

Intimate data in relationships: Tracking, sharing, surveillance - personal boundaries?

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Abstract— Self-tracking has become commonplace in the century of digitalization. People are tracking themselves or rather personal information. Moreover, they are storing and sharing this data.

The Quantifying Self movement has inspired this trend. Today it is possible to track quantifiable data like heartbeat or sleeping pattern, but also "not measurable" data like moods, feelings and behaviors, which have a high intrinsic value. Such tracked data can be highly intimate, e.g. data of sexual and reproductive activities or intimate relationship.

In this work, it is considered why people tracking themselves, and storing and also sharing such intimate data.

Index Terms—self-tracking, self-quantification, personal informatics, intimate data, data ethics, privacy

1 INTRODUCTION

In the century of digitalization there are many opportunities offered to perceive the self and own life in a different way as before. Tracking and quantifying is commonly used. Nowadays many people are engaged in tracking their data. They are tracking and also sharing this information with other people, like friends or like-minded people.

But there are many different types of data, which can be tracked. Such data like heartbeat or sleeping pattern does not seem to be too intimate when tracking and sharing, but how about data in intimate relationships and sexual behaviors?

In this work, the collecting, tracking, storing and sharing of data in intimate relationships is investigated. Therefore, the following questions will be answered by searching for literature and studies in this scientific field:

1. What data is perceived as intimate? In what circumstances?
2. Why do people track intimate data?
3. What do they do with, e.g. tracking, storing, sharing and discussing and with whom?
 - (a) Do they over-trust the tracked data?
 - (b) How do they perceive their tracked data?

For answering of the mentioned above questions a research of literature and studies on collecting and tracking data in intimate relationships is carried out. The answering of the first question is not as easy as it seems. Therefore, several definitions from different source are collected.

2 TERMS OF DEFINITION

In this section the term *intimate* is defined. Due to this it is considered which data is perceived as intimate and in which circumstances.

This question can not be answered easily. The perceiving of what is intimate depends on several factors. In general it has to be differentiated between the culture, how a human is perceiving the self and which factors are shaping the sociocultural live [2]. It is not possible to consider all well-known cultures in this work, therefore the focus is limited to the scrutiny of the western civilization. In the western civilization privacy takes up a lot of space. Nevertheless, the state of a person in the society is defining the personal perceiving of privacy and

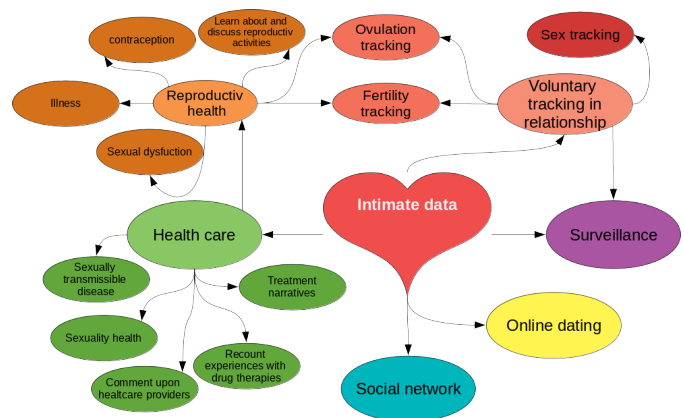


Figure 1. Visualization of possible intimate data, which are arising from using such digital technologies.

intimate data. And the personal view, as well. These things can not be defined in a few sentences, the topic is too complex and not measurable. Furthermore, it is subjective. For the individual, the perception of intimate data is different. Due to this, the definition of what is perceived as intimate for people living in the western civilization, will be shown by the following examples.

Several works are focused on intimate data in different contexts. Although, a clear definition of which data is intimate or is what people perceive as intimate is not found. In the following some descriptions are summarized to give a rough outline.

The focus in Danaher et al. [5] is on intimate interpersonal relationships. In this work no clear definition is presented. They argue that it does not need a precise definition to get an understanding of intimate relationships. However, to describing a romantic relationship the authors in this work are writing the following:

[...] we trust that most readers' intuitive sense of those terms [...] will be adequate for our arguments to make sense". That said, romantic relationship might usefully be thought of as a cluster concept, with paradigmatic examples in the middle, and less paradigmatic examples clustered around it, each one different along various dimensions (e.g., the degree to which sexual interaction is central to the relationship).

If it is possible to define an intimate or romantic relationship about such a way, this concept will also fit for the term intimate. We can build a cluster of categories of intimate data, which are assigned to corresponding activities, e.g. fertility tracking.

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In figure 1 several topics related to the term intimate data are collected and brought in relation to each other. At this point it must be emphasized that this does not cover the complete field, in which intimate data would be collected, tracked, shared and so on. Rather it is an summarization of terms and descriptions from Levy [8], Danaher et al. [5], Lupton [9] and more.

The idea to use an cluster concept can be thought of one step further. The sensitivity or level of intimate data could be arranged in some sort of data hierarchy. Form IT-Security Management it is known to evaluate risks by assigning a probability and to classify accordingly (see documentation of Federal Office for Information Security (BSI) [6]). In this table I want to classify the data summarized above based on their sensibility.

To give another understanding of what is meant with *intimate* in this paper I want to quote a paragraph from Lupton [9], which describes an Application for mobile phones:

The Glow app brings male partners into the equation by sending them a digital message when their partner is in her fertile period and reminding them to bring her flowers [...]. This app also tracks menstrual and ovulation indicators, as well as asking women to enter details of their sexual encounters, including sexual positions used, whether or not they had an orgasm and whether they experienced emotional or physical discomfort during sex. It employs the aggregated data from other users to refine predictions of ovulation and fertility for the individual user. [...]

This paragraph describes a sort of tracking which also called *intimate tracking* (defined by [5]).

We can also find intimate data also in other contexts, e.g. as mentioned above in health care. But the focus in this paper is on intimate data in relationships, therefore it is referred to the figure 1 above. This should give a general understanding of the context.

3 LIFE COURSE OF INTIMATE RELATIONSHIPS

Levy [8] has defined a so called *life course of intimate relationships*. This course includes four conditions of romantic relationships (see Figure 2). Each condition is colored from colors from figure 1. Here, the connection to the individual topics should be roughly indicated. The transitions in content are sometimes fluid.

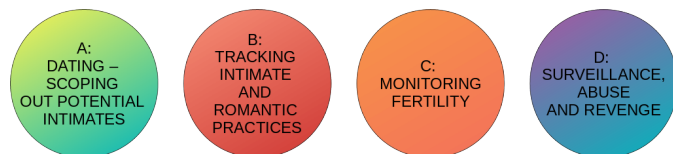


Figure 2. The life course of intimate surveillance. Each condition is co

In each of these conditions (potential) partners can use technologies for different purposes.

Condition **A** stands for the beginning of a potential relationship. The partners know each other or would like to know each other. At this point, there is an interest from one or both sides. The aim is to learn more about the other person, to check their identity and social life.

In condition **B** the partners are already in a relationship or something appropriate. At this point, it should be emphasized that this condition includes all sorts of relationships that are understood as such. For a concretely definition what a (romantic) relationship means see Danaher et al. [5] or 2. In this condition the partners know each other better and have an increased (mutual) interest. There were other forms of contact, possibly sexual contact.

In condition **C** there is usually an established relationship (but that does not have to be the case, there maybe exceptions). The couple exercises sexual activities, deals with contraceptive measures (together) or plans to start a family.

Condition **D** contains the surveillance of the partner, also abuse (of data) and revenge. Describing this condition is complicate. It can be a relationship that has already ended. The partners therefore have a relationship to each other based on their previous history. This can be different (as in the other states). More generally, this condition maybe arise from problems in the relationship, due to interpersonal conflicts oder something else. But it may also be a state or point in the relationship which is fine for both partner (that refers to the surveillance). This will be discussed later on.

Since relationships are complex and individual, the single conditions are not interconnected [15]. Also this is not the focus of this work. The descriptions above only should give an idea of what the conditions mean for the following section 4, in which all conditions will be discussed in detail.

4 CONSIDERATION OF EACH CONDITION IN LIFE COURSE

TODO: For each state, the results from the individual papers are collected. Further individual distinctions can be derived from this (for instance in B it is is to be distinguished between intimate tracking and intimate gamification). The types of possible data collection, tracking and also sharing is to be reported for each condition in life course.

4.1 Condition A: Dating - Scoping out potential intimates

At the beginning of a potential relationship you want to know more about the person person of our interest. Due to this, you collect data about this person.

4.1.1 Searching for information

A good way the get relevant information is using a standard social network like Facebook ¹ or using Google search. Monitoring a person on Facebook is known as Facebook stalking [8]. To stalk another person on Facebook undiscovered, much articles has been written about [17]. With the Website stalkscan.com ² it is possible to get all public entries from a persons Facebook profile site which is public by only one mouse click. Surley, it can only shows what is already set public, still it make it more easily to stalk another person very quickly. Within this website as tool is also avoided to give an involuntary like by clicking through the photographs, for instance. The Google search mentioned at first is known as *google someone*. With this method is it possible to get information from every source which is findable for the search engine [12]. Also for this topic there are many article how to *google someone*. For instance, the search on images is of high interest ³.

4.1.2 Creating and providing information

The topic in this condition A is not only searching for data about someone, but also create such data. Levy [8] mentioned the application Lulu as a tool to create data for use in prospective relationships. The focus of this application is on campus life. The app Lulu gives young women the opportunity to review male students and friends, with which they are connected on Facebook. The review contains information in relation to humor, manners, look and style, sex and kissing. The review giving by the female users is anonymously. In the first version, each male fiend on Facebook could be reviewed in this app. But after concerns related to privacy of reviewed male Facebook users, a review can only be committed for such male user which have explicitly allowed to this.

Furthermore, such services that combine online dating with user's geographical location are well known. Tinder is a widespread location-based dating service. The app shows potential people with different interests (e.g. romantic relationship) near to the user's location or next holiday destination ⁴. By showing the user several profiles he/she can decide to swip right for a like. If the other person does also a right swip, it is a match. Now the user can exchange messages,

¹www.facebook.com

²<https://stalkscan.com>

³<https://www.lifewire.com/google-people-search-3482686>

⁴<https://tinder.com>

Table 1. Interrelated types of data in Quantified Relationship, source from [5]

Intimate tracking	Collection of all (measurable) data that can arise through intimate behaviors (in a relationship), e.g. number of partners, number of sexual encounters, duration of sexual encounter, or romantic behaviors (gifts, help in the household, attention)	SexTracker SexKeeper Nipple Lovely kGoal
Intimate gamification	Use of gamelike incentives to change or improve the behavior in a romantic relationship; Playful learning to lead a successful relationship	-
Intimate surveillance	Use of technologies to monitor intimate partners	-

for instance to get a date. The principle sounds easy, but isn't at all. By using these apps, a huge amount of intimate data is collected. First of all, the Tinder app is connected to Facebook and Instagram, a photo-sharing social networking service, owned by Facebook itself. In order to this there is a huge commercial interest to assume. Judith Duportail demanded access to her personal data under European data protection law after four years using the Tinder app. The response was an over 800-page report containing different types of data like Facebook likes, information about education, age-rank of men she was interested in, number of Facebook friends, when and where every online conversation with her matches happened, also interests and jobs, pictures, sexual preferences. The list contains a huge amount of intimate data. In her article Duportail writes, she was amazed by how much information she was voluntarily disclosing. This was also called secondary implicit disclosed information. Firms have an increasing interest in gathering personal data from users' activities [19]. This results in a trade-off for the user - use the system and accept privacy concerns due to the commercial interest from the provider, or abstain the service. Nevertheless all concerns, users reveal their data very quickly, as shown in Tait et al. [18]. Users who tend to gain confidence quickly, therefore, also more quickly reveal more information. In addition, this study showed that higher profile activity increases the amount of information desired. That means, users who maintain an active profile and present activity also receive more and higher information from other users rather than users of profiles that provide barely information. The disclosure of information is determined in part by the personality of the user and the context in general. This affects how users surround their data online and with strangers. They found out that in only 6 - 10 minutes a user can extract the full name and date of birth from a conversation. Within this information it is easy to get further data about the person via Google search and Facebook, for instance.

In Nandwani et al. [11] it was examined how quickly users reported their data to strangers and, above all, which data. For the study, an automatism was developed to contact 100 Tinder users. The study was a single-blind study, so users did not know at the moment that they were writing with a Chat-bot. The evaluation of the data yielded the following results: Most of the published data was personal data, for instance: full name, date of birth, phone numbers, work details, email-addresses, complete address and other data that will not be listed here.

Why are this data disclosed to strangers in online platforms and apps? As mentioned above, the user trusts in the authenticity of the other within an active profile account. Also they do not reflect the impacts of disclosure the personal and also intimate data. For this purpose, Nandwani et al. [11] suggest a virtual assistant in such applications like Tinder, which study the relationship between the users by parameters and inform the user which information should be revealed in the conversation.

4.2 B: Tracking intimate and romantic practices

The potential of creating, collecting and tracking intimate data rises if the romantic relationship between two individuals deepens. A romantic relationship in which intimate data were tracked is named a Quantified Relationship (QR). Danaher et al. [5] describing in their work three categories of intimate data which can be tracked in a QR. In table 2 the three categories are summarized with descriptions and examples.

In the following the categories intimate tracking and intimate gamification are considered in more detail. The third category intimate surveillance will be discussed in section 4.4.

4.2.1 Intimate tracking

For the tracking of intimate data, there are a variety of apps that can be used for it. The apps usually track the following data about sex life [5]:

- number of partners
- number of "sessions" per partner
- sexual positions used during these sessions
- number of thrusts per session
- duration of these sessions
- number of calories burned per session

This list only mentions the most common. There are many more variants of intimate data that can be tracked. As Kelly [7] mentions, nearly everything is tracked that is possible. That may not cover the big crowd, but that's also practiced.

The data are voluntarily or automatically tracked using such technologies [5]. That means, the data is either actively provided by users or automatically recorded, e.g. by running the app in the background and recording audio. This type of tracking or communication is also referred to as *participatory surveillance*. As Lupton [9] writes, this includes looking at oneself, but for one's own purpose. Self-tracking is often associated with self-reflection, but it has less to do with it [10]. Rather, it is a visualization and reflection of the collected numbers. But the reflection of the self in this context involves much more than the visualization of the numerical data. This is more of a strict focus on the pure numbers. These numbers are only objectively perceived, and no longer associated with the subjective activity or context to which they once belonged. Often, these apps also contain elements for the gamification of the mission or goals.

4.2.2 Intimate gamification

Another observation is the gamification in this area of tracking. Users are encouraged to quantify their sex lives in order to measure their performance and compare themselves with other users [9]. This type of quantification mainly focuses on the male user.

One consequence of using such technologies may be the reinforcement of gender stereotypes [9]. The algorithm defines the goals that users use to orient and measure themselves against. The individuality is lost.

In addition, this type of feedback does not necessarily have to be of good quality or have a lasting effect on relationship life. [5]. After all, a good relationship is not measured by how much sex you have or how long it lasts. As explained in the section 2 above, there are many more components that make a good relationship.

Table 2. App for tracking the cycle

term	operating system	Description
myNFP	iOS Android	myNFP evaluates the cycle according to the symptothermal method (NFP). All important parameters for the evaluation are entered by the user herself.
Kindara Fertility & Ovulation	iOS Android	is based on the Fertility Awareness Method; supports the Sympto-Thermal method and can be used for Natural Family Planning (NFP)
Lily	iOS	It is evaluated according to the rules or according to the symptothermal method or based on average values of other users; If you want to use the app in full functionality, a contribution will be charged; therefore, the manufacturer guarantees that the data will not be evaluated by third parties, the personal information will not be stored, and no backup of personal data will be stored on any server; ⁵
Glow	iOS Android	

4.2.3 Objections

The automatic recording of such data in an app can be very questionable, because the danger is great that the user is not aware of it. Most users do not read the fine print of the terms and conditions of these services before using them [8].

Also, the sole quantification of a relationship does not necessarily lead to an improvement of the relationship skills. Rather, these types of behavioral change supports gender stereotypical reinforcement. That would be a very retrograde development compared to the current perception of our conception of love and sexuality. In addition, as already mentioned above, the users perceive the data objectively only by quantifying the activities, similar to a sport activity like running. The reflection of the real activity is lost.

Users share this data with like-minded users, or keep it for themselves and do not share it, or share it with their intimate partner. The mere possibility of sharing this data brings with it a significantly larger audience [9]. This also influences the willingness to disclose intimate data to strangers. Users also share the data for the purpose of comparison with other users. The gamification which is often used in such apps also supports this in addition.

4.3 C: Monitoring Fertility

This section will focus on tracking the cycle and fertility of female users. These types of data are therefore very intimate. So far, they have been collected only in conjunction with a medical treatment and evaluated with the doctor.

4.3.1 Overview of technologies for monitoring fertility

The cycle and thus the connected fertility of the woman has been "monitored" for a long time. The exact beginning is unknown, it has been writing about it since the 1920s in scientific medical [14]. With Josef Roetzer the symptothermal method became well known [13]. With this method the cycle could be monitored and the fertile days could be determined exactly with a few differences.

In the age of digitalization, there are of course digital technologies that support the female user to monitor the data.

The following table lists some (known) app, which can be found in Google App Store or Apple App Store.

According to the manufacturer of the myNFP app, the sensitive data is not processed by third parties. Furthermore, as few as possible data is recorded. The data are anonymous and does not indicate the person.

The manufacturer justifies this with the argument that the app charges a monthly fee of 2.50 €⁶.

For Kindara app can also be found information on privacy, but these look different than in the previous app. An excerpt from the privacy policy provides more information⁷:

Kindara collects and uses the information you provide to us when you use the Kindara Service. Information that Kindara may collect includes: name, date of birth, e-mail address, fertility-related data and other family planning and health-related information you provide. You may consider some of this information to be sensitive so you should choose carefully regarding whether and if you will use the Service.

Since the app is offered for free, it is reasonable to assume that the data will be processed further. The commercial interest of the manufacturer should be noted and analyzed in more detail before using this app. An additional device is offered for the app, which can be used to measure the wake-up temperature. The device will automatically connect with the app when the temperature is being measured. The data will be sent to the app via bluetooth⁸.

4.3.2 The Glow Application

I would like to comment on the Glow app separately, because a lot of papers are writing about it [5], [8] and [9]. Launched by Pay-

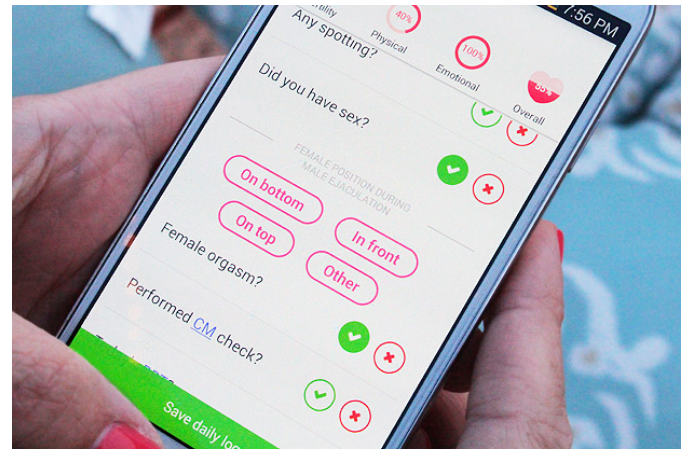


Figure 3. The Glow app collects a variety of intimate data (Photograph source: [1])

Pal founder Max Levchin in 2013, the app offers great concurrence with many other fertility and natural prevention apps. The Glow app tracks a huge amount of intimate data, among others the menstruation, position and firmness of a women's cervix, sexual intercourse (with the women's position during ejaculation), "whether they had an orgasm [and] whether they experienced emotional or physical discomfort during sex" [9]. In addition, the mood of the user can be tracked. The difference to other apps is that the Glow app makes the collection of intimate data a family affair. The users' partners are invited to download a mirror app and provide additional data [8]. The app also sends messages to the partner about the current status of the partner's period, reminding of attention such as flowers or a nice message. The data of the users are evaluated collectively in order to be able to specify better forecasts for the individual user from the large collection.

Danaher et al. [5] argue under the point *Gender Relationship Objection*, that these types of technologies are making women an object of surveillance and quantification. These technologies give the impression that the cycle of a woman is unsupervised chaotic and can

⁶<https://www.mynfp.de/datenschutz>

⁷<https://www.kindara.com/privacy-policy>

⁸<https://www.kindara.com/wink>

only be “rebuilt” with strict control. In addition, this app would promote the development and enhancement of gender stereotypes, as also augmented in [9].

The giving or disclosure of such intimate data is sometimes very questionable if the user disregards how the data is further evaluated. Certainly, these technologies can be helpful in the evaluation of the collected data, and remind of the daily measurement. Unfortunately, these very sensitive data are also used for commercial purposes.

4.4 D: Surveillance, abuse and revenge

The condition D is about surveillance in relationships. The other three conditions are also about surveillance, but of a different kind. The following briefly describes and illustrates where the difference lies.

The conditions described above deal with the different situations in which intimate data can also be used or used for monitoring purposes. The section 4.1 covered the collecting data via social networks and online dating services. In section 4.2 the collection and generation of intimate data in the relationship was described. In Section 4.3 it was discussed about the monitoring of the woman or her cycle and fertility. A summary of the previous conditions can be seen in figure 4. In all these conditions, the surveillance takes place via a third party, the manufacturer or provider, which has a commercial interest. Above, voluntary participatory surveillance was mentioned. This term describes the circumstances very well.

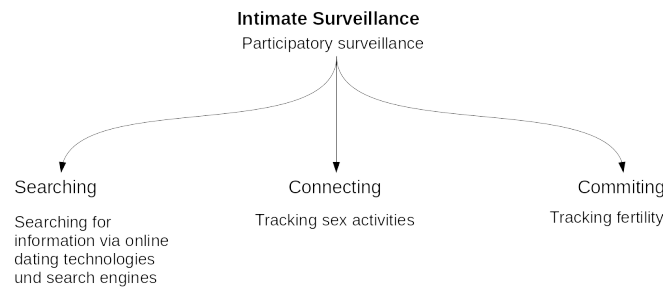


Figure 4. Summarizing of conditions A, B and C, based on the visualization of [3]

This section is about the surveillance by both (or one) partners in an existing or also terminated relationship. This surveillance can be both voluntary or involuntary.

For mutual surveillance in an existing relationship, Danaher et al. [5] have given an interesting but also something questionable approach.

The authors first define the concerns related to the use of QR-technology to support Partner’s mutual trust in a well-functioning relationship. For instance Levy arguments in [8], that mutual trust in a relationship has played a fundamental role so far and promotes pro-social behavior in the relationship. If digital technologies take on this role now, by tracking the partners in the relationship, and if the partner does control themselves and build their trust on it, it does not rely on loyalty to the partner anymore, but only to the tracking software. The following ethical aspects would be too profound to discuss further here.

Nevertheless, Danaher et al. argumentieren [5]:

Even if mutual trust is an ideal, it is an ideal that many fall short of in reality.

Due to this, they suggest that partners, to some part in the relationship, voluntarily monitor themselves to appease the other’s doubts. Of course, this requires extreme caution and respect. It requires the agreement of the other, but also involve a hard-but-reversible lock-in. They suggest that an example could be an app that allow mutual surveillance for a period of time or something else. It would be interesting to see if some partners find such an approach desirable and helpful in their relationship.

5 RISKS

Lupton writes in [9]:

“Now that mobile digital technologies that can be used for surveillance are part of everyday social life.

Since the technologies discussed above are in daily use, they pose some risks to the users privacy, the perception of themselves and also of the relationship which they lead. In this section these risks are summarized to give an overview. The overview is divided into the three categories quantification, trust in a relationship and user privacy.

5.0.1 Quantification: Perception and rating of the self and the relationship

Due to the various ways in which intimate data can be tracked, there is a risk of losing the actual reference to the data [9] and [10]. In condition 4.2 it was mentioned that by tracking of sexual activities the actual act later is only perceived by numbers, thus the act is quantified. The quality or actual perception by the user can be lost. Or put another way, the user is lost in a jumble of numbers [7]. When using these technologies, the user should be aware of why he or she is using them and what these data are actually collected for [5]. Often it is the case that many users are interested in tracking at the beginning, but after a while they give up using the tracking device and are no long interested in [16].

5.0.2 Trust: unknowingly and knowingly tracking by intimate partner; over-trust in data only

The surveillance of the partner without his consent is on the topic of QR-Technologien out of the discussion, as Danaher et al. in [5] argue. This is clearly the abuse of the data. This includes also the use of such apps as Flexispy⁹.

However, the approach that partners voluntarily monitor each other as described in D could also create problems related to the use of such an app or tracking device. This includes for instance the abuse by a dominant partner that might force the use of such software in the relationship. That would not be mutual agreement.

5.0.3 Users privacy risks

In Danaher et al. [4] the risks associated with the use of QR-technologies are summarized. The authors argued that the concerns “ [...] of the privacy-invading elephant lurking in the room [...]” are not alone a problem of a single person, but also involves one or more persons. However, this is exclusively private and an interpersonal matter, for instance if ever and with what device QR technologies are used. As further concerns, they stated that users use apps on devices that are also used for other purposes, such as smart phones, and that these devices are connected to the Internet. They conclude their argument that it is not a single process of tracking the data, which leads to problems. Rather, the problem lies in the fact that third parties collect the data on the devices that track the data, and so they get the data within existing network connection. Remedy would create devices that only track without transmitting the data. It used to be tracked without digital helpers, see 4.3 the symptothermal method model from Roetzer.

6 CONCLUSION AND FUTURE WORK

In this work, different conditions in a relationship were considered in which intimate data can be searched, collected tracked and shared. Further, an attempt was made to formulate a definition for the term *intimate data*. It also summarized how people perceive this data and how the data affects their perception.

For further work it is to investigate how partners in a well-functioning relationship perceive a mutual surveillance.

⁹<https://www.flexispy.com/en/>

7 ACHIEVEMENTS

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