

# The Data Dilemma: Google Analytics' Untapped Potential and Web Data Literacy

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## Abstract

Since its introduction in 2005, Google Analytics has become the most popular web analytics system due to free availability, easy installation, and the power of the Google brand. However, despite the abundance of freely available training resources and the obvious need to understand and optimize the user experience, the majority of Google Analytics users do not leverage this tool in a useful way. Given that data literacy has become a key competence in a more and more data-driven world, the question arises why users fail to get meaningful insights from their data when all necessary resources for effective use are readily available.

According to previous research, Google Analytics users assume value in the data and fail to find it, but it has been unclear until now why this is the case. This work is based on expert interviews with Google Analytics consultants and trainers in Germany and Austria that have been consulting hundreds of users. Using a widely referenced data literacy framework, these experts assessed their clients' data competence and elaborated on the reasons for any shortcomings. While none of the consultants and trainers had been using a formal data literacy framework before, all of them had very similar approaches to examine their clients' data analysis capabilities and help them to derive value from data. Not only do users have inflated expectations that data literacy is built into Google Analytics, they also have a hard time even asking questions that can be answered with data. The findings of our research contribute to the augmentation of existing data literacy frameworks, in particular for the workforce.

## Keywords

web analytics, google analytics, digital analytics, data literacy, user experience management

## 1. Introduction

The Digital Analytics association defines web analytics as “the collection, measurement, analysis, and reporting of internet data” [1]. Understanding and optimizing user experience through web analytics is crucial across a variety of website types, including eCommerce, media, government, corporate, social communities, educational, and personal websites [2]. Insights from web analytics help businesses understand the effectiveness of their marketing campaigns and the website itself, improving the return on investment and the contribution to business overall [3, 4, 5]. For non-eCommerce websites, access to web analytics data allows authors to understand what content is preferred, where users drop off, or the demographics of their users to finetune the persona they are writing for [6, 7, 8]. Not doing web analytics right can result in a lack of

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*Proceedings of the LWDA 2023 Workshops: BIA, DB, IR, KDML and WM. Marburg, Germany, 09.-11. October 2023.*

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CEUR Workshop Proceedings (CEUR-WS.org)

understanding of customer needs, leading to a poor user experience [9], which can decrease customer satisfaction and loyalty [10]. Businesses that do not effectively use web analytics may allocate resources to areas that do not generate sufficient returns and let them fall behind competitors who leverage data-driven insights to optimize their strategies and operations, ultimately leading to a loss of market share [11]. Given this, companies and individuals with a website should be highly motivated to leverage their web analytics tool, understand the data they collect, and generate actionable insights.

The web analytics market is dominated by Google Analytics with a market share of up to 55.2%, depending on the measurement approach [12, 13]. Previous work has shown, however, that not all Google Analytics users find it easy to derive insights from the system [14]. In fact, the vast majority of Google Analytics implementations reveals a lack of competence of its users [15]. While non-transactional site owners had the impression that Google Analytics is not made for them due to Google's focus on marketing [16], the reasons behind this perception for owners of other types of sites have remained unclear until now. Google has been adding more and more content to their help database, an abundance of free tutorials, YouTube videos and podcasts exists, and for those who can afford it, there are books and professional training courses.

To our knowledge, our contribution is the first study of the reasons why web analytics users find it so difficult to gain insights from the data, based on interviews with six web analytics consultants and trainers in Austria and Germany who have worked with hundreds of clients. As this group helps users to leverage their data, they also have insights into the data literacy levels of their clients and the problems that they encounter.

This paper is organized as follows: In Section 2, we provide an overview of web analytics and data literacy. Section 3 describes the setup of our interviews and analysis process, and Section 4 details the results. We close with a discussion and thoughts about future research in Section 5.

## **2. Background and Related Work**

### **2.1. Web Analytics**

Before Google acquired Urchin in 2005 and offered it as Google Analytics for free a few months later [17, 18], web analytics in its first era required either a substantial monetary investment, technical expertise or both in order to get meaningful data [15]. With Google Analytics, every website owner had access to advanced reports for free, just by including a little piece of code in the HTML. This second era of democratization of web analytics was not seen without concerns as real insights require more than just placing code on a website [19].

Google Analytics has been enriched with new features and companion tools such as the Google Tag Manager since its introduction in 2005 [20, 21, 22, 23, 24]. This, however, has not made it easier for its users to work with their data. Sleeper et al. conducted 18 interviews with owners of non-transactional websites in 2014 and reported that some participants felt overwhelmed by the data provided by Google Analytics, recommending that owners of such sites should be taken into account in the design of analytics tools [16]. Google Analytics users in the small and medium enterprises (SME) segment found it difficult to understand their data and rather played with it, according to a study conducted by Petersen and Martin with six participants in 2015 [14]. Zumstein et al. also identified problems in the adoption of web

analytics in the SME segment in 2022 [25]. In fact, most of the Google Analytics installations in 2022 did not go beyond a standard installation and were unlikely to provide actionable insights to website owners [15]. The third era of web analytics was driven by implementation of the General Data Protection Regulation (GDPR) in 2018, forcing website owners to modify their site in order to request European users' consent for tracking by Google Analytics and other tools. However, the vast majority of cookie banners do not work as expected [26], thus exposing the same technical shortcomings that website owners demonstrate in their Google Analytics implementations. Web analytics users thus have emerged into a two-class society in which a minority has access to experts to exploit tools such as Google Analytics whereas the majority of site owners is unable to leverage the benefits of this free tool [15].

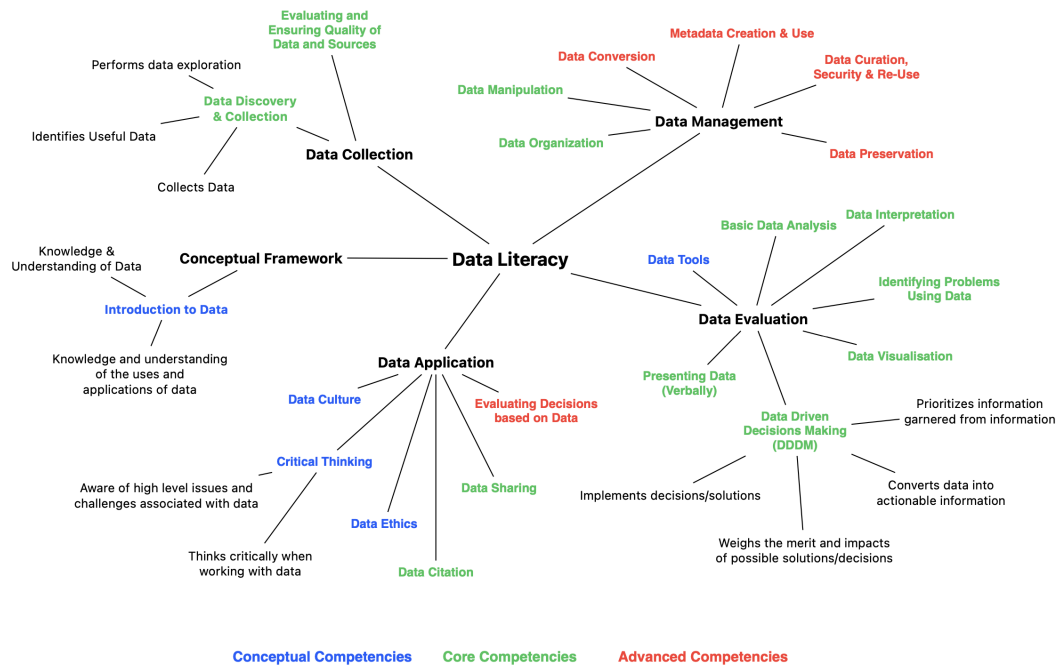
## 2.2. Data Literacy

Data Literacy has become an essential skill, especially for the business world, resulting in an increase in data literacy programs in education curriculums since the 2000s [27]. Several frameworks for the education sector as well as meta studies exist; we will focus on the latter and augment these with additional research.

In a well-referenced study, Ridsdale et al. conducted an analysis of existing strategies for teaching data literacy. They define data literacy as “the ability to collect, manage, evaluate, and apply data, in a critical manner” [28]. Their work includes five knowledge areas, that is, the conceptual framework of data, data collection, data management, data evaluation, and data application (see figure 1). These knowledge areas are further differentiated in 23 competences, for example, “data collection” includes “data discovery and collection” and “evaluating and ensuring quality of data and sources”. Each competence further includes tasks, e.g., for “data discovery and collection”, three tasks are included, “performs data exploration”, “identifies useful data”, and “collects data”. The competences are categorized in conceptual, core, and advanced competences.

Schüller and Busch provide another analysis of existing approaches [29], including the paper by Ridsdale et al., but also a non-peer-reviewed framework that was created by Jarvis [30]. Schüller et al. defined a data literacy framework with competences in a process model of data value creation [31]; this framework consists of six competence fields that are derived from process steps: establishing a data culture, providing data, evaluating data, interpreting results, interpreting data, and deriving action.

Nath and Kirby present an empirical examination of the factors of data literacy and propose a measurement scale, the Global Data Literacy Benchmark survey [32]. Using this scale, they identified three factors of data literacy: data analysis skills including decision-making based on the data, the acquisition and organization of data from different sources, and the identification of data issues. They suggest that educational programs should focus on improving students' data preparation skills to enhance their overall data literacy. Carlson and Stowell Bracke emphasized the importance of finding a context close to students in order to teach data literacy effectively [33]. As all of these frameworks focus on the education sector, the question how the existing workforce can be trained has hardly been covered by now [28]. There are also concepts such as statistical literacy that can be regarded as a subset of data literacy [34, 35], and the concept of information literacy of which data literacy can be seen as a subset [36].



**Figure 1:** Data Literacy Knowledge areas, Competences, and Knowledge/Tasks according to Ridsdale et al. [28]. Only tasks pertinent to the focus of this paper are presented herein.

Data literacy frameworks should not be confused with analytics maturity models that are used to assess the competence of organizations and the gaps to fill to get to the level that these organizations aspire to have. Gartner’s Analytics Maturity approach, for example, is structured in stages, from initial, ad-hoc use of analytics to sophisticated, predictive, and automated decision-making using advanced data analysis techniques [37]; at the same time, Gartner came to the conclusion that companies are slow in their journey to advance in data and analytics. Lismont et al. came to a similar conclusion using the DELTA model (Data, Enterprise, Leadership, Techniques, and Applications) [38]. Finally, apart from data literacy frameworks and analytics maturity models, there are also processes for data analysis, for instance, the CRISP-DM (Cross-Industry Standard Process for Data Mining) [39]. The use of appropriate processes could be considered a component of data literacy, yet it is not addressed in any of the aforementioned data literacy frameworks. We will be using Ridsdale et al.’s work as a reference point [28], allowing us to highlight competences that may be underrepresented in their work but covered in other frameworks.

Data literacy especially for web analytics has not been the subject of research although a few industry efforts exist. Hamel created a non-peer-reviewed Web Analytics Maturity Model (WAMM) in 2009 [40]. Hausmann et al. created a framework for web analytics in 2012 that starts with clear understanding of business requirements, continues with planning, development of the

data collection capabilities, and closes with actionable results and an evaluation of actions [41]. The German BITCOM association for IT and digital media published their own maturity model Digital Analytics & Optimization Maturity Index in 2017 [42]; however, while the corresponding website still exists, the offered tool does not work anymore.

## 3. Methodology

### 3.1. Approach to Data Collection and Analysis

Instead of surveying Google Analytics users in order to understand why they struggle to make beneficial use of the available materials and the tool, six independent web analytics experts were interviewed. These experts have assisted hundreds of clients in using Google Analytics profitably and are able to provide a perspective on the challenges that users face. At the same time, this approach offers an insight into the data literacy competences that these experts regard as essential to successfully work with data in the business world.

This study makes use of an inductive thematic analysis to collect the opinions and experiences of the experts [43]. All these interviews were recorded, transcribed, reviewed for notable features that were then coded, refined, reviewed again for coherence, and then finally defined and named.

### 3.2. Participants

Six interview partners were selected based on several criteria: the experts had to be owners of their businesses, authors of a book or blog about web analytics, have at least 10 years of experience in web analytics, and have contributed to industry conferences such as the Search Marketing Expo.<sup>1</sup> In addition, all participants were asked about other possible candidates to interview, and every expert had to be recommended by at least two other experts in order to be included.

### 3.3. Interview Process

The interviews took between 30 and 60 minutes and were conducted online from September 2021 until January 2023. While the interview structure was the same for all participants, there was also room for an open part where thoughts could be explored more thoroughly (semi-structured interviews). The interview questions (see section A) consisted of three groups:

- A description of their own company, the clients they are consulting, and the problems that they are solving
- An estimate of the data literacy of their clients
- Potential opportunities to improve data literacy

As it was unclear if participants were aware of data literacy frameworks, the frameworks provided by Ridsdale et al. [28] and the levels described by Jarvis [30] were kept ready as diagrams and tables to support the discussion. To avoid introducing bias, all experts were

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initially asked about their approaches to data literacy prior to the introduction of any existing framework.

### 3.4. Limitations

It is worth noting that a selection bias exists in this study in such that the interviewees only face clients that seek help and almost all of their clients are businesses. As a consequence, the results will not cover owners of private blogs, institutional websites etc; however, with respect to the large number of suboptimal Google Analytics installations, it is assumable that these groups face the same problems as the consultants' clients but may not have the resources to afford professional help.

## 4. Results

### 4.1. Thematic analysis of interview transcripts

The inductive thematic analysis produced seven themes and insights:

**Choosing a Tool:** In most cases, a decision for Google Analytics was made without adequate consideration of the specific requirements.

**Data Collection:** Users are concerned about the validity of their data, even though they expected Google Analytics to automatically ensure its accuracy.

**Limited Data Literacy:** Most experts see low to moderate data competency among their clients.

**Understanding Business Requirements:** The lack of business-related goals or the lack to distill them for web analytics is a big challenge for web analytics users.

**Help-seeking mainly initiated by external factors:** GDPR compliance and the phasing out of older Google Analytics versions are the primary drivers for clients seeking help, apart from issues related to data quality.

**Critical Thinking as a competence:** Critical thinking and formulating the right questions emerged as paramount skills within the domain of web analytics.

**Artificial Intelligence as an Enabler:** None of the experts believed that AI will be able to fill the current gap in data literacy.

Details for each theme are provided in the next subsections.

### 4.2. Choosing a Tool

Experts agreed that in all cases, the tool was already chosen, no matter what the business problem to solve was. Google Analytics was often chosen due to its popularity and the low-to-none cost of its use, without fully understanding the tool's capabilities, how the data it provides can be used, and how to use the tool effectively.

All consultants agreed that most of their clients do not question Google Analytics itself but, at the same time, have trouble working with the data presented by the tool. The trust that Google as a leading technology provider already knows what data is important plays an important role in the selection of a web analytics tool. Moreover, according to the experts, some clients think that they are using a data-driven strategy already just because they have installed Google Analytics, even if they are not actively analyzing or leveraging the data.

### **4.3. Data Collection**

Understanding how data is collected by a tool was highlighted as one of the key competences by all experts. They emphasized that if data is not collected correctly, every following step will produce incorrect results. In addition, all experts said that they were either approached because a client was concerned about their data quality or data quality issues were found during the consultancy project. While Google Analytics is easy to install at first sight and there is even a debugging mode for the Google Tag Manager, debugging requires substantial expertise. Again, the tool itself was not challenged in terms of data collection, and users initially assumed that Google was acquiring the right data correctly, and without the need to customize anything.

### **4.4. Limited Data Literacy**

All participants recognized the importance of data literacy and could enumerate elements of data literacy frameworks, yet they had not formalized an approach to it or consulted an existing framework prior. Rather, they were applying a mental model of data literacy and emphasized those competences that were relevant for creating business value out of the data. When exposed to the frameworks [28, 30], these were regarded as helpful but not to a degree that they would be put to use in the future. Two of the experts mentioned the DAOMI model [42] when asked for a data literacy model; however, even this was not used, and the one expert who endorsed it was not aware that the tool was not working anymore when the interview was conducted. Another expert mentioned Hamel's WAMM [40] but also was not using it.

With the exception of the CEO of the largest web analytics consultancy, all experts saw most of their clients in the lower areas of data literacy, with a few exceptions. In addition, only the largest consultancy saw an improvement in data literacy competences over the last years. The other experts mainly worked with medium-sized companies but saw no difference in data literacy and maturity with respect to the size of a company. Rather, some industries such as eCommerce are more likely to be more advanced than traditional companies. Bigger companies may also be able to afford web analytics teams but are also more likely to be slow due to internal processes whereas smaller companies cannot afford web analytics specialists and ask subject-matter experts of marketing domains to analyse the data of their own channel. The difference between the largest consultancy and the others may also be a result of the client base they cater to. The largest consultancy is a reseller of the premium version of Google Analytics, potentially attracting a different caliber of clients, further highlighting the existence of a two-class web analytics society [15].

With regard to Ridsdale et al.'s framework, according to the five experts working with medium-sized companies, none of these companies possess the competences outlined in Ridsdale et

al.'s framework that would allow them to effectively utilize Google Analytics. Clients do not overestimate their capabilities [44]; they are aware that something is missing but they attribute the problem to a different cause than their missing data literacy as they overestimate the tool's capabilities without being able to clearly articulate what is missing. One participant emphasized that some clients were surprised that Google Analytics is just a tool and that data literacy is not part of the tool itself.

While every expert agreed that free training and documentation exist, these resources do not provide enough practical guidance or industry-specific examples relevant to a client's business context. Additionally, one participant assumed that analysis and mathematics, in general, may intimidate a portion of the population.

#### **4.5. Understanding Business Requirements**

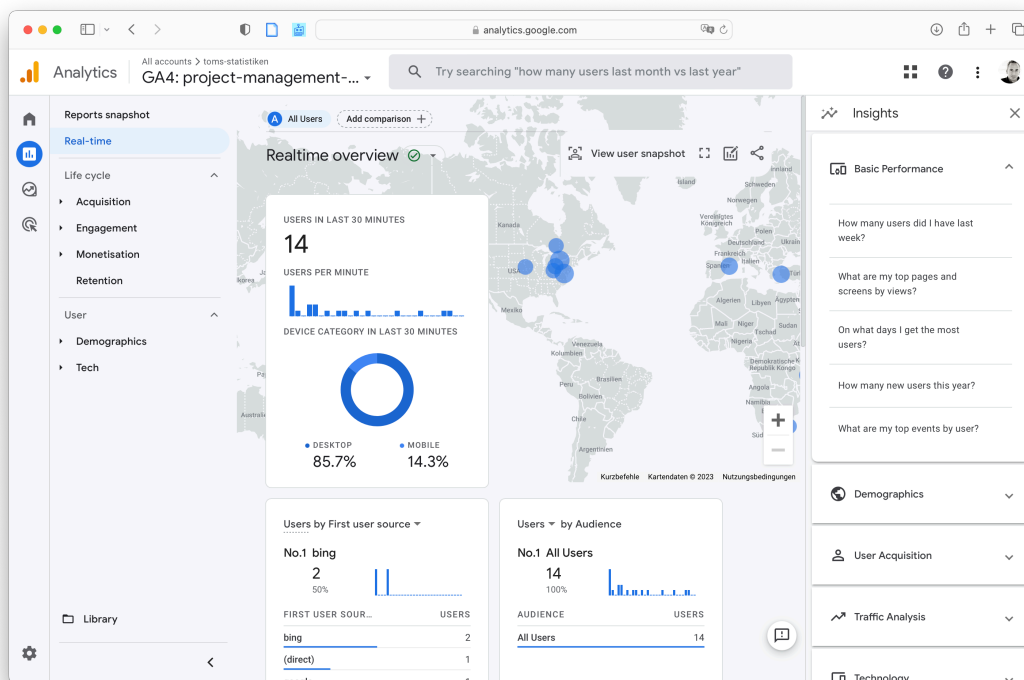
All experts underscored the vital competence of understanding business requirements and translating them into web analytics key performance indicators (KPIs). At the same time, all experts agreed that most of their clients do not really understand what the problem to solve is, beginning with what the goals are that need to be achieved with the website, connected to overall business goals. More than once, the experts mentioned that asking for business requirements overstrains clients. This is less of a problem if a manager is part of a consulting mandate or a training course which is, however, rarely the case. Either business goals are not communicated strongly enough or, if they are, the role of a website to contribute towards these goals is unclear. For instance, there is a desire to improve user experience, but in a standard installation, Google Analytics merely offers KPIs such as Bounce Rate and Time on Page. These metrics do not provide any information on how users interact with the content of a page, resulting in no clear measurement of user experience, and therefore, its improvement becomes impossible.

A decision to use Google Analytics is often made before business requirements are defined. Consequently, data from a standard installation starts populating pre-configured reports, which, due to their generic nature, may not meet specific business requirements. A gap thus emerges, as these pre-configured reports struggle to align with needs that have not been adequately defined in the form of KPIs. As a result, clients often ask consultants to explain the features of Google Analytics itself, instead of seeking guidance on making better data-driven decisions. This is due to their assumption that there's valuable information hidden within the tool, which they simply haven't discovered yet. Most of the consultants conduct workshops with their clients to define goals and KPIs before they start to refine the Google Analytics implementation. Indeed, all interview partners unknowingly used an approach similar or equal to CRISP-DM that starts with business understanding.

#### **4.6. Help-seeking mainly initiated by external factors**

The GDPR and the resulting need to install cookie consent banners is one of the main triggers for clients to seek help. One of the experts assumed that 70% of consent banners are not working correctly (which is a correct assumption [26, 15]). Another main trigger has been the planned shutdown of older Google Analytics versions and Google's focus on Google Analytics 4. As data





**Figure 2:** Screenshot of Google Analytics 4 with prompts for automated insights.

is collected differently in this new version, clients want to revamp their installations. Finally, the assumption that something is wrong with the data also triggers clients to seek help, notable as one of the few triggers that does not come from external sources.

Increasing data literacy is not a driver for clients; web analytics trainings are provided to new people on the job to make sure that they can support the business according to their responsibility and tasks but not as part of a data literacy curriculum.

#### 4.7. Critical Thinking as a Competence

All consultants expressed concerns about the lack of critical thinking demonstrated by Google Analytics users. Their concerns encompassed the users' approach to tool selection, data collection, and the application of this data to support their businesses. Just by virtue of the tool being offered by Google, users seem to not question the usefulness and quality of the data provided. Clients rarely start with a hypothesis about how to make sense of a number. Also, clients rather focus on a solution instead of understanding the problem first. Asking questions has been regarded as a key competence as well, although all experts were concerned that their clients do not know what questions to ask due to the missing business goals.

#### 4.8. Artificial Intelligence as an Enabler

All experts agreed that it would be difficult if not impossible for a machine learning-driven or AI-powered tool to understand the business requirements as they are different from company to company, and thus an AI could not fill the current gap. While one participant believed that 80% of all questions in a company are comparable to those of other companies, all agreed that the current status of the AI-driven suggestions made by Google Analytics (see Figure 2) are not meeting expectations. Worse, as said before, users may not be able to phrase the right questions, so that Natural Language Processing-based interactions will not help, and if data collection has not been verified as a first step, the foundation of training as well as the interpretation may already be wrong.

### 5. Discussion and Conclusion

The thematic analysis of the expert interviews reflected several competencies from Ridsdale et al.'s data literacy framework, despite the experts not having prior exposure to any such framework. Competencies such as data collection, data quality, decision-making based on data, and critical thinking were the most frequently mentioned.

External pressures such as the introduction of the GDPR and the sunsetting of older Google Analytics versions were primary reasons for hiring an expert. Interestingly, while experts generally perceived their clients as having low levels of data literacy, the lack of this competency wasn't a key motivation for these clients to seek expert help, as Google Analytics was expected to have the solution built-in, no matter what the problem was. The interviewed experts were primarily tasked with showing where the desired information is "hidden" in the tool.

Instead, the experts focused on a key competence not explicitly emphasized in data literacy frameworks and often lacking in their clients before choosing a tool: the ability to translate (business) goals into data use cases. The cognitive translation required to turn goals into data application may be encompassed in Ridsdale et al.'s "conceptual framework" knowledge area [28], but it is not explicitly elaborated on. Similarly, Schüller et al. [31] focus their process on value creation by leveraging data, in a manner similar to the CRISP-DM approach, but it may not entirely bridge the gap identified in the expert interviews. This shortcoming in clearly defining goals or the inability to link them to web analytics software are the primary reasons for the underutilization of Google Analytics.

This also explains why training content is mostly not relevant to users and their specific needs as they are missing a step beforehand. The power of Google Analytics to be configurable to different business needs thus seems to be its curse as users lack the understanding why they should do so. While Google Analytics already includes insights based on Machine Learning and natural language questions, these were not considered to be useful by the consultants.

Future research holds significant potential to investigate how data analytics tools can foster the definition and translation of goals into analysis. This could include formulating objectives, KPIs, configuring and reviewing implementations, and guiding user inquiry, for instance, in relation to user experience beyond bounce rates and time spent on site. At the same time, the connection of goals to analytics could enrich current data literacy frameworks, especially in workplace applications.

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## A. Interview Questions

The interviews took place in German, questions have been translated to English for this article.

1. Please describe your company and your work.
2. How long have you been working in the field of web analytics/digital analytics?
3. Why do website operators come to you? What problem or problems do you solve?
4. Have the problems you solve changed over time?
5. Do clients ever come to you with one problem, only for you to discover that they have a completely different problem? Could you please provide examples?
6. Are you familiar with the term data literacy?
7. What do you understand by this term?
8. Is it important for users of web analytics systems to have data literacy?
9. Do you know of a model that can be used to assess a user's data literacy?
10. (Participants are introduced to the data literacy framework, their questions are answered before the next question is asked.) How would you describe your clients' data literacy?
11. What do you think is the reason for this level of data literacy?
12. What is the impact of this degree of data literacy?
13. How do you go about assessing a client's data literacy?
14. Have you been able to observe a development in the data literacy of users?
15. Not everyone can afford a consultancy, how do you see the data literacy of users who, for example, manage personal pages?
16. Can you already see the user's data literacy from the installation of a web analytics system?
17. Do you think that the users should acquire more data literacy, or should the systems provide more support to the users?
18. How could the web analytics systems support the users?
19. How do you train your own staff?
20. What skills should already be taught in school to improve data literacy?