Visible Traces, Hidden Processes: Parents' Understanding of Children's Digital Traces in Sweden

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Abstract

Children's everyday use of digital platforms generates information through both visible activities and less visible platform processes. As this information persists and accumulates, it contributes to broader digital footprints that may affect children over time. While previous research has examined children's digital privacy, online risks, and parental mediation, less is known about how parents understand these cumulative and partly invisible data processes. This study explores how parents in Sweden understand children's digital traces in the context of everyday platform use. Based on semi-structured interviews with twenty parents of children aged 11–14 and reflexive thematic analysis, the findings show that parental understanding was uneven rather than absent. Parents most readily understood visible and intentional activities, while background processes such as tracking, storage, and algorithmic data use were recognised in more general and uncertain terms. Parents also understood that digital information could persist, accumulate, circulate beyond its original context, and affect children in the future, but these concerns were primarily associated with visible content and social consequences. The findings reveal a gap between general awareness and actionable understanding: parents often recognised that data were being collected and retained but had difficulty translating this awareness into concrete guidance about less visible and long-term data processes. This suggests a need for communication that connects familiar platform activities with the underlying processes through which children's digital footprints are created and used.

Keywords

Digital traces, digital footprint, children's data, parental mediation, parental digital literacy, datafication, platform data, online privacy, risk communication, qualitative study

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1. Introduction

Children's everyday lives are increasingly shaped by digital environments, and many children develop a digital presence before they fully understand how online platforms work or what information may be revealed through their use. Through social interaction, communication, online services, and games, children leave digital traces across platforms [1, 2, 3, 4]. In this study, digital traces refer to specific pieces of information created through digital activity. These include visible traces, such as posts, messages, comments, likes, and shared content [5], as well as less visible traces generated through platform use, such as browsing histories, location data, IP addresses, device identifiers, and interaction data [6, 7]. These traces may in turn be collected, stored, connected, and reused through less visible platform processes such as tracking and profiling. When such traces persist, become connected, and are interpreted over time, they contribute to a broader digital footprint [5].

A central challenge is that digital traces are often produced through ordinary and socially accepted activities, such as messaging, browsing, watching videos, liking content, or using apps [3]. From the child's or parent's perspective, these activities may appear mainly social or practical. From a platform perspective, however, the same activities may generate information about behaviour, interests, routines, relationships, or preferences [7, 5]. The issue is not that every trace is harmful or that data creation is automatically problematic. Rather, ordinary activities may produce traces whose consequences are not visible when they are created, especially when data are stored, combined, and interpreted across

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contexts over time [1, 3, 5]. From a socio-technical perspective, these social activities and technical data processes are not separate: platform interfaces and infrastructures shape what users can see and control, while everyday user practices continuously generate the data on which these systems operate. Parents' understanding is therefore formed in interaction with platform architectures that make some traces visible while leaving other data processes largely opaque.

This makes digital traces difficult to assess in everyday parenting situations. Some risks are immediate and visible, such as unwanted contact, bullying, or the spread of shared content. Others are more indirect and long-term, including profiling, categorisation within digital systems, or reputational consequences when past content is interpreted in new social or professional contexts [8, 9, 10]. Such risks are often not tied to one specific action, but emerge through repeated activities, platform routines, and the accumulation of traces over time [5, 11]. As a result, children's platform use cannot always be guided through simple "do" and "do not" rules, because the significance of a trace may depend on how it is stored, connected, reused, or interpreted later.

The abstract and indirect character of digital traces is also relevant from a risk communication perspective. Research on risk communication shows that providing more information does not necessarily lead to better understanding when risks are indirect, uncertain, or difficult to relate to everyday experience [12]. Effective communication should therefore be grounded in the audience's existing understanding: how people already interpret the issue, what they find difficult to understand, and what assumptions shape their reasoning [13].

Existing research has provided insights into children's digital privacy, online risks, and children's own understandings of online data [14, 15, 1, 3]. Research on parental mediation has also shown that parents play a central role in guiding children's digital activities through communication, rules, boundaries, and shared understandings [16, 17, 18]. However, less is known about how parents themselves understand digital traces as everyday, cumulative, and partly invisible data processes. In particular, it remains unclear how parents understand what information remains after children's digital activities, how they reason about traces being created and aggregated over time, and how they connect these processes to possible risks or consequences in everyday parenting contexts.

The Swedish context is particularly relevant because children engage with digital platforms from an early age and increasingly use them independently during early adolescence, while parents continue to play an important role in guidance and mediation. Examining parents in this setting therefore provides insight into how parental understanding develops alongside children's increasingly autonomous platform use.

This study therefore examines parents' understanding of children's digital traces in relation to everyday platform use. It addresses the following research question (RQ):

RQ: *How do parents understand digital traces in relation to their children's everyday use of digital platforms?*

To answer this question, the study focuses on how parents describe what remains online after children's everyday digital activities, how they reason about the creation and persistence of these traces, and how they understand possible risks or consequences in everyday parenting contexts. The focus is therefore not on parents' technical knowledge per se, but on how they make sense of the relationship between visible platform activities and the less visible data infrastructures underlying them.

The remainder of the paper is organised as follows. Section 2 presents the conceptual background on digital traces, digital footprints, long-term risks, and parental understanding; Section 3 describes the research design and methods; Section 4 presents the findings; Section 5 discusses their implications for parental mediation, digital literacy, and risk communication; and Section 6 concludes with implications and directions for future research.

2. Background

This section approaches digital traces as a socio-technical phenomenon in which platform infrastructures, everyday user practices, and parental interpretations are mutually shaping. The section outlines the

concepts used to examine how parents understand children's digital traces. It first introduces digital traces and digital footprints, then discusses long-term data-related risks and explains why parents' understanding matters for guidance and risk communication.

2.1. Socio-technical dimensions of digital traces and digital footprints

Children create digital traces through everyday online activities from an early age. These traces include shared content, interactions, and data generated through digital platforms, and they may persist over time as part of a growing digital presence [1, 3]. Digital traces differ in how they are created and how visible they are to users. Some are technical or less visible, such as cookies, IP addresses, device identifiers, search history, viewed content, or interaction patterns [7, 19]. Others are more visible and directly observable, such as posts, comments, messages, and other forms of user interaction [5].

Digital traces are generated continuously through ordinary platform use and may be left behind intentionally or unintentionally through activities such as logins, online purchases, browsing, messaging, and content interaction [20, 5]. They may also be created or shared by others, for example, when someone tags, screenshots, or shares content involving the individual [21], meaning that traces are not always fully controlled by the person they concern [11]. Because these activities are often routine and socially accepted, the traces they produce may not be experienced as risky when they are created or when considered in isolation [3].

A digital footprint refers to the broader result of these accumulated traces. It includes not only the amount of information available online, but also how different traces are connected, interpreted, and used across digital environments [5, 11]. As individuals interact with platforms, their traces contribute to a growing, more detailed digital footprint [5, 11]. Importantly, traces are not stored or interpreted only as isolated pieces of information. They can be connected across platforms, contexts, time, and types of activity [5].

When digital traces are combined, separate actions may take on new meaning as part of a larger whole [11]. Even small interactions can contribute to inferences about users [22]. For example, liking content, searching for information, sharing posts, or engaging with platform recommendations may seem insignificant as individual actions, but when combined, such traces can reveal interests, behaviours, preferences, or routines [11, 5]. Routine activities such as shopping behaviour may similarly contribute to inferences about habits or personal patterns [7].

This broader process can be difficult to recognise in practice. Background data processes are often hard to observe [5, 7], while everyday activities are easier to understand as separate actions than as contributions to a cumulative digital footprint [5]. This may shape how parents interpret children's online activities, encouraging attention to visible actions and immediate concerns [18], while less visible accumulation and interpretation processes remain harder to connect to everyday reasoning [13]. Research on complex risk communication similarly suggests that abstract and partly invisible processes can be difficult to relate to everyday experience [12].

2.2. Long-term and uncertain risks

Long-term data-related risks are often difficult to understand because they may not appear as clear or immediate harms in everyday digital activities. Instead, possible consequences may emerge gradually through how traces are combined, interpreted, and reused over time [11]. Since these risks may be difficult to connect to specific everyday actions [3], it can be hard to classify particular activities as simply "safe" or "risky" [3, 5].

Such risks may involve future profiling or categorisation within digital systems [8], or reputational consequences when past content is interpreted in later social or professional contexts [9]. Their significance may depend less on one specific action than on how traces are interpreted across contexts [11]. This uncertainty can make it difficult for parents to know when concern is needed or how to reason about risks in everyday situations [13]. At the same time, parental mediation has often focused

on more concrete and immediate concerns, such as peer interaction and contact-related risks [17], which may contribute to long-term data-related risks receiving less attention [18].

These risks, therefore, require ongoing attention and judgement [23]. Ordinary digital activities may be difficult for parents to assess on their own [3], because their significance depends on how they contribute to broader processes over time [11]. Individual actions are therefore relevant not only in the moment, but also as possible contributions to a broader digital footprint and to processes of profiling or categorisation [5, 8].

2.3. Parental mediation within opaque platform systems

Parents play a central role in children's digital lives through everyday decisions about platform use, boundaries, and guidance [17]. Parents' own sharing practices may also contribute to children's digital footprints by creating and circulating information about them online [14, 15]. Yet children's everyday digital activities are embedded in data-driven environments where data are continuously generated about routines and behaviours [8]. Because these processes often remain difficult to observe [3], parents may need to guide children without fully understanding how everyday activities contribute to a digital footprint over time [3, 8].

Research on parental mediation shows that parents often manage children's digital activities through communication, rules, and shared understandings rather than solely through technical controls [17]. These practices are shaped by parents' risk perceptions, digital skills, and previous risk experiences [18]. However, everyday communication and rule-setting do not necessarily help parents understand the less visible processes through which digital traces are generated, stored, combined, and interpreted over time [1]. This matters for risk communication, since abstract data-related risks may be difficult to communicate unless they are connected to parents' own assumptions and everyday perspectives [12, 13].

Existing research has largely examined how parents manage children's digital lives, while research on digital traces has often focused on children's understanding of data and privacy [17, 3]. Less is known about how parents themselves understand and reason about digital traces and related risks in practice. This gap is important because parents' own understandings may shape how they guide children and how communication about digital traces should be designed.

2.4. Synthesis

The literature shows that digital traces differ in visibility, origin, and perceived controllability. Some traces are visible and connected to children's own actions, while others are less visible and generated through platform processes such as tracking, storage, or behavioural data collection. Traces may also be created through other people's actions, such as tagging, screenshotting, or sharing content. Over time, these traces can accumulate into a broader digital footprint, where information becomes more meaningful when stored, connected, or interpreted together.

The literature also shows that related risks are often long-term, uncertain, and difficult to connect to specific everyday activities. This matters because parents are expected to guide children in digital environments where many data processes are not directly visible. Concepts such as visible and less visible traces, active, passive, and interpersonal trace generation, accumulation, permanence, and long-term risk, therefore, provide a conceptual basis for analysing how parents make sense of digital traces in everyday situations.

Taken together, these concepts support a socio-technical framing of children's digital traces, in which technical systems and infrastructures are considered in relation to the social practices and interpretations surrounding their use [24]. In this study, this perspective is applied to examine how what platforms make visible, understandable, and controllable shapes what parents can recognise, explain, and mediate.

3. Method

This section describes the qualitative design, participant recruitment, interview procedure, data analysis, and measures taken to support the trustworthiness of the study.

3.1. Research design and interview guide

The study used a qualitative exploratory design to examine how parents understand and reason about children's digital traces in everyday platform use. This approach was suitable because the research question concerned parents' own interpretations, uncertainties, and assumptions, rather than predefined attitudes or behaviours. Semi-structured interviews were used as the main method of data collection because they allowed the interviews to follow themes related to the research question while leaving room for clarification, follow-up questions, and unexpected perspectives [13, 25]. This was important because digital traces and related data practices may be difficult to observe and reason about in everyday life [3, 5].

The interview guide was developed from the research question and informed by literature on digital traces, digital footprints, long-term data-related risks, and parental mediation. The questions addressed what parents believed remains online after children's everyday digital activities, how they understood visible and less visible forms of trace generation, how they reasoned about traces being connected over time, and how they understood possible risks or consequences [5, 7, 11, 26, 17]. The questions were open-ended and formulated in everyday language to avoid imposing technical terminology on participants, in line with the mental models approach [13]. The guide moved from concrete examples of children's platform use to more reflective questions about accumulation, persistence, uncertainty, and long-term consequences [17, 12]. The complete interview guide is provided in Appendix A.

Three pilot interviews were conducted before the main data collection. They were used to test whether the questions were understandable, sufficiently concrete, and able to support discussion of an abstract topic. The pilot interviews led to minor wording changes, additional everyday examples, and the decision to introduce the term "digital traces", once participants had first discussed what may remain online in their own words. Pilot data were not included in the final analysis.

3.2. Participants and recruitment

Participants were parents in Sweden who were legal guardians of at least one child aged 11–14 using digital platforms, such as social media or online gaming environments. This age range was selected because children's digital platform use often becomes more independent during early adolescence, while parents may still play an active role in guidance and decision-making. Many children receive their first smartphone around 12 years of age [27], and approximately 50% of Swedish children aged 9–12 use social media despite the common age limit of 13 years [28]. Since parental insight and direct control tend to decrease as children grow older [29], the upper age limit of 14 was chosen to focus on a period where parental involvement is still likely.

Participants were recruited through the researchers' contact networks, local schools, a football team of 13-year-olds where one researcher was a coach, and a youth centre where one researcher worked part-time. Convenience sampling was used because the study aimed for in-depth understanding rather than statistical representation. The adequacy of the sample size was considered in relation to information power, which suggests that qualitative samples may require fewer participants when the study has a focused aim, a specific sample, strong interview dialogue, an established theoretical basis, and an in-depth analysis strategy [30]. In the present study, the focused research question, the specific participant group, and the targeted semi-structured interviews provided information-rich material for the analysis. This recruitment strategy may have introduced bias, as parents who were more engaged in their children's digital lives may have been more likely to participate or may have presented themselves as particularly attentive. The findings are therefore interpreted as accounts of participating parents' understandings, not as direct measures of parenting practices or statistically generalisable results.

Table 1
Overview of participant demographics

Participants	Female	Male	Age range	Interview language
20 parents	13	7	33–51 years	18 Swedish, 2 English

3.3. Interview procedure and ethics

All interviews were conducted in person and held in Swedish or English depending on the participant's preference. Interviews lasted approximately 20 minutes. The focused interview length was a deliberate design choice, allowing the study to address a specific set of questions while limiting participant burden. Interviews took place in quiet rooms, such as offices or other available spaces where the participant and interviewer could speak without disturbance. With participants' consent, the interviews were audio recorded, transcribed, and anonymised. A denaturalised transcription approach was used, prioritising semantic content over speech features such as filler words and non-substantive repetitions. Interviews conducted in Swedish were transcribed in Swedish and subsequently translated into English by bilingual members of the research team before data analysis. The translated transcripts formed the basis for the thematic analysis described in Section 3.4.

Before each interview, participants received information about the study purpose, voluntary participation, confidentiality, and their right to skip questions, withdraw, or have their answers removed. Detailed examples of digital traces were avoided before the interview to minimise priming of participants' responses. Participants were also told that there were no right or wrong answers, to reduce evaluative pressure, particularly because some participants were recruited through contexts in which the researchers had existing connections. Written consent was obtained before the interviews. Audio recordings and transcripts were stored securely, and the audio recordings were deleted after the analysis was completed.

3.4. Data analysis and reflexive rigour

The data were analysed using reflexive thematic analysis. This approach was suitable because the study aimed to identify patterns of meaning in how parents understood digital traces, while acknowledging the researchers' active role in interpreting the data [31, 32, 33, 34]. The analysis was theory-informed but remained grounded in participants' accounts. Concepts from the literature, such as visible and less visible traces, active and passive trace generation, accumulation, permanence, reach, and long-term risk, functioned as sensitising concepts rather than fixed coding categories.

The analysis followed Braun and Clarke's six-phase approach [33, 34]. First, transcripts were checked against the recordings and read several times to build familiarity with the material. Each interview was summarised, and initial codes were generated by labelling meaningful segments related to the research question. Codes were then compared across interviews and grouped into preliminary themes and sub-themes. Themes were reviewed against the original transcripts, refined, and organised to capture recurring patterns in how parents defined digital traces, understood trace creation, reasoned about digital footprints, and described permanence and reach.

Several measures were taken to support reflexive rigour. The interview guide was grounded in previous research and refined through pilot interviews. Open-ended questions allowed participants to discuss the topic in their own words rather than through predefined technical categories. During analysis, transcripts were reviewed repeatedly, notes were taken throughout coding and theme development, and themes were checked against the original material. Direct quotations are used in the results to ground the analysis in participants' accounts. Since the study is qualitative, interpretative, and based on a limited convenience sample, the findings should be understood as analytical insights into participating parents' understandings rather than statistically generalisable results.

4. Results

The thematic analysis identified four interrelated analytical themes and one cross-theme interpretation, summarised in Table 2. The themes capture how parents understood digital traces in terms of visibility, trace creation and perceived control, accumulation and permanence, and reach. Across these themes, the analysis showed that parents' understanding was uneven rather than absent.

Table 2
Overview of analytical themes and cross-theme interpretation

Theme / interpretation	Analytical focus
1: Visibility of digital traces	Captures how parents distinguish between traces they can see and name, such as posts, messages, comments, likes, photos, and shared content, and less visible traces, such as tracking, platform storage, search history, recommendations, and data collection.
2: Trace creation and perceived control	Captures how parents understand traces as created through children's active behaviour, automatic platform or device processes, and other people's actions. This theme also captures how trace creation is connected to responsibility, control, and parental guidance.
3: Accumulation, permanence, and future consequences	Captures how parents understand that traces can build up into a broader digital footprint, persist over time, and potentially affect children in the future, especially through social or reputational consequences.
4: Reach and access to digital traces	Captures how parents reason about who or what may access children's traces. Parents mainly understand reach through social visibility, such as friends, followers, strangers, predators, or hackers, while platform, commercial, and infrastructural access is less central in their reasoning.
Cross-theme: Parental understanding	Captures the main pattern across the themes: parents show general awareness of digital traces, but their understanding is shaped by visibility, perceived control, everyday relevance, and whether the issue can be translated into concrete parenting guidance.

4.1. Visible traces were easier to recognise and explain

Parents most readily defined digital traces through platform activities they could see and name. Posts, comments, photos, videos, messages, likes, saved content, watched videos, and followed accounts were common examples. These traces were easy to describe because they appeared as visible outcomes of children's actions and could be connected to familiar platform interfaces. As one parent explained:
"Comments, likes, what you save and things like that on, for example, TikTok... what videos you watch, who you talk to, who you follow... that's what I think of." — Participant 7

This focus on visible traces did not mean that parents were unaware of less visible forms of data generation. Many also mentioned data collection, search history, watch behaviour, recommendations, location data, tracking, and platform storage. However, these traces were usually described in broader, less certain terms. Parents often recognised them through their effects, such as targeted advertising or personalised recommendations, rather than through a clear understanding of how the data were generated, stored, or used:
"I mainly think the information is used for advertising or what the child gets to see in the app or online, and maybe that can shape the child without you noticing it." — Participant 7

Figure 1 provides a descriptive overview of the types of digital traces identified across participants' accounts. It is included to illustrate the breadth of the material and was not used to determine theme importance or prevalence.

Overall, visibility acted as a filter for parental understanding. Traces that appeared through platform interfaces were easier to define, explain, and connect to children's behaviour. Less visible traces were

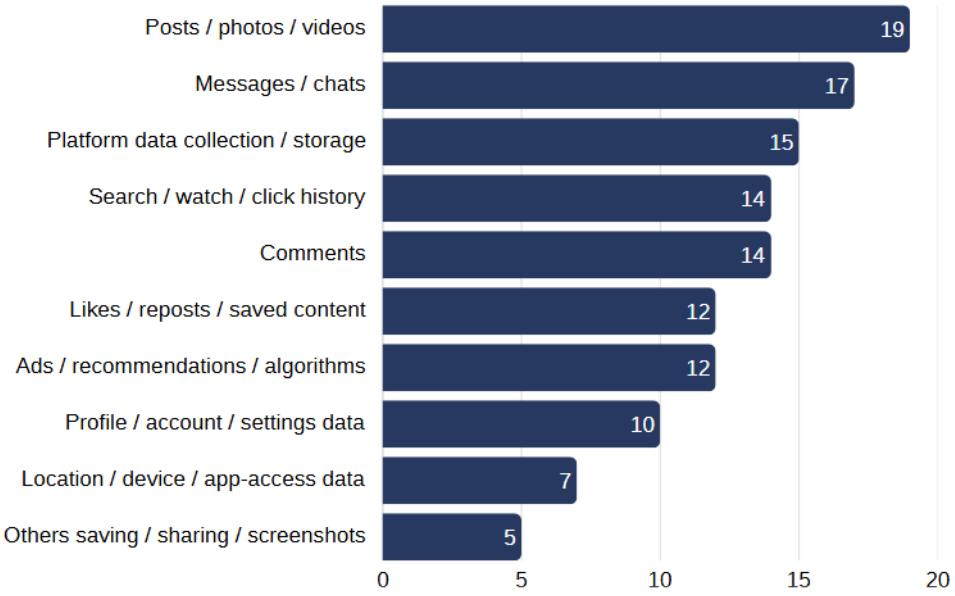


Figure 1: Digital traces and related data processes mentioned by parents

not absent from parents' reasoning, but they were less concrete and less easily connected to everyday parenting situations.

4.2. Trace creation was understood through control and responsibility

Parents' accounts also differed in how they understood the creation of digital traces. The clearest form was active generation, in which the child deliberately engages in online activities, such as posting, messaging, commenting, liking, or uploading a photo. Parents often described this in terms of direct logic: if the child writes, sends, posts, or shares something, it leaves a trace.

"Things you post, pictures or texts, or that you have written on some forum, sent a message... everything you do on the phone or a computer, really. All of this lives on, online." — Participant 15

Active generation mattered because it could be linked to guidance and responsibility. When traces were understood as the result of children's deliberate actions, parents could respond through rules and advice, such as encouraging children to think before posting, to avoid sharing personal information, or to be careful about what they write.

Parents also recognised passive generation, in which traces are produced automatically by platform or device processes. They mentioned search history, tracking, app permissions, location data, platform storage, and background data collection. However, passive generation was usually described as a general background process rather than as a set of specific mechanisms:

"Everything he searches for is probably saved and tracked... All comments that are left are saved. There's probably evidence of everything you do online." — Participant 2

Interpersonal generation was less prominent. Fewer parents described traces as being created or spread through other people's actions, such as tagging, screenshotting, mentioning, or sharing material involving the child. When it was mentioned, it was usually framed in terms of circulation, persistence, and loss of control rather than as a distinct form of trace creation.

Taken together, parents' accounts suggest a hierarchy of trace awareness. Active traces were easiest to explain and connect to guidance. Passive traces were recognised but remained vague. Interpersonal traces were least frequently discussed, even though they point to an important limit of individual control: children do not fully control the traces that concern them.

4.3. Digital footprints were linked to accumulation, permanence, and future consequences

Parents understood the digital footprint as something that builds up over time, contributes to an online identity, and may affect the child in the future. Many parents described how separate pieces of information could be combined and become more revealing:
"If you post a comment on one platform, it's saved there, and then you can go to their profiles on other platforms and find more posts... and that can be put together." — Participant 7

This shows that parents could reason about accumulation, but usually through concrete examples of visible traces being combined. Parents less often connected this accumulation to broader data processes such as profiling, commercial use, algorithmic inference, or platform-based data circulation. The digital footprint was therefore often understood as a visible and socially interpretable representation of the child, rather than as an infrastructural or commercial data process.

Permanence was one of the clearest concerns across the interviews. When discussing visible content, such as posts, photos, comments, and messages, many parents assumed that once something is shared online, it may never fully disappear:
"It sounds a bit cliché, but I think that everything remains online forever. You know yourself that things you posted 10 years ago are still there in the feed and profile." — Participant 15

At the same time, parents recognised that deletion may reduce visibility without guaranteeing full removal. Traces could remain through screenshots, platform storage, backups, or other users' devices:
"If you delete them, they won't be able to find them in your profile... but yeah, it's always a possibility that someone else saved them, or that they are stored somewhere on the platform." — Participant 14

Parents, therefore, understood permanence less as a technical question of whether data still exists and more as a practical concern about whether content could resurface, circulate, or be judged later. Future consequences were often linked to visible traces and familiar scenarios, such as old posts that affect how a child is perceived at school, work, or in social situations. Less visible and routine activities, such as watching videos, liking content, browsing, or granting app permissions, were less often associated with long-term consequences.

4.4. Reach was understood mainly through social visibility

Parents' understanding of who could access children's digital traces was mixed. Some described broad or uncontrollable reach, including strangers, predators, hackers, commercial actors, platform owners, or the wider public. These concerns were often expressed through concrete risk scenarios, such as strangers identifying a child's location or old content being misused:
"I mainly think about older people, for example, who either stalk or try to find information about children online, that feels very creepy, and it's clear that information from different places can be combined for that." — Participant 8

Other parents understood reach as more limited. They associated children's digital traces with bounded audiences, such as friends, followers, family members, or people with special technical resources. For these parents, ordinary platform use was often seen as relatively private unless content was deliberately shared publicly or involved exceptional circumstances:
"There is data left in the app, stored in the app's database. So not that it is just open for everyone, but that it is saved somewhere." — Participant 11

Figure 2 provides a descriptive overview of the actors and contexts that appeared in participants' accounts of digital footprint reach. As with Figure 1, it illustrates the material but was not used to determine theme importance or prevalence.

A key pattern is that reach was usually understood through social visibility: who might see, share, misuse, or judge content. Platform-level access and data handling, including storage, reuse, commercial access, algorithmic profiling, or data circulation across systems, were less central in parents' accounts. This can be understood as a socio-technical dissonance between the visible social boundaries presented by platforms and the less visible infrastructures through which data may persist, circulate, and be

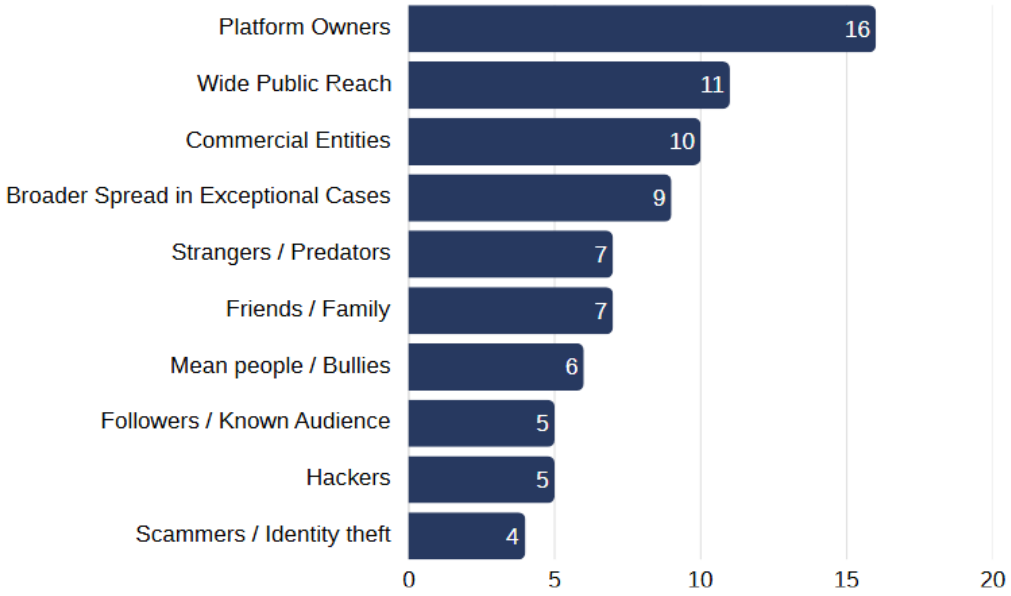


Figure 2: Actors and contexts mentioned in relation to digital footprint reach

reused beyond those boundaries. This created a tension between permanence and reach. Parents could believe that something remains online, while not necessarily seeing it as likely to circulate widely or become relevant outside the original context.

4.5. Synthesis: parental understanding was uneven rather than absent

Across the interviews, parents' understanding of children's digital traces was partial but not absent. Parents recognised visible content, permanence, accumulation, and possible future consequences. They also showed some awareness of less visible data collection and platform storage. However, these elements were not always connected into a broader understanding of how traces are created, stored, combined, circulated, and used over time.

The main pattern is that parents understood digital traces through everyday platform experience. Traces connected to familiar actions and visible situations were easier to recognise, explain, and treat as relevant. In contrast, passive, commercial, infrastructural, and long-term data processes remained more abstract. This created a gap between general awareness and actionable understanding: parents may know that data are collected in the background, while the opacity and complexity of platform infrastructures make it difficult to understand how these processes operate or translate such awareness into everyday guidance.

The findings, therefore, suggest that the challenge is not simply a lack of parental awareness. Rather, parents' understanding is shaped by what platform infrastructures make visible, controllable, and meaningful in everyday use. Visible traces support concrete reasoning and guidance, while less visible and long-term data processes are harder to connect to everyday parenting situations.

5. Discussion

This section discusses what the findings suggest about parents' understanding of children's digital traces. The main contribution is that parents' understanding was not simply absent or incorrect, but shaped by what digital platforms make visible, controllable, and meaningful in everyday use. This has implications for parental mediation, digital literacy, and risk communication.

5.1. Visibility and actionable understanding

The findings show that parents mainly understood digital traces through visible, interface-level actions, such as posts, messages, comments, likes, and shared content. This aligns with research showing that platform interfaces make some forms of data visible while rendering technical and infrastructural data processes less accessible to ordinary users [6]. The present study adds that this visibility also shapes parents' practical reasoning. Parents did not simply lack awareness of less visible traces; rather, their awareness was often general, uncertain, and difficult to connect to concrete parenting decisions. This reflects a socio-technical asymmetry between visible platform affordances, such as posts, likes, and feeds, and less visible data infrastructures, such as tracking, storage, and profiling. What parents can understand and act upon is therefore partly shaped by what the system makes observable.

This finding extends research on parental mediation. Livingstone and Helsper [17] showed that parents often guide children through communication, rules, and shared understandings. However, such strategies are easier to apply when the issue is linked to identifiable actions, such as posting a photo or sharing personal information. Digital traces are more difficult to mediate because they are often produced through ordinary, repeated, and partly invisible platform activity [5]. As a result, parents' guidance vocabulary remained oriented toward visible outputs rather than the data-generating processes behind them.

The findings, therefore, complicate assumptions about parental digital literacy. Previous research shows that parental mediation is shaped by digital skills, risk perception, and previous risk experience [18]. This study suggests that awareness alone is not enough. Some parents knew that platforms collect data, store information, or generate recommendations, but they described these processes in ways that were difficult to translate into guidance. What matters is whether parents have actionable mental models: understandings concrete enough to connect everyday platform activities to possible consequences and parenting decisions [13]. This suggests a socio-technical mismatch: the complexity and opacity of the underlying data processes limit what parents can infer from the visible platform interface and, therefore, what they can translate into everyday guidance. The resulting transparency gap is therefore not solely a matter of parental knowledge, but also of system opacity.

5.2. Long-term risk and the limits of familiar risk narratives

A second finding concerns the gap between recognising long-term risk in principle and connecting it to ordinary platform use. Parents could imagine future consequences, such as old content resurfacing, strangers misusing information, or future employers judging past posts. However, these risks were often tied to specific and familiar scenarios rather than to routine activities such as watching videos, liking content, using apps, allowing location access, or interacting with recommendation systems.

This pattern is consistent with research showing that cumulative data risks are difficult to perceive because they emerge through aggregation across contexts rather than from one clearly risky action [11]. Parents in this study sometimes described traces as being "combined" or "put together," but they more often understood the endpoint of the process, such as a profile, reputation, or permanent record, than the mechanisms that produce it. This reflects a temporal and contextual mismatch: parents tended to reason about future consequences through identifiable actions and outcomes, while platform data processes may accumulate and connect information across activities, contexts, and time. This aligns with Mascheroni's [8] argument that children's everyday activities continuously produce data, while both children and parents may lack insight into how these data are collected and used.

This has implications for risk communication. Fischhoff [12] argues that effective communication should start from the audience's existing mental models while also addressing gaps and misconceptions. The findings suggest that communication aimed at parents should not only repeat warnings about posting behaviour. Such warnings address visible traces, but not the less visible processes through which ordinary activities contribute to profiling, aggregation, and data circulation over time. Communication should instead help parents connect familiar platform activities to underlying data processes and possible long-term consequences [3].

5.3. Platform logic and the scope of parental mediation

The findings also show that parents mainly reasoned about reach through social visibility: who can see a post, whether a profile is public or private, whether followers are known, or whether strangers might misuse visible information. This reflects the contact- and content-oriented concerns that have been central in research on children's online risks and parental mediation [14, 17]. However, it also reveals a gap. Parents were less likely to reason about reach through platform infrastructures, including storage, commercial access, profiling, data reuse, and algorithmic inference.

This pattern is consistent with Neumayer et al.'s [6] distinction between visible social data and less visible technical data processes. It also reflects broader concerns about online data collection, where companies collect and process large amounts of data through platforms and apps in ways that are not always visible to users [7]. In this study, parents' understanding of "who has access" was often aligned with the visible social layer of platforms: friends, followers, strangers, or public audiences. Platform owners, commercial actors, and data infrastructures were recognised by some participants, but they were less central to everyday reasoning. This also reflects an information asymmetry: platforms have extensive access to behavioural data and processing mechanisms, while parents have limited visibility into how these processes operate beyond the visible interface.

This matters because parental mediation may become too narrowly focused if exposure is understood mainly as social visibility. Advice about privacy settings, public profiles, and stranger-related risks remains important, but it does not address risks linked to data retention, commercial profiling, or algorithmic inference from behavioural traces. The findings, therefore, suggest that parental mediation theory should more explicitly account for data-related risks as a distinct category, not reducible to contact or content risks. This should not be understood primarily as a deficit in parental skills, but as a consequence of the limited visibility and asymmetry of contemporary data infrastructures, which constrain what parents can reasonably observe and mediate.

5.4. Limitations

Several limitations should be considered. The study was based on interviews with 20 parents in Sweden, many recruited through researcher networks and local contexts. This may have influenced who participated and how participants presented their experiences. Parents who were more engaged in their children's digital lives may have been more likely to take part, and the sample did not allow systematic comparison between demographic groups, such as educational background, age, or level of digital experience.

The study also relied on self-reported accounts rather than observations of parenting practices or independent assessment of participants' knowledge of platform mechanisms. The findings therefore reflect perceived understanding, which may differ from actual behaviour or technical awareness. Most interviews were conducted in Swedish and translated into English for analysis, which may have affected some nuances. Finally, the study focused on parents of children aged 11–14, so the findings may not apply in the same way to parents of younger children or older adolescents.

6. Conclusions

This study examined how parents understand digital traces in relation to their children's everyday use of digital platforms. The findings show that parents' understanding was uneven rather than absent. Parents recognised many forms of digital traces, but reasoned about them with different levels of detail depending on how visible, familiar, and actionable they appeared. Their understanding was strongest for traces associated with visible, intentional platform actions, such as posting, messaging, commenting, liking, or sharing content. Less visible and system-driven traces, including platform storage, tracking, recommendations, search history, and data collection, were also recognised, but were described in broader and more uncertain terms.

A central conclusion is that visibility functioned as a filter for parental understanding. Traces that could be seen were easier to define, connect to the child's behaviour, and translate into guidance. Parents also understood that digital traces could persist, accumulate, and affect children in the future, particularly through reputational or social consequences. However, these consequences were usually linked to visible or clearly problematic actions, such as posting inappropriate content, rather than to ordinary platform activities such as browsing, watching videos, liking content, using apps, or allowing platform permissions.

The findings also show that parents' understanding of reach and risk was mainly shaped by visible and social forms of access. Parents often reasoned about who might see a post, whether the content was public, or whether strangers, predators, hackers, or others could misuse visible information. Automated, commercial, and infrastructural access to data received less attention. The challenge is therefore not simply that parents lack awareness of digital traces, but that general awareness is difficult to connect to the less visible processes through which traces are created, stored, combined, circulated, and used over time.

6.1. Implications

The findings have implications for how information about children's digital traces is communicated to parents. The study did not evaluate a specific communication approach, so these implications should be understood as directions for audience-centred communication rather than as an evaluated model [12, 13].

Communication about digital traces could begin from familiar situations that parents already use to reason about children's platform use, such as posting photos, sending messages, watching videos, using apps, changing privacy settings, or allowing location access. These everyday examples could then be used to explain less visible processes, including how traces are generated, stored, combined, and accumulated into a broader digital footprint.

The findings also suggest that parents need support in connecting long-term and less visible data processes to ordinary platform activities. Many parents recognised that digital traces could persist or have future consequences, but these concerns were often framed as distant, exceptional, or difficult to connect to everyday use. Supporting parents may therefore require not only more information, but explanations that make hidden data processes concrete, situated, and actionable.

6.2. Future research

Future research could examine parents' understanding of digital traces across broader and more diverse samples, including parents with different demographic backgrounds, digital skills, and experiences of children's online risks. It would also be relevant to study parents of children in other age groups, since parental involvement and children's digital independence may differ across childhood and adolescence.

Further research should also examine how parents reason about digital traces in practice. Since this study relied on interview accounts, future studies could use observations, diaries, or parent-child discussions to examine how parents actually talk about and respond to digital traces in everyday situations. Finally, future work could evaluate whether concrete examples, scenarios, or visual explanations help parents connect familiar platform activities to less visible processes such as tracking, profiling, platform storage, and data accumulation over time.

Overall, this study shows that parents are not unaware of children's digital traces; rather, their understanding is uneven and shaped by what is visible, familiar, and actionable in everyday use of platforms. Parents can readily reason about visible content and its social consequences, while less visible processes such as tracking, profiling, storage, and data accumulation remain more difficult to connect to concrete parenting guidance. Supporting parents therefore requires more than raising awareness of digital traces: it requires making these hidden and cumulative data processes understandable and relevant to everyday parental mediation.

Declaration on Generative AI

During the preparation of this work, the authors used ChatGPT 5.5 and Grammarly to perform grammar and spelling checks, enhance content, and improve writing style. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

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A. Appendix: Interview Guide

Before we start, I just want to state that there are no right or wrong answers in this interview. We are interested in how you think and reason, not in testing your knowledge. You are free to skip any question if you prefer not to answer, and you can stop the interview at any time. The goal is simply to understand your perspective, and there is no pressure to answer.

Short background questions for context

What kind of digital devices does your child usually use?
What kinds of digital platforms or applications does your child use most often?

Section 1

Question 1
Is there any situation in everyday life, for example, when your child is using Snapchat, where you feel unsure about what happens to the information shared by or about your child online?
Use an example based on the platforms the child uses most often.
Potential follow-up probes:

- Do you have a specific example? If so, can you describe that situation?
- What made you feel unsure?
- How did you try to handle or understand the situation?

Question 2
When your child is active online, for example, posting something, chatting, playing a game, or searching for something online, do you think anything about your child remains online afterward?
Potential follow-up probes:

- Can you describe what you have in mind when you say that something remains?
- Do you think this happens on all platforms, or only some?
- Do you think this can affect your child in any way? If so, how?

Term clarification

Introducing the term "traces"
So far, we have discussed how something about your child may remain online after using digital platforms, such as Snapchat. In the following questions, I will refer to what remains online about or from your child as "traces".
Question 3
When you think about traces that remain online about your child, are you mainly thinking about things your child actively shares, like posts or messages, or do you think other types of activity might also leave something behind?
Potential follow-up probes:

- What kinds of activities do you think might leave something behind?
- Can you explain how you think these traces are created?

Section 2

Question 4
Do you think traces about your child after activities are separate pieces of information, or do you think there may be connections between different traces over time?
Potential follow-up probes:

- Can you describe how you think traces can be combined?
- Do you think all traces can be combined? Or only specific traces?
- How do you think this could affect your child?

Question 5
When you think about traces that remain online about your child, do you think these traces stay the same over time, or can they change in some way in the long term?
Potential follow-up probes:

- Can you describe how you think they could change?
- Do you think that change can affect the impact on your child?
- Can you describe how you think it might affect your child?

Section 3

Question 6
Are there aspects of the traces that remain online about your child that you find difficult to understand?
Potential follow-up probes:

- What feels unclear?
- Could it, for example, be about how traces are created, stored, combined, or used?

Question 7
Is there anything else you would like to add?