Child sexual abuse material networks on the darkweb: a multi-method approach

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SUMMARY

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Because of the development of the internet and the associated digital opportunities, the crime of the possession and distribution of child sexual abuse material (CSAM) has gone through tremendous developments in the last decennia. Nowadays, many CSAM offenders access and distribute CSAM through the Darkweb, the hidden and encrypted part of the internet. This occurs on Darkweb CSAM fora, which have a sole focus on child sexual abuse. While the phenomenon of CSAM crime is not new, the fact that it now occurs on anonymous platforms like the Darkweb, has impacted the way these crimes are committed.

Research goal, research questions and method

This dissertation is about CSAM networks on the Darkweb. Because of the illegal nature of Darkweb CSAM fora, empirical knowledge on their workings remains limited. Therefore, the overall objective of this dissertation is to describe and explain the criminal process and offender behavior on CSAM fora on the Darkweb. To do so, this dissertation applies insights from both the organized crime literature and from previous studies on individuals committing sexual offenses against children. A more practical aim of this effort is to offer professionals a more detailed insight into offenders' modus operandi, that can help to design more effective approaches for the identification, detection, assessment and treatment of CSAM offenders. In order to achieve the goal of this study, the following research questions were asked:

1. How can the criminal process of Darkweb CSAM fora be characterized?
2. How organized is the crime of CSAM on the Darkweb?
3. Which offender profiles and behavioral patterns can be distinguished on Darkweb CSAM fora?
4. How can keyplayers on Darkweb CSAM fora be identified?
5. How is trust on Darkweb CSAM fora established?

The main source of data used for this dissertation was (samples of) posts and threads from CSAM fora on the Darkweb. In all studies together, data from a total of six fora was used. The fora together had a total count of over 600,000 active forum members, and the datasets included a total of approximately 760,000 posts. The timespan covered in the fora together was 2009-2017. Additionally, police investigations case files and suspect interviews were analyzed and interviews were conducted with police officers and public prosecutors.

A mix of qualitative as well as quantitative methods and multiple theoretical perspectives were used to answer the research questions. First, a crime script analysis (Cornish, 1994) was conducted in order to gain insight into the steps involved in the criminal process of Darkweb CSAM offending. Subsequently, a case file analysis of Dutch police investigations and accompanying interviews with professionals resulted in a study on the organization of CSAM on the Darkweb. Thirdly, various quantitative methods were used to determine offender profiles and to describe offender behavioral patterns on Darkweb CSAM fora. Quantitative methods used included Group-Based Trajectory Modeling (GBTM) (Jones & Nagin, 2013; Nagin, 2005) and various network science methods and techniques (Barabási, 2016). Finally, the concept of trust on Darkweb CSAM fora was analyzed by the means of a systematic literature review.

Results

The criminal process of Darkweb CSAM fora

The criminal process of Darkweb CSAM offending can be subdivided into various phases (Chapter 2). In the first phase, preparations necessary to access the Darkweb CSAM forum are being made. Second, in the preactivity stage, members enter the forum for the first time. The third phase, the activity stage, consists of the actual execution of the main illegal act of exchanging CSAM. Finally, the postactivity stage consists of safely and securely exiting the crime scene and preventing detection. The most important characteristic of the criminal process of Darkweb CSAM offending is the continuous focus on technical security and support. Moreover, Darkweb CSAM offending entails more than the sole act of the online exchange of CSAM. Forum members not only discuss the CSAM exchanged on the forum, but forum discussions also include topics such as societal engagement, politics and media. In addition to online marketplaces, Darkweb CSAM fora can therefore be characterized as social communities.

An important distinction within this criminal process, is that between keyplayer members and general forum members. Keyplayer members often have a higher forum status, such as moderator or administrator, but they could also be 'regular' forum members who carry out important forum tasks. Keyplayers are much more active,

and often play a role in services important to the forum's establishment, maintenance and management. Technically, they invest much of their time to keep the forum safe and secure. Finally, keyplayers can decide about strategic changes to the forum, for example about its size and structure, entry requirements or branding and marketing. Contrarily, general forum members primarily use the forum's infrastructure for the exchange of CSAM and sometimes to communicate with like-minded others, but their role and activity are not pivotal for the forum's existence and development. These general forum members, especially the new ones, continuously need to be tutored in basic technical practicalities by more experienced forum members.

The organization of CSAM crime on the Darkweb

In order to study the organization of CSAM crime on the Darkweb (in Chapter 3), the flexible conception of organized crime from Von Lampe (2016) was used. Von Lampe (2016) distinguishes three types of social structures – entrepreneurial, associational and illegal governance structures – that may influence organized criminal activity.

Darkweb CSAM fora can firstly be characterized as digital marketplaces, or entrepreneurial structures, in which illegal goods in the form of CSAM are voluntarily exchanged and where there is overlap between suppliers and demanders. Like for actors in other criminal markets, there is a risk of exposure by law enforcement, and the need for security leads offenders to screen and get familiar with their co-offenders. In this insecure environment, some level of illegal governance, or enforcement of forum rules and regulations and the resolution of (internal) conflicts, is imposed by forum administrators. In 'business meetings' between forum administrators, decisions about such rules and responses to conflicts are being made. Another important task for forum administrators is to decide about arrangements between forum members served to protect them from threats such as government involvement or other outside attacks to the forum. Darkweb CSAM offending is further embedded in the social network between offenders, or the associational structure, provided by the forum environment. The shared sexual interest in children is the social tie that binds forum members, leading to an identification with the community, to unwritten internal social rules of and to the use of 'slang'. Although monetary profit, physical violence and the desire to monopolize the market (some traditional characteristics of organized crime) are largely absent, the criminal process of Darkweb CSAM offending as well as the offenders involved in it show clear signs of entrepreneurial and social organization.

Offender profiles and behavioral patterns

In this dissertation, six developmental pathways that can be interpreted as latent offender profiles, were distinguished (in Chapter 4):

1. The 'lurkers'. The largest group of forum members shows very little forum activity. Members allocated to this group enter the forum during its later stages and mostly refrain from posting shortly after entering.
2. The 'browsers'. This group also typically enters the forum in its later stages and portrays limited posting activity. Still, their average number of posts is almost five times higher than that of 'lurkers' and also includes posts under the 'Girls hardcore' forum environment category.
3. The 'CSAM interested'. This group has a longer posting duration and a higher average total of posts. The posting career of this group is more versatile in nature, and members allocated to this group often post under the 'Girls hardcore' and 'Boys hardcore' environments. Over half of the members in this category are registered as 'full member' by the forum administrators, suggesting that they contribute to the forum on a regular basis.
4. The 'escalators'. This group shows an increase in posting frequency the longer members are active on the forum. Given the timing of their last post, were the forum not taken offline, many members in this group likely would have continued to contribute to the forum. One in ten of the members allocated to this group has a VIP status.
5. The 'vested members'. Members of this group first become active already during the early stages of the forum's evolution and have a higher average total of posts in various sections of the forum. Their posting behavior signals their affinity with the (social) community as a whole. The large majority of members allocated to this group enjoy a 'full member' status, and over one fifth even has a VIP status.
6. The 'managers'. This final group is characterized by a high posting frequency. Members of this group do not only post under the 'General discussion' topic; three quarters also post under the 'Information and technical safety' topic, indicating that they are involved in the management of the forum in some way. Members in this group show the longest posting career, and over half of them have an Administrator or VIP status.

The results of this dissertation indicate that a small minority of forum members is responsible for the vast majority of the public forum communication. In other words, a large majority of forum members can be characterized as 'lurkers'. However, whereas these members show no verbal forum activity at all, they are still behaviorally active on the website and browse through the various forum environments. Furthermore, 93.6% of the forum members, of whom many 'lurking' members, are found to actively download CSAM. By their mere presence on the forum, 'lurkers' therefore also create and facilitate the demand and the market for CSAM (Chapter 5).

Keyplayers on Darkweb CSAM fora

Keyplayers can be automatically identified from large forum datasets using network metrics, such as various centrality measures (Chapter 6). More specifically, using these network science methods and techniques, the more individualistic role of technical keyplayer members dealing with the forum's establishment, encryption and maintenance can be revealed. Furthermore, structural properties and distributions of the topics discussed in and members active on the fora can be illuminated in this way. Insights in the forum's anti-lurker and anti-law enforcement policies and new member application guidelines, could be deduced only from looking at the network structure of the data. Distinguishing offender profiles and behavioral patterns and identifying keyplayers ultimately aids in the identification of the most active and dangerous Darkweb CSAM offenders, giving direction to law enforcement's prioritization in CSAM crime investigations.

Trust establishment on Darkweb CSAM fora

Although the concept of trust is not equally important to all forum members, and likely has the greatest value in explaining the behavior of the most active forum members; it is an important concept to comprehend how and why forum members communicate about their deepest sexual feelings online. Moreover, trust, to some extent, is necessary for two or more offenders to be willing to cooperate (Von Lampe, 2016).

Criminological studies, discussed in Chapter 7, highlight that on Darkweb CSAM fora trust initially needs to be established under circumstances of anonymity, without knowing the true identity of one's co-offenders. Information about others, and hence their level of trustworthiness, is therefore limited. The process of trust establishment may be enhanced by creating a legitimate and reliable online identity. Members share information about cybercriminal attributes, which then become a personal brand and as such lay the foundation for an online reputation that is necessary for trust to be developed further. Trust can be maintained by being visible and portraying oneself as an active member. This includes engaging in frequent online activity, involving posting messages, contributing to open discussions, exchanging valuable advice and by generally being helpful, as well as by mentoring and offering feedback to others. In addition, humor, playfulness, and sarcasm are frequently used to invoke trustworthiness. To conclude, within the high-stake and high-risk environment of the Darkweb, the associational structures of the fora lay an important foundation for trust to be established and maintained.

Research strengths and limitations

The most important strength of this dissertation is its use of digital forensic artifacts. Online activities and behavior leave many more traces than do offline activities and behavior, offering a wealth of new data to be studied. This results in knowledge that could not – or at least not as reliably – be obtained without having access to these online data sources. Using Darkweb CSAM forum communication as a data source, enables to study a hard-to-reach population whose members are scarcely caught by law enforcement. Research into this hidden offender population through unobtrusive means allows to study the actual and 'natural' behavior of these individuals, thereby shedding unique light on concepts such as the criminal process, the criminal organization, as well as their motivation and trust establishment and maintenance. Moreover, using forum communication and forum member relationships as a data source enabled to study all forum members active on a Darkweb CSAM forum at once. In this world of big data, with Darkweb CSAM fora sometimes consisting of hundred thousands of members, sophisticated quantitative analyses become a necessary tool to gain insight into the fora's structures and to identify the most important forum members.

Despite their strengths, the studies included in this dissertation also have some limitations. The first is related to the generalizability of the results. Though varied in size and structure, the fora used for the current analyses do not constitute a representative sample of all Darkweb CSAM fora in a statistical sense. Moreover, some potential crucial data was excluded from the current studies. The data available only covered forum communication posted on the public areas of the fora. Therefore, there was no way of estimating the size and nature of the private communication going on between members. Moreover, although general estimates of the type of CSAM exchanged on the various Darkweb fora under investigation were conducted, this dissertation did not include an assessment of the actual CSAM exchanged or collected through the fora and it did not use the material exchanged as unit of analysis. Finally, because of its sensitive nature, some of the data could be analyzed by one author only, which may have led to single coder bias.

Academic and practical relevance

The use of digital forensic artifacts in this dissertation enabled to test theoretical constructs about criminal cooperation and the behavior of online sexual offenders, specifically for offenders active on Darkweb CSAM communities. Doing so, this dissertation offered a deeper as well as broader understanding of sexual offender theories, based on the growing population of online sexual offenders active on the Darkweb.

Although online activities and behavior leave many traces, and the accessibility of online data continues to grow, the possibilities to make this data available to researchers are still scant. This relates to challenges in making datasets containing material of an illegal nature available to researchers in a non-sensitive or derived way to allow them to study these data, as well as in challenges related to transform the often very large online datasets in analyzable formats. This dissertation relied on intensive cooperation with law enforcement personnel who have access to the relevant data and the clearance to view the actual material. The current research would simply have been impossible if such intensive cooperation could not be obtained. Having direct access to expertise within a specialized law enforcement unit, further enabled substantive interpretation of the results and hence, a deeper understanding of the data and the phenomenon under scrutiny. Therefore, in future research close cooperation between academic and law enforcement communities should be continued and reinforced.

From a practical point of view, this dissertation offers practical guidance and knowledge that may aid law enforcement in designing their investigations. Digital investigations, especially those on the hidden and anonymous Darkweb, are complex and time-consuming, and need a great deal of (technical) expertise and experience from law enforcement. Cooperation and close partnerships between academics and law enforcement communities are valuable in this regard. Law enforcement can provide academics with the most urgent questions to be answered in order for them to do their work effectively, and academics can feed law enforcement professionals with practical translations of the most recent research findings, including recommendations for a better practice. Finally, and most importantly, offending is inseparable from victimization. In other words, if there were no offenders, there would be no victims. Unfortunately, the impact of CSAM on its victims is often severe. Offender focused research, resulting in increased knowledge and recommendations for better intervention practice, ultimately contributes to a better protection of children.