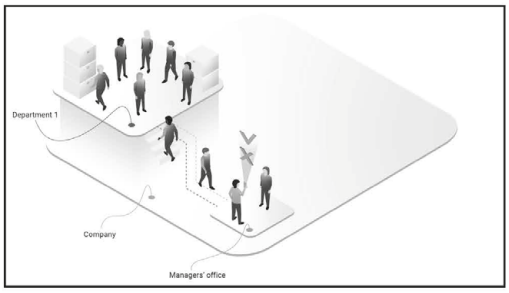
2

Tänk dig nu att avdelningen där du jobbar har blivit slumpmässigt utvald för att genomgå drogtest. Urvalet har skett med interna system på företaget, där en avdelning och lista med namn har tagits fram.



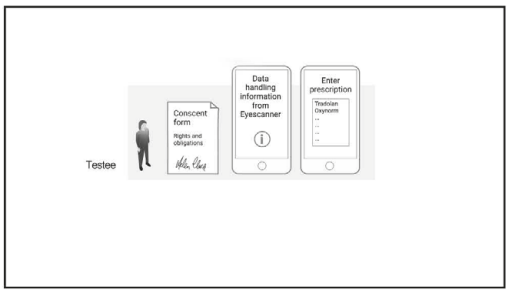
3

Istället för att slumpa mellan individer så slumpas avdelningar fram.



4

Chefen för avdelningen ansvarar för drogtestningen. Medarbetarna testas genom att analysera ögonrörelser med Eyescanners mobilapp. Testerna sker på din chefs kontor. Nu är det din tur att testas.

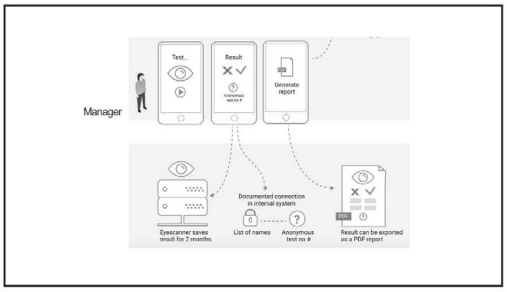


5

Du infinner dig på chefens kontor, där du får information om hur testet kommer gå till. Du informeras om rättigheter och skyldigheter. Om eyescanningen ger utslag så är du skyldig att genomföra ett urintest. Du signerar samtycke och läser sedan genom hur Eyescanner behandlar datan. Testet är anonymiserat, eyescanner skapar endast ett anonymt testnummer, och sparar inga personuppgifter. Du får också får också fylla i om du tar några recept i appen, för att Eyescanner ska kunna se om utfallet av testet stämmer överens med eventuella narkotikaklassade läkemedel. Chefen behöver inte se vad du skriver in.

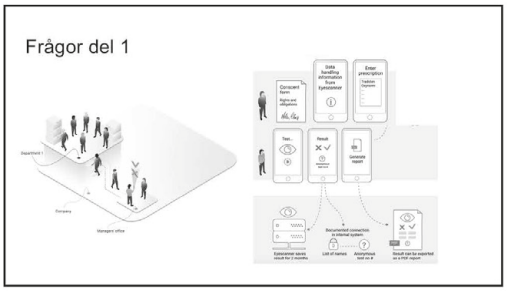
6

När detta är klart är det dags för testet. Chefen startar testet. Efter 30 sekunder är testet klart och Eyescanner genererar ett resultat. Resultatet är kopplat till ett anonymt testnummer. Resultatet kan kan exporteras som en PDF- rapport.



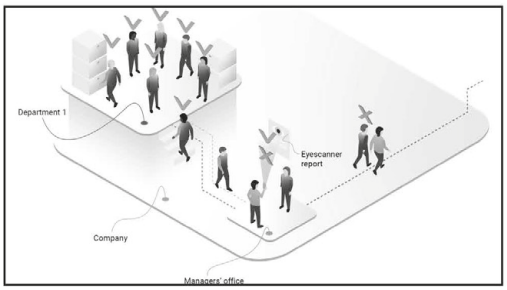
7

Eyescanner sparar det anonymiserade resultatet under en kortare period på sina servrar. Chefen ansvarar för att dokumentera det anonyma testnumret i koppling till ditt ID i företagets interna system.



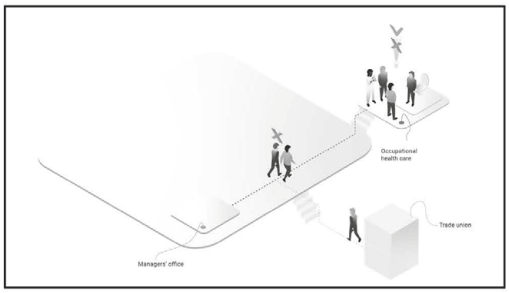
8

Vad tycker du om idén att slumpa mellan avdelningar istället för individer?
Du är testpersonen, hade du velat att det var din chef eller en vakt som utför testerna? Eller annan?
Var kan testet utföras, chefens kontor eller annan plats?
Eyescanner kan även erbjuda möjligheten att slumpa fram att en viss mängd av testerna ska kompletteras med urinprov. Eyescanner har begränsad detektionstid, så detta är ett alternativ för företag som önskar jobba fortsatt preventivt med urintester. Hur du på detta? Tror du företaget vill fortsätta slumpa fram urintester?
Var det något annat du reagerade på i scenariot?



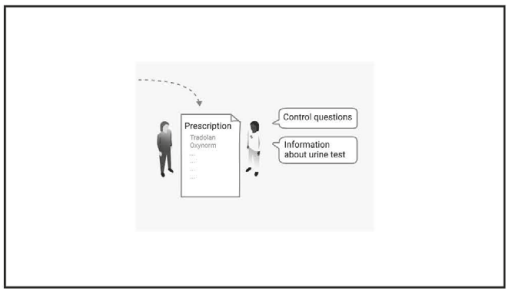
9

Efter testet genereras ett testresultat som antingen är positivt eller negativt. Vid ett negativt resultat kan du snabbt gå tillbaka till arbetet. Om du däremot testas positivt innebär det att Eyescanner har upptäckt drogpåverkan.
Om Eyescanner ger utslag på grund av receptbelagd medicin så får chefen reda på detta, då det eventuellt kan bero på överdosering. Om din medicinering inte ger något utslag så behöver chefen inte få reda på något om ditt recept. Har du testats förut och angett recept så finns det möjlighet att kunna jämföra med tidigare resultat. Chefen kan då kontakta företagshälsovården för att se om utfallet stämmer överens med föregående resultat. Anledningen till detta är att en anställd som tar receptbelagd medicin inte ska behöva genomgå urintest vid varje testtillfälle, då drogtester kommer ske oftare än tidigare. Den anställde kan återgå till arbetet medan detta säkerställs.



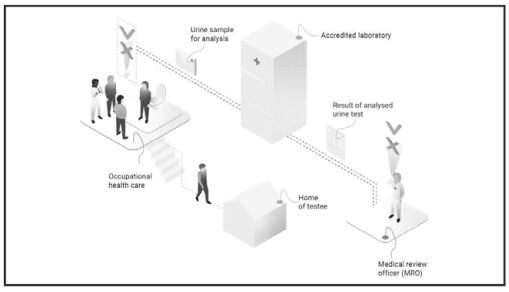
10

Vid ett positivt resultat behöver chefen följa med dig till företagshälsovården för att lämna ett urinprov. Om du önskar stöd från din fackliga organisation så kontaktas facket och följer med.



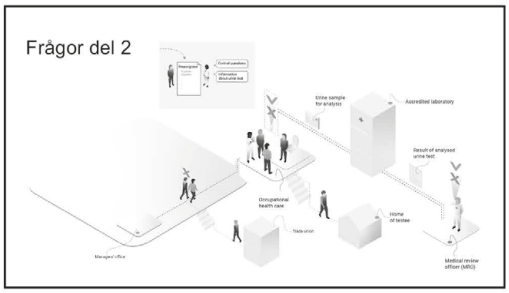
11

På företagshälsovården ställs kontrollfrågor där du som medarbetare får redogöra vad det positiva resultatet kan bero på. Här behöver du också kunna visa upp ditt recept. Sköterskan kontrollerar så att det stämmer överens med vad som angavs i eyescanner.



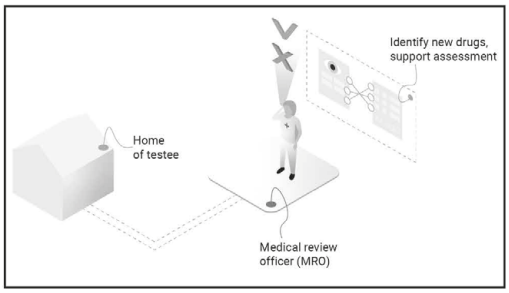
12

Sedan genomförs ett urinsnabbtest. För att verifiera resultatet bör det skickas på analys. Du som medarbetare skickas hem enligt företagets rutiner. Om inga droger hittas med snabburintestet går det att använda ett annat typ av test, eller skicka för en komplett analys på labbet. En MRO kopplas in för att verifiera resultatet.



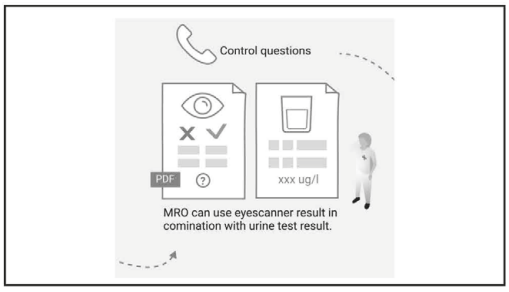
13

Var det något du reagerade på i den delen? Om du tänker dig att du är den som testats, hade du föredragit att din chef eller en vakt följer med till företagshälsovården?



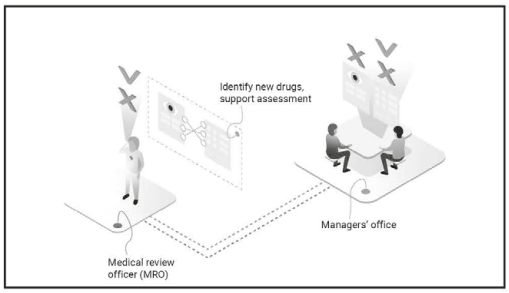
14

MRO-läkaren kontaktar dig som testats för att säkerställa ifall det finns någon annan anledning till testresultatet. MRO-läkaren ringer upp för ett samtal.



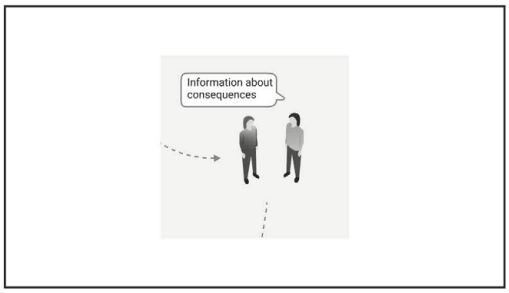
15

Här finns möjlighet för MRO-läkaren att använda sig av Eyescanner resultatet för att göra en bättre bedömning. Det finns även en möjlighet att upptäcka nya droger och bidra till forskning, eftersom Eyescanner ger en ny möjlighet att upptäcka drogpåverkan från fler droger jämfört med snabburintesten.



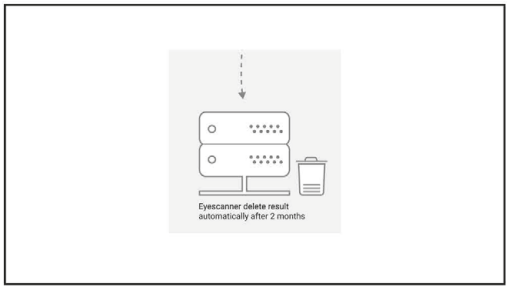
16

När MRO-läkaren gjort sin bedömning återkopplas resultatet till chefen.



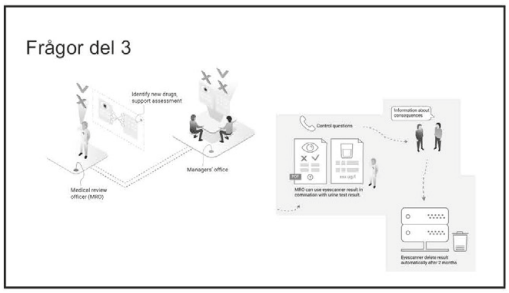
17

Chefen informerar dig om vilka konsekvenser som kommer ske, beroende på testens utfall.



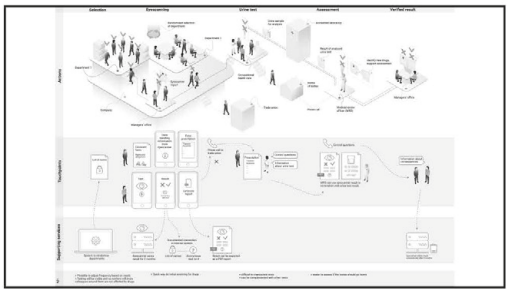
18

Slutligen raderar Eyescanner det anonyma testresultatet från sina servrar automatiskt efter 2 månader.



19

Tanken är att Eyescanner inte ska spara resultatet särskilt länge, ur en datasäkerhetssynpunkt. Därmed behöver företaget eller företagshälsovården spara resultaten så länge de behövs, som exporterade rapporter eller på annat sätt. Hur ser du på detta, är det rimligt rent praktiskt att företaget hanterar att spara resultat kopplat till personuppgifter?



20

Du har nu fått se lite urklipp ur konceptet, här är helhetsbilden
Vad är din uppfattning om helhetskonceptet? (Styrkor, risker, nya ideer? etc?)
Diskutera: Anställda märker tydligare att drogtester pågår, men det finns en risk att det märks när någon testas positivt. Synligt att drogtester pågår - tydligare signal att det är nolltolerans mot droger på företaget, men kanske märkbart om nån från avdelningen försvinner. Hur ser du på den aspekten?
Frekvensen, hur ofta, hur mycket är rimligt att testa?
Målet att inte ha någon problematik, med det här konceptet skulle man kunna justera frekvensen och om man märker att det går ner. Vi jobbar även vidare med andra preventiva insatser, hur man kan involvera medarbetaren, och förhoppningen är att problematiken ska minska, och att inte bara förlita sig på drogtesterna.

Appendix V – Being subjected to Eyescanner test

In the survey conducted and sent out to the public, the respondents got to explain how they would react if they were to be subjected to drug tests through an Eyescanner test. Below, comments are compiled. Asterisks (*) show the number of people leaving similar comment.

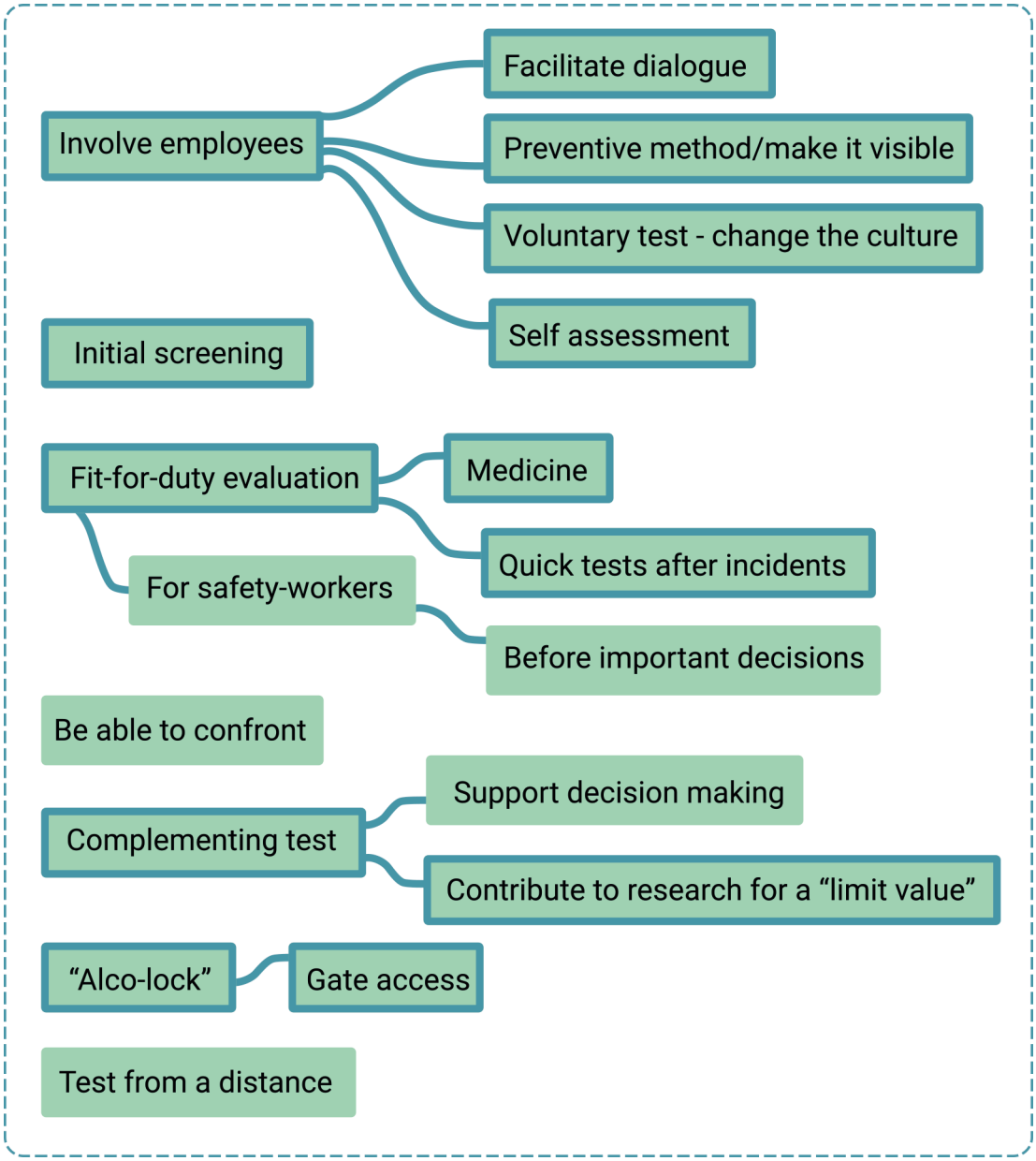
White-collars
Would take it personally **
Would wonder/question why I was chosen **
Would not trust its accuracy *********
Would accept it if its trustworthy **
Would feel it's not a serious test method *
Would accept it because it's an easy method ******
Would accept (assume) it if it's followed by a real test ***
I would have resigned if I had to do a drug test at work *
It would feel ok **********
I would want a dialogue explaining the process, why I was chosen, how the test works etc **
Would be surprised ***
Shows my status at the time which seem fair *
Would be afraid that my nervosity/bad sleep etc would affect my eye movement ***

Blue-collars
Would feel ok ****
Would feel guilty even if I was innocent **
No problem, as long as it's trustworthy **
Would question it's accuracy *
Intrusive to integrity *
If there are problems at workplace, sure *
Unnecessary to be treated like a criminal at my own workplace *

Students
Would be ok *******
Does it react to something other than drugs? *
Would question why I was chosen **
Would not want someone to be standing too close *
Very efficient if it works *
Do not trust the method ***
Would want to know why drug test are being performed *
Would want to know what it measures and how it works **
Surprised *
Always afraid in test situations although I have never used drugs *
Ok if trustworthy *

Others
Does not feel very scientific *
Would think other things than drugs can affect the result *
Would be ok *

Appendix VI – Possible applications of Eyescanner



Appendix VII - Comments from evaluation iteration 1

The comments below were compiled after analysing material from evaluation workshops. Thematic coding was used as analysis method.

Complementing test

+ Can detect all drugs
+ Be able to decide for consequences of a positive test
+ Helps assess if a person can continue working
+ Support the manager in decision making
+ No medical knowledge needed for Eyescanner test
+ Continuous development of the Eyescanner technique
+ Can be a fast way to reject suspicion

– Urine test dilemma remains (shy bladder, integrity, refusal etc.)
– Might be limited due to occupational health care resources
– Difficult to handle a result of a potential new drug (that is not yet illegal)
– Not the company's main interest to help verify the tool

Ideas for modification

- Combine with using the Eyescanner test as a screening tool
- Likely that the scanning will be done by a manager, guard, nurse or other educated staff

Initial screening

+ Better preventive effect with raised awareness that drug tests are carried out
+ Rapid/efficient testing of large group
+ Can allow increased testing volume
+ Can allow increased number of random tests without increased cost
+ Same person can be tested several times
+ Less resistance because of more dignified test method
+ Increase likeliness that colleagues are free of drugs (ensures the quality of production)
+ Possible to test during all working hours
+ No one is pointed out in the selection
+ Reduce risk of threats, becomes clear that the selection is done by company routines
+ More random testing can lead to a decreased need of suspicion testing

– Difficult to ensure anonymity when testing a whole group
– Legal basis for suspecting a whole department?
– Risk to base large testing quantities on suspicion, if it turns out to be misplaced
– Will not detect and thus, not be of help for those who use drugs outside of work

Ideas for modification

- Random selection on group level, suspicion on individual level
- Voluntary tests
- Maybe Eyescanner can provide random selection of urine tests to detect problematic drug use, this can have a preventive effect (that people choose to admit that they have taken drugs)

Safety barrier

+ Reduces risk of accidents
+ Clear signal that it is not accepted to drive under the influence
+ Could be installed at all departments (not only safety critical ones)
+ Decreases the need of suspecting employees
+ Ensures everyone around are drug free when performing a task
+ Objective process, no need for confrontation in the first stage
+ Protects the relationship between manager and employee

+ Helps the manager with responsibility to make sure that working environment is safe
+ Would enable an increased number of tests
+ Can detect smaller deviations with a personal profile
+ Natural way of testing, justified by safety aspects
+ Personal profile may be justified by safety or monetary reasons

– Unclear if employees can be required to share their medical information/eye data with a program
– Legal aspect of collecting personal information, handle refusal of information collection
– Negative consequences for production if there are any technical issues or delays
– Be able to handle a potentially large amount of positive tests
– Might be expensive to install a lot of hardware
– Employer cannot demand employees to use their private phone for work tasks
– Practical issues to solve, what if someone takes something after passing the barrier?
– Can be an anonymity issue if it is visible to others when someone gets a positive test result
– What if the same eyes pops up twice? Identification issue needs a solution

Ideas for modification
- Can be used as a continuous check tool during rehabilitation
- Can be installed at entrances, or safety restricted areas, key cabinets or similar.
- In case of a positive test, a message should be sent to the manager, rather than not letting an employee enter the workplace. Should not be possible to start a vehicle (and similar)

Make it visible
+ Increased awareness, interest and understanding about drugs
+ Helps sharing the responsibility between employees
+ Can help employees to reflect about their own behaviour
+ Can help fill an information gap within the company
+ Voluntary testing may lead to opinion formation
+ Environmentally friendly to use Eyescanner test
+ Good to provide employees with information

– Risk of undermining the legitimacy of the app if available for everyone
– Risk of manipulation if app is available for everyone
– Self-testing can allow to ensure effects are gone before shift
– Eyescanner should not be the only test method (if positive result)
– Risk of strengthening liberalisation wave when attempting to impact drug culture
– Could be confusing/a lot of work to rotate test methods

Ideas for modification
- Fact-based information, for example how addictive tramadol is
- Can be available for self-testing at the company health care
- Use existing communication screens to spread the information
- Use information that attracts the target group
- Can be a part of the tools for a competence group for preventive work
- Can be more transparent with actual consequences of drug related issues at the workplace
- Can help improve the understanding of target group motivations, for example by including a survey
- Can be included with other company app-initiatives, newspapers, safety information sites etc.
- Could combine voluntary testing with entering a competition to win a prize

Fit for duty evaluation
+ Focus on ability to work

– Requires extensive studies
– A task for medical professionals, not the company

Ideas for modification
- More useful for company health care
- Could be an extra feature

Appendix VIII - Requirements list and Pugh matrix evaluation

R - Reference, today's testing procedure
A - Initial screening
B - Make it visible
C - Safety barrier
D - Combination of Initial screening and Make it visible Weights 1-3, where 3 is most important
Scores (-2) - (+2), where 0 is equal to the reference

Weight	Requirement	R	A	B	C	D
	Justify testing					
1	Should help companies to interpret their obligations related to drug preventive work (laws and regulations)	0	0	0	0	0
3	Should help to prevent drug use	0	1	1	1	2
3	Should not point out an individual without ground	0	2	0	2	2
3	Should support a caring workplace environment	0	1	2	1	1
1	Should help companies to prevent connections to criminal activities/groups	0	1	1	2	2
1	Should be of help to confirm or eliminate suspicion of drug use (individuals or larger groups of people)	0	1	0	0	1
2	Should allow for usage in acute situations (incidents, accidents, suspicion)	0	2	0	-1	2
	Safe working environment	0				
2	Should facilitate cooperation between all people in the company to achieve a safe working environment	0	0	2	0	2
2	Should support a trusting workplace environment (build on trust rather than control)	0	-1	2	-2	1
2	Should support a trusting workplace environment (not have to suspect people around you)	0	1	1	2	2
2	Should support a drug free workplace	0	1	1	2	2
2	Should support a safe office environment	0	1	0	2	1
3	Should help ensure that people with (safety) critical tasks are drug free during execution of task	0	1	0	2	1
3	Should support a safe workshop environment	0	1	0	2	1
2	Should allow for adjustment of frequency based on need	0	2	0	-1	2
1	Should prevent criminal distribution of drugs at workplace	0	1	0	1	1
3	Should decrease the risk of threats towards people who are dealing with suspicion of drug use	0	1	0	1	1
	Prevent drug use/promote a healthy workplace environment					
3	The drug testing method should have a preventive effect	0	1	0	2	1
3	Should contribute to signaling the company drug policy	0	1	1	2	2
3	Should facilitate a sustainable workplace culture (contribute to a common attitude towards drug use at the workplace)	0	1	2	0	2
2	Should help protecting the company brand	0	1	2	1	2
2	Should support the company to counteract societal trend (liberal attitude, but need to maintain a safe working environment)	0	1	2	1	2
2	Should support the implementation of other preventive/health promoting interventions (other than drug tests)	0	0	2	0	2
2	Should not require heavy investments in time from company	0	1	2	1	2
3	Interventions (other than drug tests) should have a preventive/health promoting effect	0	0	2	0	2
2	Interventions (other than drug tests) should target the majority of employees	0	0	2	0	2
3	Interventions (other than drug tests) should be accessible for all employees (time and place)	0	0	1	0	1
3	Should support an open dialogue about work environment issues	0	0	2	0	2
3	Should help maintaining a good relationship between manager and employee	0	0	2	1	2

3	Should help maintaining a good relationship between employees	0	1	2	1	2
	Drug testing on terms of employees					
1	Should allow for equal treatment of employees	0	0	0	0	0
3	Should be perceived as a safe and serious tool	0	-1	0	-1	0
2	Should contribute to a positive attitude towards drug testing in general	0	1	1	1	2
3	Should minimise stress and pressure for the testee	0	1	1	1	2
3	Should not cause intrusion of privacy during test procedure	0	1	0	1	1
1	Should not interfere with the employee's private life, differentiate between civil right and work right (unless the employee wants help)	0	2	0	2	2
2	Should allow for employees to get support in the process (support during the testing process)	0	1	1	1	2
1	Should not require the employees' private time (drug testing process)	0	1	0	1	1
	Integrity	0				
3	Should support company to help employees with drug addiction	0	-1	2	-1	2
1	Should help ensure a safe work environment without interfering with personal life	0	2	0	2	2
2	Should be able to handle prescriptions that can cause positive test results, in an anonymous way	0	0	0	1	0
2	Should help avoiding safety risks caused by legal substances (prescription drugs)	0	2	0	2	2
3	Should be used without risk of spreading personal data	0	0	0	0	0
3	Should be part of a transparent test procedure (for testee)	0	0	2	0	2
3	Should support an anonymous test procedure (result)	0	-1	0	-1	-1
2	A testee should not be treated as guilty until the result has been verified	0	0	0	0	0
	Facilitated and secured assessment					
3	Should have a low risk of false results (similar to quick tests, around 2 %)	0	0	0	0	0
3	Should be part of clear routines regarding its usage	0	1	2	1	2
3	Should allow for further verification of a positive eye scanning test	0	1	0	1	1
2	Should prevent attempts of manipulation of drug test (should make it more difficult to manipulate than today's test methods)	0	2	0	2	2
2	Should allow for usage in a safe manner at suspicion of drug use	0	2	0	0	2
1	Should prevent test refusal	0	1	1	1	2
2	Should have processes to cover for non-valid tests (when eyescanning cannot provide a result)	0	0	0	0	0
2	Should allow for dialogue with the testee in connection to the test procedure	0	1	1	-2	2
3	Should help assessing if Central Nervous System (CNS) is affected at the time of test (impaired working ability)	0	2	0	2	2
3	Should provide basis for appropriate consequences of a positive test result	0	2	0	2	2
	Ability to confront					
3	Should enable a process that does not require suspicion/confrontation of individuals	0	2	1	2	2
3	Should make it possible to identify drug problems at an early stage	0	-1	1	1	1
2	Should help maintaining a good relationship between manager and employee in case of suspicion	0	1	0	0	1
2	Should make it easier to confront/tell about suspected drug use (caring rather than outing)	0	0	2	0	2
3	Should support a safe confrontation process (includes protecting the person who confronts or tells)	0	0	0	0	0
	Having enough knowledge					
3	Should enable all employees to become aware of the company drug policy (consequences, obligations)	0	0	2	0	2
3	Should enable all employees to become aware of their rights and available support	0	0	2	0	0
2	Should facilitate a dialogue about drug related issues	0	0	2	0	2

3	Should facilitate continuous learning processes for managers and leaders (problem magnitude at company)	0	0	2	0	2
3	Should facilitate continuous learning processes for employees (problem magnitude at company)	0	0	2	0	2
2	Should facilitate a continuous learning process for employees (health promotion)	0	0	2	0	2
1	Should support shared knowledge related to drug prevention between companies	0	0	0	0	0
	Administering the tests					
2	Should not cause for unnecessary time delays	0	2	0	1	2
2	Should allow for testing by other professions than today (not limited to nurses)	0	2	0	2	2
2	Should allow for sufficient testing in order to achieve a drug free workplace (amount of tests)	0	1	0	2	1
3	Should allow for testing at all working hours	0	2	0	2	2
3	Should provide a simpler test procedure than existing solutions (urine, oral fluid)	0	2	0	2	2
2	Should allow for testing in large and small scale	0	2	0	0	2
3	Should provide a quick preliminary test result (for situations when needed - suspicion, if used as safety barrier etc.)	0	2	0	2	2
2	Should allow for continuous testing of an individual	0	1	0	2	1
3	Should prevent people from getting information about a test result (only those who need to know should know)	0	-1	0	-1	-1
	Technical limitations and possibilities					
2	Should contribute to limit value research (limit value = delimitation between considerable drug influence and residual substances)	0	2	0	2	2
3	Should cover all drugs that can cause impaired working ability	0	2	0	2	2
	Total -	0	-6	0	-10	-2
	Total +	0	68	59	68	115
	Sum	0	62	59	58	113
	Sum requirements weighted 3	0	24	32	30	51
	Sum requirements weighted 2	0	29	25	19	51
	Sum requirements weighted 1	0	9	2	9	11
	Total weighted sum	**0**	**139**	**148**	**137**	**266**