

In Reviews We Trust: But Should We? Experiences with Physician Review Websites

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Abstract: The ability to openly evaluate products, locations and services is an achievement of the Web 2.0. It has never been easier to inform oneself about the quality of products or services and possible alternatives. Forming one's own opinion based on the impressions of other people can lead to better experiences. However, this presupposes trust in one's fellows as well as in the quality of the review platforms. In previous work on physician reviews and the corresponding websites, it was observed that there occurs faulty behavior by some reviewers and there were noteworthy differences in the technical implementation of the portals and in the efforts of site operators to maintain high quality reviews. These experiences raise new questions regarding what trust means on review platforms, how trust arises and how easily it can be destroyed.


1 INTRODUCTION

Trust is the most important phenomenon in social networks because it is necessary for the functionality of such communities (Adali et al., 2010). Thus, trust is defined as “a measure of confidence that an entity or entities will behave in an expected manner” (Sherchan et al., 2013). In social networks, trust is defined as “the perceived trustworthiness of a typical member [in a group] or the average trustworthiness of all members” (Huang, 2007). Thus, trust delivers information about who is eligible to receive and deliver information and is therefore an interesting research issue and important quality factor for the public (Emmert et al., 2013). Furthermore, in our work, trust means to believe in published reviews and willingly hand over data to other entities (e.g., to the operator) in a social network such as the operator. Moreover, trust usually is asymmetric. In general, one party trusts another more and vice versa (Sherchan et al., 2013).

In this paper, we investigate the trust factor on Physician Review Websites (PRWs). These websites, where patients can review the perceived quality of a medical service, are an important phenomenon of the Web 2.0 (Emmert and Meier, 2013). Physicians can comment on reviews. PRWs offer additional services for making appointments and provide medical

information by physicians for patients. However, the true meaning of the relationship between patients and physicians has been a complex research topic for ten years (Ridd et al., 2009). Since patients' privacy has to be protected (Gal et al., 2008), there must be a special trust mechanism in the community and even on the platform. However, while the Web 2.0 boosted review platforms, their quality is to be doubted. Apart from privacy issues (Bäumer et al., 2017), there are worries about content quality. For example, there is the common threat of fake reviews: Reviews published without a prior performed service, reviews as revenge or published in order to harm Health Care Providers (HCPs), to influence competition or for other reasons than reviewing a performed service (Luca and Zervas, 2016). However, there are many scenarios possible, even system infiltrations (e.g., fake replies to reviews by non-HCPs) or mistakes caused by PRWs themselves. These few samples put the trust factor in the focus of our investigation as users must trust reviewers, PRWs and HCPs in their public actions. While there are known concerns from the users' point of view, it is important to evaluate who exactly has to trust whom in order to employ a working PRW providing a benefit. To further investigate trust, we build a trust network that includes trust relationships among several entities.

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We structured this paper as follows: In Section 2, we summarize the relevant state of research. In order to explain who has to trust whom and what issues there are in the area of trust in PRWs, we explain our PRW trust network in Section 3. In Section 4, we give an insight into our experiences in working with physician reviews, considering both the reviews and the implementation of different PRWs. In addition, we provide information on the areas in which we have gained experience and what we would like to look at in future work. We discuss previous experiences and the effects on our work in Section 5 before we conclude in Section 6.

2 STATE OF THE ART

So far, most patients do not challenge an HCP's opinion or treatment methods (Lu et al., 2018). In the Web 2.0, patients started gathering their own knowledge (McMullan, 2006), not only about HCP's performance but also about diseases. That means that information from the Internet influences the patient-physician relationship (Jacobson, 2007). Here, it can be stated that self-information search strongly influences the patient-physician relationship because it reduces the information asymmetry. Patients can turn themselves into informed patients but can also be misinformed by the Internet (Lu et al., 2016). PRWs are one source for this kind of information, since they deliver not only ratings for HCPs, but also health care information published by HCPs. For instance, the Lithuanian PRW `pincetas.lt`^c enables providers to publish articles dealing with medical treatment methods, research news or advice on staying healthy.

While some scholars tried to quantify the trust relationship (Dugan et al., 2005), HCPs are still the gate keepers because they possess the medical knowledge obtained through an expensive and enduring process. Patients are usually left without the full picture (Lenert, 2010). Generally, consumers do not have full access to valid information, while information especially on PRWs must be doubted (Eysenbach and Jadad, 2001). While the Internet shapes the trust relationship, three possible reactions can be observed. HCPs react to the changed relationship where patients gain their own knowledge because so far, the knowledge was almost exclusively on the HCPs side. One possible reaction is feeling threatened, but delivering the expert knowledge, another reaction is that HCPs work together with the patients in order to find the right diagnosis or, another possible reaction, HCPs help patients finding the right information (McMullan, 2006). The here presented facts demonstrate the factors influencing the patient-physician relationship. When regarding patients as customers, trust plays an utterly important role in order to keep patients from visiting another HCP. Trust can build customer loyalty and HCP reputation is identified to be a dominant factor here (Suki, 2011). While some studies deal with trust in patient-physician relationships (Anderson and Dedrick, 1990; Chaitin et al., 2003) other studies investigate trust in social networks (Adali et al., 2010; Almishari et al., 2013; Ma et al., 2018) or with health information on the Web (Bernstam et al., 2005) and other deal with PRWs in general (Emmert and Meier, 2013; Fischer et al., 2015; Gao et al., 2012). In the following, we explain how trust is built on PRWs and present our idea of trust network for patient-physician relationships.

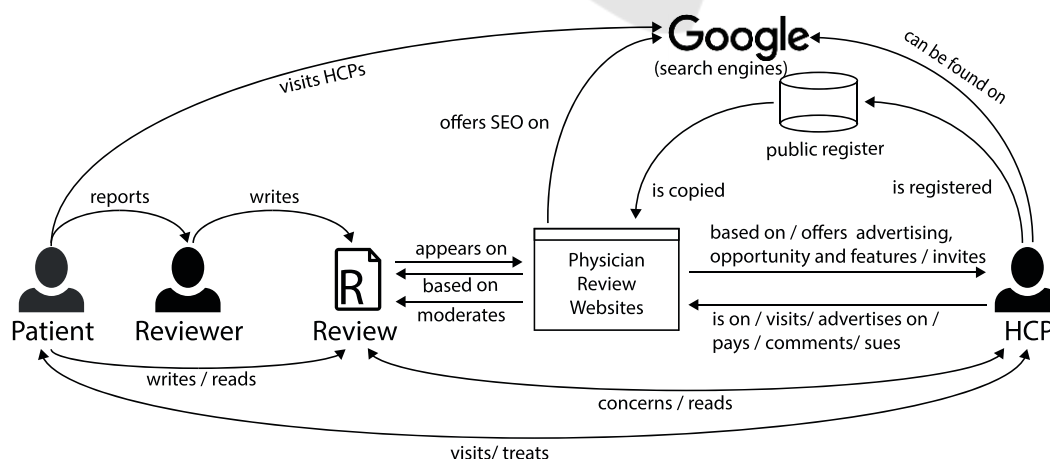


Figure 1: Trust Network Model on PRWs.

^c Available at <https://www.pincetas.lt>.

3 TRUST ON PHYSICIAN REVIEW WEBSITES

This section shows our first findings how to establish trust on PRWs. We show examples for fake reviewing behavior and differences in the technical implementation of PRWs, which we consider as important quality factor. Since it is essential to understand who interacts with whom, what is one's motivation, and what are the interdependencies between the actors, we first outline our idea of how a PRW trust network works in Figure 1. We designed the trust network based on Jøsang et al. (2006). Our study identifies several trusted entities such as patients and reviewers, which both can be, but are not necessarily, the same person (Bäumer et al., 2017). Patients may report to related reviewers or write a review on their own. Additionally, both patients and reviewers read reviews, search for HCPs and visit HCPs' offices. While treatments still mainly take place in the HCPs' office, efforts are being made in the field of telemedicine to enable medical consultations via PRWs. An example therefore are the efforts of the German PRW [jameda.de](https://www.jameda.de), which recently took over the German market leader for video consultation (Jameda.de, 2019). Already today, HCPs' appointments can be arranged online on PRWs – information is hereby made available to a third party. Other entities are the PRWs and the HCPs.

Several actions can take place between them while they influence and are influenced by these actions. Generally, the PRW is the center of our network because most of the covered interactions between actors take place on it. However, since reviews form the central business model of PRWs, they are (in most cases) moderated by PRWs and rely on a predefined rating schema. This rating schema is unique per PRW, difficult to compare between PRWs (e.g. different rating categories and scales) and can take national peculiarities into account (e.g., on the Lithuanian platform pincetas.lt, users can report how much extra money was paid to an HCP). For our study, we mainly used the Lithuanian PRW pincetas.lt and the German PRW [jameda.de](https://www.jameda.de)^d. The moderation on PRWs takes place in the sense of a fair use policy, the protection of HCPs and serves the purpose of PRWs' self-protection, as PRWs are often sued. Since reviews as well as HCPs' profiles appear on well-known PRWs, they can be found on search engines (e.g. Google) and improve the visibility of HCPs on the Web. Similarly, negative reviews can also damage HCPs' reputation. Since PRWs offer advertising opportunities and special features for paying HCPs (e.g. publishing articles in their name, place their profile prominently etc.), the relation between HCPs and PRWs is also important for the PRW business model. HCPs visit, advertise, pay for, comment on or possibly even sue PRWs.

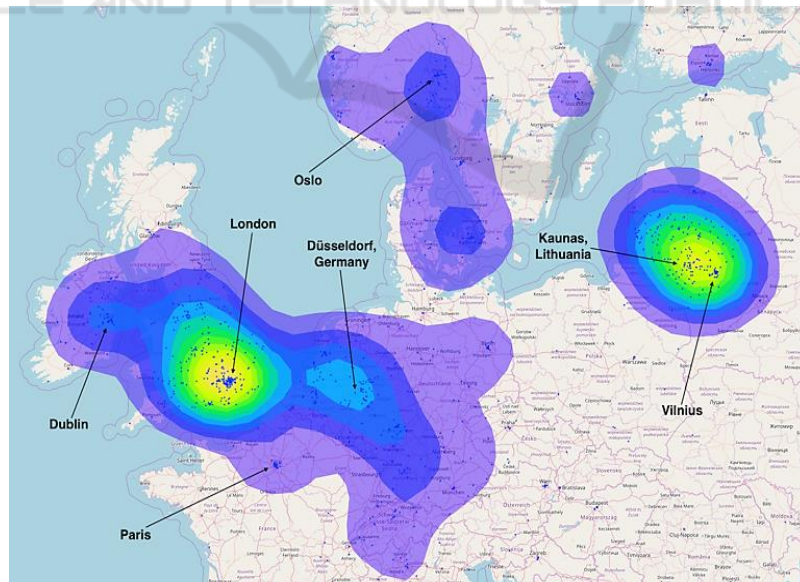


Figure 2: Distribution of Reviewers over Europe (pincetas.lt).

^d The website can be found at <https://www.jameda.de>.

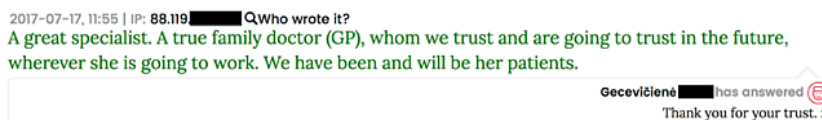


Figure 3: Review with IP Address and Comment by the HCP (Bäumer et al., 2018).

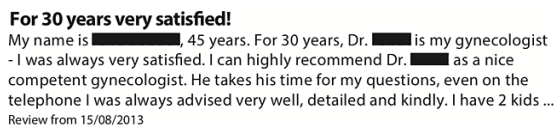


Figure 4: Review Text as Possible Threat to Anonymity.

Since PRWs often copy basic datasets from online available data sources (e.g. physician databases, telephone directories) without further consent of the HCPs. Here, trust also means that HCPs have to trust the PRW, that they delete defamatory and unfair reviews. However, among all entities, there must be trust to establish a working social network. Missing trust results in disputes and issues such as fake reviews. A former empirical study based on physician review data from several European PRWs led to several findings: Faulty reviewer behavior comes up as fake reviews to (1) harm an HCP, (2) take revenge, (3) gain advantages or (4) improve the PRW (e.g. public perception as an active platform) (Bäumer et al., 2017). The literature defines fake reviews as, among other possibilities, posting a review for any other reason than reviewing the performed service or product (Horton and Golden, 2015). We regard duplicate reviews as an obvious example for spam because they are copied review texts that are then published for several HCPs. We found examples for this in the data (Bäumer et al., 2018). Besides, the ratings are given in typical manner, i.e. only good grades for every rating category (e.g. 5/5 stars) or only bad grades (1/5 stars). We found different kinds of noisy data, which we will discuss in the following.

4 TRUST FACTORS ON PRWS

When examining review texts, profiles and platforms, we have noticed cases in which the trust of different actors on PRWs was at risk. In the following, we would like to present our observations on the different trust factors and how they are influenced.

4.1 Trust of Patients

On PRWs, patients have the opportunity to share experiences with HCPs and utter their own opinions. It is also a way to change the balance in the HCP-

patient relationship for the benefit of patients. However, it is obvious that negative comments on medical services are not in the interest of HCPs and that the relationship between the actors can dramatically deteriorate. For this reason, patients have a legitimate interest in ensuring their anonymity. At this moment, they trust both possible reviewers and the PRWs to protect their anonymity. This means, for example, that PRWs show only necessary meta data (e.g. no real names, IP addresses). Here, large PRWs use review moderation procedures, which filter private information to protect patients. However, these efforts do not often go far enough, as existing research in this area shows (Bäumer et al., 2017). Meta data (e.g. location, date, insurance, age, gender) in combination with information that is disclosed in the review text provide a user profile that allows the de-anonymization of patients, possible at least for the HCP and the staff members (see Figure 9). In contrast, there are also PRWs that try to ensure a fair use on the PRWs by reducing anonymity. For example, the Lithuanian PRW `pincetas.lt` deliberately displays IP addresses next to reviews that have not been written by registered users (see Figure 3, translated from Lithuanian). While this can be perceived as a measure against cyberbullying and fake reviews, it is also a danger because geographical information can be derived via the IP address. It is also possible to identify public places, universities and cafés where the reviewers are located (see Figure 2). In this example, a first look at the data shows that some reviewers (2%) come from other countries (countries most Lithuanians emigrate to (International Organization for Migration, 2019)). Figure 4 (translated from German) shows an example that contains real names, information about the family situation, etc. The question here is, of course, whether the patients simply do not care about possible consequences or whether this information was given unintendedly (in these cases, protection mechanisms of the PRWs should have to take effect).

4.2 Trust of Reviewers

Because of the aforementioned fact that reviewers are not necessarily identical with patients (Geierhos and Bäumer, 2015), they have to trust the patients' reports. As reviewers are the legally liable persons when publishing reviews, their trust relationship with the patient is important. Furthermore, when dealing e.g. with minors, soft factors like the personal relationship and interpretation of a child's report are inevitable. The reviewer has to trust the PRW as it can put him/her at legal danger, and it possesses his/her private data. This is a serious privacy concern because PRWs usually do not validate the personal identity. While reviewing HCPs, the reviewer puts his/her relationship with HCPs in danger when being the one who negatively reviews for another person.

4.3 Trust of PRWs

PRWs trust their reviewers because there are usually no boundaries for the registration to provide personal identification on PRWs. However, some PRWs force the users to confirm to be the treated person, i.e. reviewer and patient should be the same person. In this regard, observations have shown that this is not always the case, especially when parents rate for their children (Geierhos and Bäumer, 2015). Nevertheless, PRWs trust their reviewers who are, next to HCPs, the ones providing valuable content that make it desirable for others to access the website. In our work with reviews, we have identified patterns of unnatural user behavior. In the following, we would like to give an insight into the patterns that are hidden for normal users of PRWs, since they do not have an overview of the entire dataset when they are searching for HCPs. First of all, Figure 5 shows two examples that represent duplicates, i.e. reviews with overlapping content. Example A in Figure 5 shows a complete duplicate in which two negative reviews (red colored nodes) consist of seven identical sentences (blue colored nodes) given to different HCPs. While such complete duplicates can be found very quickly in a database, it is almost impossible for users or rather a matter of chance to become aware of such duplicates.

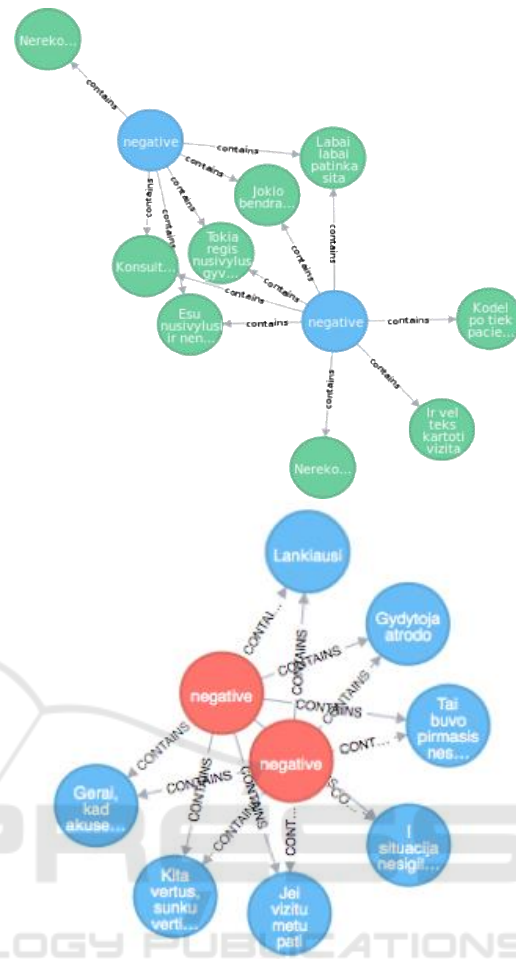


Figure 5: Negative Reviews consisting of the same Sentences (Lithuanian), Examples A (top) and B (bottom).

Here, it is the responsibility of the PRW's operators to prevent such duplicates to keep the users' trust in the review quality. However, the recognition is more difficult in cases where reviews are not 1:1 duplicates but consist of mixed-up sentences taken from other reviews (see Example B).

Example B shows two reviews (blue colored nodes) that share five sentences (green colored nodes) in total and still have their own sentences. This is a phenomenon that often appears. For some phrases, this is uncritical (e.g. "Thank you", "Good doctor").

2497	Manau reikėtų pervalinti gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 30 min, registratūroje tuo metu slaugytojos
10199	Manau reikėtų pervalinti gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 30 min, registratūroje tuo metu slaugytojos
20135	Manau reikėtų pervalinti gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 30 min, registratūroje tuo metu slaugytojos
2751	Manau reikėtų pervalinti gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 45 min, registratūroje tuo metu slaugytojos
2497	Manau reikėtų pervalinti gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 45 min, registratūroje tuo metu slaugytojos
2497	Manau reikėtų pervalinti šitos gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 45 min, registratūroje tuo metu slaugy
8274	Manau reikėtų pervalinti šitos gydytojos kvalifikacija. Pirmą kartą konsultacijos laukiau apie 45 min, registratūroje tuo metu slaugy

Figure 6: Examples of Duplicates with marginal Changes (Bäumer et al., 2018).

However, in the case of sentences that are very long (e.g. 10-grams) and in which spelling and grammatical errors are the same, intent must be assumed. Even not only negative reviews are affected, as shown in Figure 6. There are also cases where a lot of reviews share the same sentences and cases, where sentences are even used for different sentiment statements. Such fake reviews destroy users' trust in the platform and therefore quality of reviews, ratings and technical implementation of PRWs (Filieri et al., 2015).

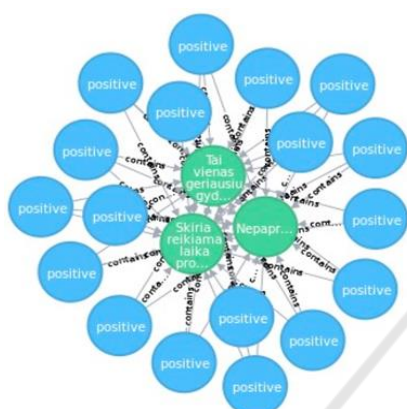


Figure 7: Positive Reviews sharing the same Sentences.

There are, however, duplicates with only small differences. E.g. only numbers are changed, like presented in Figure 7 (in Lithuanian). There, an HCP with ID 2497 has four similar ratings (three visible in the Figure). The first is from 2011, the others were written within a shorter period in 2017. Three of four reviews have the same IP address. These reviews are either fake or real. As there is the same IP address used, the reviewer could be a patient that visits a

doctor regularly and has the same opinion that is only slightly changed. Anyhow, here is no explanation delivered on why many HCPs have the same review texts, as we experienced. Next to this, PRWs must trust in HCPs when communicating with them. That applies to advertisements booked by HCPs and to complains. In short, HCPs can complain when they feel not treated the right way. Such cases appeared in the media, even when HCPs fear to be treated unfairly (Nützel, 2018). PRWs have to balance their trust in HCPs and reviewers in order to solve complains. HCPs may feel unjustly rated while reviewers feel justified in their opinion. However, in general, while there is a direct relationship between patients and HCPs, the PRW is the intermediary on the Internet

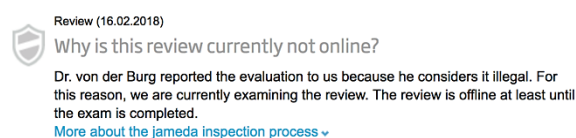


Figure 8: Sample Panel of Currently Blocked Review.

where involved parties may feel safe to say whatever they have in mind. The trust of PRWs in reviewers and HCPs has to be assumed as more unsafe due to a missing personal relationship.

4.4 Trust of the HCPs

HCPs trust in PRWs and their patients. Generally, HCPs can feel safe treating patients due to the information asymmetry (Eysenbach and Jadad, 2001; Lu et al., 2016). HCPs are the professionals while patients are usually uneducated in health care (Dickerson and Brennan, 2002). However, this may lead to harsh judgements (and comments) on PRWs

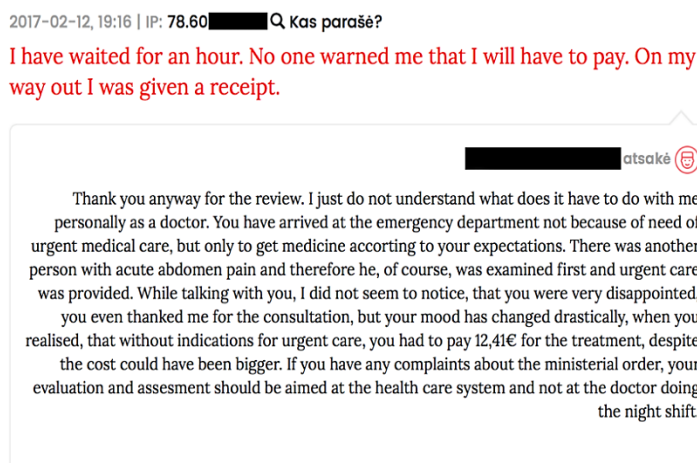


Figure 9: HCP Response with Data Disclosure (translated from Lithuanian).

due to misinterpretations (see Figure 9). Besides, HCPs have to trust in PRWs as they, regardless of HCP's will, may publicly make a profile available and encourage patients to review HCPs. Furthermore, HCPs must trust in PRWs to provide proper information and identify spam or fake reviews as well as insulting reviews. An example for the protection by PRWs is given in Figure 8. Here, a PRW blocked a review because it was reported by the rated HCP.

5 DISCUSSION

As is often the case, trust is essential for social interaction – whether offline or online. PRWs represent an interesting subject for research: While PRWs are pure online service providers, patients and HCPs also interact offline. However, as described here, the question of trust aroused: “Who trusts whom on PRWs?”. In the past, we acquired data from PRWs to answer this question. Anyhow, as presented in this paper, the relations are complex and not all entities can be separated from another (e.g. reviewer and patient). Many factors influence the relationships. For example, the patients have less knowledge than physicians (information asymmetry), while patients are regarded as “oppressed” party (Dickerson and Brennan, 2002). In conclusion, a complex network of relationships is built in which one change affects many entities. Therefore, we want to shed light on the whole network by summing up possible relationships and their characteristics.

But does it have to be taken so seriously? Aren't PRWs just other social networks where everything can't be taken seriously? We deny that. As we have shown, the trust factor in the network also arises from the various intrinsic motivations to participate in it. Patients who share their experiences in good faith and patients who get recommendations from these portals trust PRWs. The PRWs' business model is based on positioning themselves as a professional contact point for HCPs and patients and therefore a solid trust in this business model must also be part of it. When it comes to fake reviews, it should be mentioned that reviews have undergone quality checks by most PRWs before publication. However, there are quality concerns that need to be tackled by the PRWs. In order to support the development in this area, we could make use of collected PRW data. Still, fake reviews are hard to identify because, when writing a review, the true intention is only known by the reviewer himself.

As we presented a systematic approach to figure out trust in PRWs, we lack some quantified basis.

This will be part of our future work. An idea fitting to the complexity of a trust network are key performance indicators measuring the current state of the trust network. Our work presents thoughts that will help researchers in future to investigate new aspects concerning the medical sector. However, it will be of great importance to not only formalize trust relationships but to understand their true meaning and current state. For this reason, future research should investigate how trust between entities currently works (based on reviews from PRWs). Here, our model helps identifying relationships and assigning a state to them. Generally, it will be an interesting finding how well the relationships from our trust network are working right now and over time. This provides a new way of investigating the patient-physician relationship apart from, e.g., opinion polls.

6 CONCLUSION

All in all, we created a trust network for PRWs that can be used for a better comprehension of the relationships on PRWs and comparable health-related websites. We further discuss trust factors, i.e., who has to trust whom to establish fully working PRWs in the sense of social networks. We here identified several weaknesses that lead to serious repercussions in real life. We also showed several examples extracted from PRWs. Further research enables us to conduct a data-based investigation of the trust network. We acquired exhaustive data bases of several European PRWs and from the USA. We will analyze the existence of relations and threats to them while providing solutions to avoid such issues in future. This, however, requires a partly redesign of PRWs or the application of natural language analysis tools. We answered the question who trusts whom and why. In future work, this question can be answered in a more detailed manner. Generally, we expect a data-based analysis to be promising when determining key performance indicators that may provide information about the state of trust as well as the corresponding relationships and threats to them.

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