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Simple questions for complex matters?

An enquiry into Swedish Google search queries on wind power

Abstract

Renewable energy sources have emerged as a current subject matter in Sweden amidst discussions regarding energy costs, climate change and development of energy production. This study explores how Google Search is used for seeking information about wind power and how utilised search queries contribute to the understanding of this energy source. Adopting a practice theoretical perspective, the study explores search queries as doings and sayings, and understands search engines as an established part of everyday routinised information seeking-activities. Data collection was carried out in a trace ethnographic vein through the automatic retrieval of search queries enacted between November 2021 and October 2022. The search queries were analysed and visualised according to their prevalence and meaning. A qualitative, multiple coding approach was moreover used for the identification and interpretation of themes and subthemes. The results show that geographical locations, wind power functions and small wind turbines comprise the most prominent subthemes of the search queries. This is replicated also in the search term frequencies, providing further insights to queries related to wind turbine's efficiency as well as subthemes of advantages and disadvantages. Moreover, the study shows the tendency to phrase search queries as simple questions for complex matters, with nuances being lost in the pursuit of austere, uncomplicated answers. Altogether, the results contribute to a wider understanding of how environmental information seeking is conducted today.

Keywords: information seeking, wind power, renewable energy, environmental information, search engines, search queries, information practices

Introduction

The topic of renewable energy sources has recently surged as a theme of discussion in the Swedish policy-making landscape, in daily press and on social media (cf. Energimyndigheten 2021; Lindström, 2022; see also Haider et al., 2023). The generation of electricity through offshore as well as onshore wind farms is typically described as a sustainable and popular source of energy due to a small environmental impact (Wizelius, 2015). Furthermore, harnessing the wind is a long-established practice, tracing back over thousand years through the use of windmills (Wizelius, 2015). However, wind power as an energy source is currently a contested subject in terms of public opinion. While the support for wind power remains high among the Swedish public in general, a national public opinion survey reports that countryside dwellers are less positive to wind power compared to city dwellers for the first time since the millennial turn (Jönsson, 2022). Similarly, most of the survey respondents have a negative attitude to the idea of wind turbines operating in their immediate surroundings (Jönsson, 2022).

As has been the subject of previous research, motives for opposition are multifaceted and include concerns such as noise pollution, loss of property value and landscape impact (Anshelm 2013; Bjärstig et al. 2022; Bolin et al. 2021; see also Aitken 2010). However, a recent review paper describes that the experience of wind turbine noise can be heightened by engaging with web-based material emphasising an adverse effect on people's health (Karasmanaki, 2022). The author furthermore reports that "[...] experimental research has shown that material which is available on the internet and accentuates adverse health effects from wind turbines noise can affect individuals to the degree of reporting somatic symptoms" (Karasmanaki, 2022, p. 95). Moreover, it is reported that misinformation and misconceptions concerning wind power noise may result in community oppositions, unless resolved by for instance information campaigns focusing on scholarly results (Karasmanaki, 2022). This aspect of access to relevant, substantiable, and current information opens for thought-provoking questions concerning how high-tech, everyday tools such as search engines outline people's routinised activities for seeking information about wind power online.

Previous information studies contributions have emphasised the role of search queries as a unit of analysis for studies of online information seeking. For instance, in a study of patterns of search engine queries, Rose & Levinson (2004) concludes that emphasis needs to be placed not only on how people seek information, but also why. Several studies emphasise information needs as a focus of enquiry for examining online information seeking (Savolainen & Kari, 2006; White et al., 2009; see also Byström & Kumpulainen, 2020). While these contributions typically draw on cognitivist perspectives to query log studies, we argue that practice-based investigations of search query logs from an information studies viewpoint allow the escaping from dichotomies of actor and system, in turn leading to considering the intertwined relations of information seeking (cf. Nicolini, 2012). Although patterns of variability are traceable from longitudinal, behaviourist studies (White & Drucker, 2007), socioconstructionist approaches to the investigations of query logs can serve to unfold how search queries shape online information seeking, as well as understandings of, particular subjects from a practice-based point of view. Furthermore, keywords used for conducting search queries have been suggested to be understood as voices for reference, visions for representation, memories for retention and hearings for relevance (Van der Veer Mertens, 2023), providing interesting steppingstones for further research on how the searcher and the search engine shape online information seeking.

What is more, social aspects of online search engines comprise relevant matters in the current information studies body of work. Following the emergence of online search engines such as Google Search, DuckDuckGo, Baidu and Yahoo, everyday life has been described as search-ified, where ordinary practices involve online searching and, conversely, online searching is considered imbued as

a routine element in varying practices (Sundin et al., 2017; see also Haider & Sundin, 2019). Moreover, the terms entered in a search field of an online search engine do not disappear; the data are stored and maintained, amassed, and fed back into the engine for fine-tuning the relevance of results for subsequent queries (Haider & Sundin, 2019). Considering dichotomic and occasionally polemic discussions concerning wind power (cf. Borch et al., 2020; Hindmarsh, 2014), practices of seeking information relating to wind power through online tools and search engines become an interesting point of departure for information studies engaged with environmental enquiries.

While wind power discussions have been described to be influenced by local cultures and social norms in previous research (Karakislak et al., 2021), less attention has been given to how contemporary ubiquitous tools for seeking information, such as online search engines, shape public understandings of renewable energy sources in general and wind power in particular. As the utilisation of search engines comprises a prevalent part of everyday life, shaping the access that people have to information (cf. Haider & Rödl, 2023; Haider & Sundin, 2019), we focus our analysis on routinised information seeking-activities about wind power using web search engines. In this study, which draws on a practice-oriented view of information, the search words and phrases entered into the fields of search engines are assumed to comprise traces of routinised information-related activities, i.e., information seeking practices. The study is part of a research project investigating information about wind power and which considers the current Swedish debate concerning renewable energy sources. The collected data are investigated to understand how search queries related to wind power are conducted in the context of Google Search.

Prior research has emphasised the social aspects of understandings of wind power (Karakislak et al., 2021; Karasmanaki, 2022). Similarly, relevant studies on online search engines accentuate how online, algorithm-based software for seeking information shape the access to information (Haider & Rödl, 2023; Haider & Sundin, 2019, 2022; Noble, 2018). Still, there is a lack of research portraying how information about wind power is sought for in relation to large-scale online search engines. The analysis of traces of routinised information activities conducted in web search engines, which in the case of the present study is focused on the prevalence of search queries on wind power, allow the generation of new knowledge about how information concerning renewable energy sources is sought. In turn, this knowledge enables the awareness of how online search engines reciprocally shape the understanding of wind power with the searcher in a socioconstructionist vein (cf. Talja et al., 2005).

The aim of this study is to contribute with knowledge concerning how online search engines are used for seeking information about, and implicated in advancing narratives related to, wind power in Sweden. This is achieved by drawing on a dataset of search queries from Google Search related to wind power, conducted in Sweden. The focus of enquiry comprises search queries used for seeking information on wind power, along with additional metadata concerning query frequencies and occurrences. The data were collected from Google Search by way of the large-scale search engine result toolkit Result Assessment Tool (RAT, previously Relevance Assessment Tool), and visualised through data science software packages such as the data visualisation package *ggplot2* (Wickham et al., 2022) and the text mining software package *tm* (Feinerer et al., 2022). Accordingly, the study is guided by the following research questions:

- What wind power-related themes occur in Swedish Google search queries?
- How do these search queries contribute to shape online information seeking about, and understandings of, wind power?

The article is structured as follows: after this initial introduction including an overview of relevant previous research, a description of the theoretical approach of the study is done. Next, the methods and empirical data is presented. This is followed by the results of the study. The article ends with a concluding discussion.

Theory

The present study adopts a theoretical viewpoint grounded in practice theory, embracing the notion that practices comprise of “[...] open, temporally unfolding nexuses of action” (Schatzki, 2002, p. 72). In turn, the openness and the unfolding of activities mean that “[...] fresh actions are continually perpetuating and extending practices temporally” (Schatzki, 2002, p. 72). As an initial theoretical positioning in relation to the empirical setting and the data under scrutiny, we consider online information seeking as a practice both in terms of sayings and in terms of doings. This emphasis is important considering that doings and sayings are the primary forms of actions that comprise practices (Schatzki, 2002). Following the account of this initial overarching theoretical approach, the reasoning is further elucidated below.

Considering the aspect of doings as a basic unit of practices, these doings can be understood as bodily basic actions which are directly performed (Schatzki, 2002). However, it is worth noting that these doings do not need to be regular. Rather, the concept of practices also allows changing, unique, or irregular doings (Schatzki, 2002). Online information seeking can take shape as many forms of doings, for instance through typing words on a computer keyboard into a search field in a graphical user interface or through the utterance of questions to a sound recognition-supported virtual assistant. Although carried out as different forms of doings, the activity of searching for information online is typically a routinised everyday activity. Furthermore, a theoretical focus of online information seeking as doings allows the understanding of search queries as traces of performances. Such performances, in turn, are conducted to access a results page, or several, through which descriptive summaries of web pages along with page titles and hyperlinks can be reached.

At the same time, as stressed by Schatzki (2002), sayings are a subset of doings involving the aspect of language. That is, sayings comprise utterings; doings that say something (Schatzki, 2002). In this regard, search queries designate that an activity involving language has been conducted, which is parsed by the search engine for the retrieval of (hopefully) relevant documents. The aspect of search queries as sayings are hence understood as language used for asking about more information concerning a specific area, thing, or entity, which in the scope of the present study includes matters adjacent to wind power. Echoing the notion that doings can be unique or irregular, an important facet here includes the idea that “[...] numerically distinct acts can say the same thing and thus be the same saying” (Schatzki, 2002, p. 72). This aspect opens for enquiries into patterns of sayings where the words used as search queries might differ but that they essentially say, or ask for, the same thing.

Considering that practices are always enacted in relation to material aspects of tools used (cf. Pilerot & Lindberg, 2018), the remnants of routinised information seeking-activities here explored are viewed in relation to an empirical setting where people utilise online search engines to seek information about wind power. The adoption of this theoretical view enables the understanding of the text strings that comprise search queries, along with numerical data representing occurrences and frequencies of queries conducted, as traces of routinised information seeking activities in terms of both doings and sayings.

Focusing the enquiry of search queries as sayings and doings allows the investigation of information seeking practices through aspects of both performances and language. Moreover, employing this practice-oriented theoretical approach to the setting of the study and the empirical material at hand

allows the exploration of how information seeking about wind power has been conducted through Google Search during the given time span as well as the enquiry into patterns of information seeking practices. Thereby, we explore how the doings and sayings are shaped through the online search engine in question. Following this theoretical reasoning through which we approach the empirical material, the next section will account for the methods utilised when collecting and analysing the empirical data.

Method

With the aim and research questions in mind, search engines form the empirical setting for this study. For demarcation purposes, the decision was made to focus specifically on queries from Google Search, as it is the world's most utilised online search engine (StatCounter, 2023). Drawing on the methodological approach of trace ethnography, wind power search queries were disclosed, aggregated, and made understood in terms of searches conducted. The approach allowed that the empirical data could be understood as "'thick descriptions' [...of...] events that are often invisible in today's distributed, networked environments" (Geiger & Ribes, 2011, p. 1). In particular, the information seeking activities were considered routinised in terms of search queries occurring repeatedly and recurrently. The following section outlines the process of collecting search queries, followed by descriptions of how these queries have been analysed.

Data collection

The empirical data collected for this study comprise amassed wind power-related search queries from Google Search for the twelve-month period between November 2021 and October 2022. The list of search queries was collected on the 9th of December 2022 using RAT. RAT is a digital software developed at the Hamburg University of Applied Sciences, Germany, for investigating search systems and search engines through automatic data collection of search query lists and search results (Lewandowski & Sünkler, 2012, 2013, 2019). The data collection included providing RAT with an initial search query, through which adjacent queries, along with query volumes in terms of monthly searches carried out, were amassed. Data collection was conducted using the initial search query *vindkraft* (wind power), resulting in the gathering of Swedish search queries related to wind power in a set of three iterations.

The data were exported and retrieved in Microsoft Excel format, including 741 entries of search queries, collected as a single, tabulated spreadsheet file. Each of the 741 rows in the dataset included a search query, with 11 columns representing metadata variables. Variables included metadata such as minimum monthly searches, maximum monthly searches, mean monthly searches, searches per month and competition indexes. The data were regarded as documentary traces of information-related activities in Google Search through a trace ethnography perspective (cf. Geiger and Ribes, 2011). Regarding ethical considerations of the study, the data did not include single users' search logs (cf. Metcalf & Crawford, 2016).

Analysis

The analysis of the data drew on an approach where search queries were understood as traces of information practices. Placing a focus on the search queries carried out through Google Search, along with numerical data relating to the prevalence of each search query, the queries could be visualised and compared in terms of occurrences and average searches. Through an abductive approach working back and forth between the data and the theory (cf. Pritchard, 2013), understandings of the visualisations were coupled with meanings interpreted from reading and analysing the search queries; considering the queries as doings and sayings enabled the understanding of the queries in a

larger context through which themes and subthemes could be identified. The search queries were qualitatively coded through the development of a coding scheme by organising the queries and through iterative reading discover patterns in the organisational structure in relation to the focus of the present study (Auerbach & Silverstein, 2003), i.e., the thematic forms of search queries conducted in Google Search. A multiple coding approach was conducted, wherein two researchers affiliated with the project interpreted the data, cross checking coding strategies (cf. Barbour, 2001). This coding process was conducted in relation to the theoretical framework in the sense that numerous separate, although similar activities can say the same thing and thus comprise the same saying (and thereby also the same doing) (cf. Schatzki, 2002). Following this initial coding process, overarching themes were identified and coded. An excerpt of the coding scheme can be seen in Table 1.

Theme	Code (Subtheme)	Code description	Query example (translation in parenthesis)	Code occurrence
Coverage	News	Queries related to news concerning wind power	vindkraft nyheter (vindkraft news)	11
Economy	Costs	Queries related to the costs of wind power.	hur mycket kostar ett vindkraftverk att bygga (how much does it cost to build a wind turbine)	43
Locality	Geographical places	Queries related to wind power and particular geographical places in Sweden.	markbygden vindkraft karta (markbygden's wind power map)	169
Operation	Function	Queries related to how wind power, wind turbines and wind farms function.	vindkraft hur fungerar det (wind power how does it work)	168
Organisations	Businesses	Queries related to wind power businesses.	vattenfall vindkraft (vattenfall wind power)	74
Other energy sources	Solar power	Queries related to solar power.	sol och vindkraft (solar and wind power)	9
Regulations	Law	Queries related to laws and regulations concerning wind power.	miljökonsekvensbeskrivning vindkraft (environmental impact assessment wind power)	8

Table 1 Coding scheme excerpt

Following the qualitative coding of the search queries, the search queries were analysed, made visible and understood in relation to the theoretical approach and through scripts using the R programming language, aided by associated software packages. Visualisation software packages provided a way to understand the data both in groups as per visualising search phrase frequencies through the qualitative coding scheme and through natural language processing-techniques in terms of relative word frequencies. Bar chart visualisation of monthly average queries was carried out using the software package *ggplot2* (Wickham et al., 2022) from the *tidyverse* software package (Wickham & RStudio, 2022). Word cloud visualisation was conducted using the text mining software package *tm* (Feinerer et al., 2022) and the *wordcloud* software package (Fellows, 2018). In this approach, common terms such as *vindkraft* and *vindkraftverk* (wind turbine) were omitted from the analysed search queries so as not to skew results. Moreover, a term document matrix was created after data wrangling activities such as converting strings to lower case, removing punctuations, removing Swedish stop words through the stop word list of the *tm* package (Feinerer et al., 2022), and stripping whitespace.

Additional software packages used for reading and visualising data included *readxl* (Wickham et al., 2022) and *RColorBrewer* (Neuwirth, 2022).

Qualitative analysis of the search queries was simultaneously conducted in an interpretive manner (cf. Auerbach & Silverstein, 2003) by examining the search queries representing traces of information seeking practices in relation to the practice-oriented theoretical framework focusing on search phrases as sayings and doings (cf. Schatzki, 2002). Altogether, the analysis process allowed the study of search queries and their meanings, as well as the understanding of how information seeking and understandings about wind power is shaped. In the following section, the results of the study are presented.

Results

Considering the ubiquity of Google Search in everyday life information seeking, investigating conducted search queries in the search engine provide an interesting point of departure for enquiries into online information seeking. While demarcation features such as Boolean operators, search prefixes, temporal facets and other delimiters can be utilised, queries concerning wind power found in the analysed dataset typically comprise formulated questions or a few adjoined words related to wind power.

In this section, the results of the analysis of the utilisation of search queries about wind power in Sweden is presented. Initially, we discuss the prevalence of certain query themes in the dataset in terms of monthly average searches, placing the focus of enquiry into the doings of seeking for information concerning wind power. Next, we delve into examining search queries' term frequencies and weights, i.e., the sayings utilised for querying Google Search for web page results related to wind power. Subsequently, we accentuate queries from a qualitative perspective to emphasise both the sayings and doings, as well as patterns of information seeking practices, for the comparison of queries to consider how these are shaped through Google Search.

Querying phrases – search query themes and subthemes

Drawing on the qualitative classification of the search queries, as outlined in the method section, the monthly average searches of each query could be made visible in relation to the code and the theme assigned. Placing a practice-oriented analysis on these occurrences, the queries can be traced to the unfolding of patterns of routinised information-related activities through Google Search for the access of web documents concerning wind power. Of specific importance, in relation to the queries at this stage of the analysis, is the notion that doings are basic actions directly performed (cf., Schatzki, 2002). By considering this facet, the entering of one or several search terms into the search field concerning wind power comprise traces of queries conducted which are related to the same theme.

Considering the trace ethnography approach adopted in this study in the sense that “[...] documentary traces are the primary mechanism in which users themselves know their distributed communities and act within them [...]” (Geiger & Ribes, 2011, p. 1), the themes and subthemes identified indicate the prevalence of queries aligning to distributed communities with various interests in mind. As is visible in Figure 1, the *Locality* and *Operation* themes comprise the most prominent groups in terms of monthly average queries, followed by *Economy* and *Organisations*. In these themes, a few coded subthemes particularly stand out. The most prominent query sub theme when it comes to monthly average searches is that of *Small wind turbines* (20090). This is followed by the prevalence of queries relating to the *Function* subtheme (11040), i.e., how wind power in general and wind turbines in particular work. *Geographical places* (4490) comprise yet another prominent subtheme concerning monthly average searches. Next, the monthly average searches for the subthemes *Investments*

(2150), *Costs* (2040), *Businesses* (1970) and *Efficiency* (1960) are reasonably even in terms of average searches conducted per month. While queries relating to the efficiency of wind turbines concern how wind turbines and wind power operate, financial aspects are also prominent in terms of monthly average searches. What is more, specific queries are also directed to the subtheme of *Offshore wind farms* (1370), indicating the interest in a particular type of wind power initiatives established or planned in bodies of water or at sea. In other words, interests concerning at-home wind turbines, the operation of wind power and wind turbines, wind power initiatives at specific geographical regions, the efficiency of wind turbines and financial aspects to wind power are especially prevalent in the dataset.

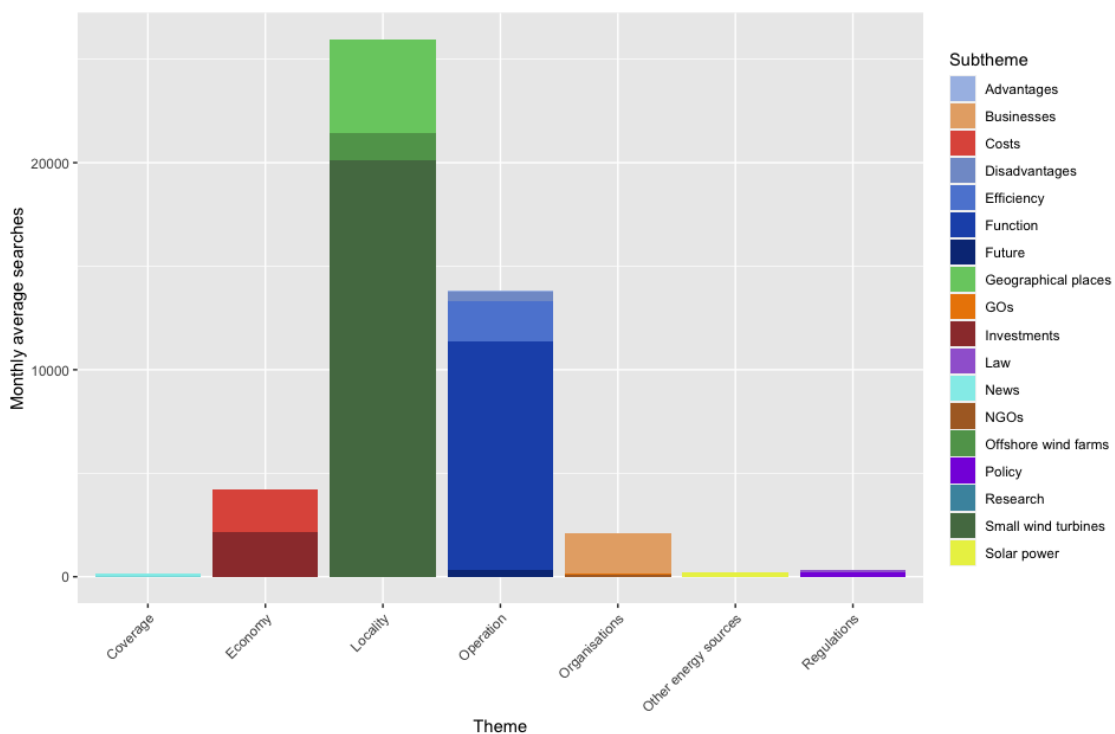


Figure 1 Monthly average searches for search query themes

The remaining half of the subthemes are comparably lower in terms of monthly average queries than the previously mentioned query subthemes. The *Disadvantages* (430) subtheme relate to concerns about wind power initiatives as sought in Google Search including, for instance, malfunctions, noise, and emissions. Moreover, the *Future* (330) subtheme include queries relating to the prospects of wind power. The *Policy* (230) query subtheme relates to regulations concerning wind power initiatives, whereas queries relating to *Solar power* are quite similar in monthly average searches (210). *News* (160) and *Law* (90) comprise comparably small subthemes. *Advantages* (60), including queries concerning why wind power has environmental benefits, follows the same schedule. Governmental (GOs) and nongovernmental institutions (NGOs) also follow relatively low numbers of monthly average queries (110, 30) respectively. Finally, a single query concerning *Research* (10) comprises the smallest number of monthly average searches in Google Search as per our dataset.

Elaborating on these results, the subtheme of small wind turbines, for at-home energy production is particularly prevalent in terms of monthly average queries. This indicates that people in Sweden to a large extent tend to utilise Google Search as a means of browsing the web for possibilities of setting

up small-scale wind turbines on their own property. Related to locations of wind power, specific geographical-oriented queries are also prevalent in the dataset. This includes the subtheme of offshore wind farms, signifying that there is a clear interest in knowing more about the establishment or plans for setting up wind turbines or wind farms at given local sites. Moreover, another point of interest is that of general understandings concerning how wind power in general and wind turbines in particular function and operate. Pondering these query subthemes as traces of information seeking practices in terms of doings (cf. Schatzki, 2002), they are possible to conceive as highly prevalent and routinised topics when searching for information about wind power using Google Search. Similarly, economical aspects of wind power with regards to adjacent query subthemes, there is also a typical tendency to utilise Google Search for web-based documents concerning how to invest in renewable energy shares, the probable costs for the establishment of wind farms, business companies developing renewable energy sources and the efficiency of wind power in terms of kilowatt-hours. The distinction of search queries relating to advantages respectively disadvantages with wind power is moreover notable where, in terms of sheer numbers, possible shortcomings regarding wind power are more sought for than benefits.

This subsection has first and foremost discussed the most prominent themes and subthemes concerning wind power in Google Search. While some subthemes are less prominent when it comes to monthly average searches, they are nonetheless significant for the enactment of the information seeking activities as practices and are elaborated in forthcoming subsections. In what follows, yet another aspect of online information seeking concerning wind power will be discussed, that is, Google Search queries and search terms as sayings.

Querying words – search query terms and wordings

Following the analysis of the monthly average search frequencies for the search queries in the dataset, we now turn towards exploring the most frequent words utilised for seeking information about wind power in Google Search. Pondering the search terms used, we consider these terms in relation to the theoretical aspect of sayings as a subset of doings involving language aspects in the sense of sayings as doings that say something (cf. Schatzki, 2002). This approach allows the understanding of traces of information seeking practices enacted through Google Search with a focus on the search queries as sayings.

The previous subsection discussed that aspects related to the subtheme of *Locality, Operation and Economy* comprise the most frequent themes when seeking information about wind power through Google Search. When exploring the most frequent terms of the search queries (as seen in Figure 2 and Table 2), this finding is echoed through search terms used. As is illustrated by the search query word cloud and the following table, the ten most frequently used terms in the search query data include *kostar* (costs, 25), *bygga* (build, 20), *pris* (price, 20), *fungerar* (functioning, 17) and *små* (small, 14), *eget* (own, 13), *kostnad* (cost, 13), *köpa* (buy, 13), *producerar* (producing, 12) and *vertikal* (vertical, 10).

Delving further into the topics identified, the subtheme of *Small wind turbines* can be identified through the of multiple similar terms concerning the purchasing or development of at-home wind turbines. Besides already mentioned terms such as *bygga*, *små*, *eget*, *kostnad* and *köpa*, adjacent terms such as *litet* (small, 8), *bygglov* (building permit, 9) *villa* (detached house, 10) and *privat* (private, 8) occur. Clearly, terms relating to the establishing of small-scale renewable energy sources are prominent in the dataset. Another aspect of the *Locality* theme can be identified in the edges of the plot, in which the orange- and green-coloured terms to a large extent relate to geographical places. While less prominent in terms of frequencies, they are widespread in terms of variations of the same subtheme. For instance, *markbygden* (5), *viksjö* (5), *lyngsåsa* (4), *jörn* (3) and *lillhärdal* (3) all relate to geographical places in Sweden. Adjacent to the previously discussed *Investments* and *Efficiency* subthemes, terms such as *andel* (share, 8) and *andelar* (shares, 8) respectively *ger* (gives, 7), *per* (per, 7) *kwh* (kilowatt-hour, 7) and the earlier mentioned *producerar* are particularly notable.

As discussed above, there are variations to each term as viewed in relation to the identified subthemes. Seen through the theoretical lens of sayings as a constituent part of practices, multiple diverse acts can say the same thing and as such comprise the same saying (Schatzki, 2002). The subtheme of *Geographical places* is echoed through this notion in the sense that, during the given time span, Google Search was utilised for seeking information concerning several particular geographical locations in Sweden. The entering of keywords in the search field of Google Search, as understood as sayings, is thereby a matter of using similar, although somewhat varying, language for the same form of information seeking. While several themes and subthemes are identified, and extensively examined in relation to the frequency of the search term variations, it is worth noting that irregular doings, and thereby sayings, can occur in practices (cf. Schatzki, 2002). The variations of geographical locations sought for provide an empirical example of such irregularities, but also search terms such as *andel* and *andelar*, which are different words relating to the respective topics of interest.

The present subsection has focused on the term-related aspects of search queries utilised for seeking information about wind power through Google Search. As seen through the theoretical lens of routinised sayings as a prominent unit of practices, several variations of terms can be identified as essentially the same saying as well as in the light of the identified themes and subthemes. The next subsection covers a qualitative reading of search queries by contemplating the queries as both performances conducted and language used and thereby as the main actions that comprise practices (cf. Schatzki, 2002).

Querying queries – simple questions for complex matters?

The results section has hitherto covered search queries in terms of frequencies related to themes and subthemes as well as search terms with regards to recurrent wordings utilised to seek information through Google Search. The present subsection will continue this depiction by considering search queries as both doings and sayings, further exploring aspects of performance and language in relation to routinised information seeking-activities. In relation to the theoretical approach through which the empirical data is analysed and present study is conducted, it is worth restating that practices are understood as “open, temporally unfolding nexuses of action [...where...] fresh actions are continually perpetuating and extending practices temporally” (Schatzki, 2002, p. 72). In this sense, as discussed below, several queries comprising slightly different terms are considered similar in terms of what they say and what they do.

A facet of enquiry not exhaustively examined yet, but which is highly relevant given the shifting public opinion of wind power as outlined in the introduction of the present article, is the matter of

dichotomic discussions. Traces of such discussions can also be identified by delving into the *Advantages* and *Disadvantages* subthemes of the search queries. Among the queries posed in the *Disadvantages* subtheme, we find combinations of search terms such as *vätgas vindkraft* (hydrogen gas wind power), *vindkraft co2 utsläpp* (wind power co2 emission) and *brinnande vindkraftverk* (burning wind turbine). Considering that practices can include unique, changing, or irregular doings (cf. Schatzki, 2002), these queries are understood to be posed as statements related to ongoing concerns about wind power, i.e., gas emissions or instances of ruptured turbines. Other related queries are posed as questions, that is, general queries relating to assumed general issues in the case of *varför är vindkraft dåligt* (why is wind power bad) or more specified queries relating to noise pollution such as *hur långt hörs ett vindkraftverk* (how far can a wind turbine be heard) and *hur mycket låter ett vindkraftverk* (how loud is a wind turbine). Concerning queries related to the *Advantages* subtheme, we see a similar appearance of adjacent questions in terms of *varför är vindkraft bra för miljön* (why is wind power good for the environment) and *varför är vindkraft bra* (why is wind power good). While the queries found in the *Advantages* and *Disadvantages* subthemes vary in meaning, they have in common that they emerge as plain, straightforward questions to intricate topics.

The posing of questions is further accentuated in other subthemes emerging in the empirical data. For example, in the case of the *Efficiency* subtheme, several variations of the same question emerge in the empirical data: *hur mycket el ger vindkraft* (how much electricity does wind power provide); *hur mycket el producerar ett vindkraftverk per år* (how much electricity does a wind turbine produce per year); *hur mycket energi producerar ett vindkraftverk* (how much energy does a wind turbine produce). While temporal aspects are occasionally present in the queries, these variations, as seen through the theoretical approach embraced for the present study, entail slightly different acts that essentially are the same saying (cf. Schatzki, 2002). Though, it is not only the saying that bears the similarity but also the way that the saying is uttered, that is, the aforementioned queries all have in common that they are questions. Though not all search queries in the dataset comprise questions, the queries typically lack search prefixes, field codes and other functions used in domain-specific information systems to delimit the retrieved results. Rather, the queries are written as free text, and Boolean operators used to combine or exclude search terms are mostly absent.

Question-related aspects of utilising Google Search for wind power-related queries are however not limited to questions about wind power efficiency. The same sort of formulations can be traced to, for instance, wind power benefits in the case of *varför är vindkraft bra för miljön* (why is wind power good for the environment), the future of wind power such as *hur ser framtiden ut för vindkraftverk* (what does the future hold for wind turbines) and economy-related queries, i.e., *är vindkraften subventionerad* (is wind power subsidized). These means of formulating queries indicate the tendency of seeking information online through natural language-esque expressed questions which, in turn, indicates the routinised activity of assuming the search engine, and the algorithms utilised for returning results, to provide clear-cut answers to complex matters. The answers to certain questions posed, such as subsidization, could be stated as either positive or negative but queries relating to, for instance, the future of wind power cannot be answered in binary terms. In other words, when it comes to online information seeking about wind power, we see the tendency to ask Google Search simple questions for complex matters as nuances are lost in the pursuit of austere, uncomplicated answers.

This section has accentuated the results of the study, deliberating query frequencies, search terms utilised and question-posed search queries through the lens of doings and sayings in a practice-oriented information studies manner. In what follows, the results will be overarchingly discussed and reflected upon in relation to the empirical setting and relevant literature previously accounted for.

Concluding discussion

The present study has explored how online search engines are utilised to seek information about, as well as being implicated in advancing narratives connected to, wind power in Sweden. Through a practice-oriented approach, search queries were analysed in a trace ethnographic vein (cf. Geiger & Ribes, 2011), utilising visualisations and qualitative readings. In particular, search queries are understood as both sayings and doings (cf. Schatzki, 2002), extending practice-based studies on web-based information seeking. Three facets of enquiry were emphasised: search query themes and subthemes, search query terms and wordings, as well as search query patterns.

The analysis showed that identified themes include *Coverage* in terms of *News* and *Research*; *Economy* including *Costs* and *Investments*; *Locality* as in *Geographical places*, *Offshore windfarms* and *Small wind turbines*; *Operation* through subthemes of *Advantages*, *Disadvantages*, *Efficiency* and *Function*; *Organisations* such as *Businesses*, *GOs* and *NGOs*; *Other energy sources* including *Solar power* and *Regulations* as in *Law* and *Policy*. Moreover, regarding conducted search queries viewed through the lens of doings (cf. Schatzki, 2002), *Small wind turbines*, *Function* and *Geographical places* are the most prominent subthemes with regards to monthly average searched during the time span of November 2021 and October 2022. As such, patterns of variability (cf. White & Drucker, 2007) arise also in the context of the present study.

The emphasis on queries related to small-scale, at-home wind turbines along with queries related to wind power initiatives at various geographical locations echoes notions from previous research of wind power discussions being influenced by social norms and local cultures (Karakislak et al., 2021). For the subthemes, there is a dualistic characteristic to the aspect of locality, where the queries can be understood to be opposing at times. On the one hand, people tend to seek information regarding the possibilities to install small wind turbines on their own property. On the other is the exploration of wind power projects in particular regions. Seen in light of previous research showing that countryside dwellers tend to be hesitant about wind power developments in their close surroundings (Jönsson, 2022), this twofold aspect of local wind power indicate that people tend to be interested in installing personal, at-home wind turbines while also being attentive toward the development and planning of large-scale wind farms in their region. It should be noted, however, that it has not been possible to see whether the people searching for these two subthemes generally belong within the same, or different, groups.

Moreover, the prevalence of the *Small wind turbines* and *Geographical places* subthemes is supported by the term frequency analysis, as seen in Figure 2. While a variation of search terms is used, these are understood as essentially implicating the same saying (cf. Schatzki, 2002). However, other aspects related to online information seeking concerning wind power also emerge. For instance, terms relating to the investment of shares are prevalent, as are terms concerning how wind turbines operate and their efficiency, supporting prior findings (cf. Haider et al., 2023). Regarding other forms of energy sources, Haider et al. (2023) found that wind power is frequently compared with nuclear power in Twitter discussions. However, queries related to nuclear power remain absent in the dataset analysed for the present study. Instead, solar power appears as the single other form of energy source queried. Furthermore, previous research has highlighted how online material depicting adverse health effects of wind turbine noise can “[...] affect individuals to the degree of reporting somatic symptoms” (Karasmanaki, 2002, p. 95). While not the focus of this particular study, queries relating to wind power noise feature in the analysed data. Adjacent queries relate to the disadvantages of wind power concern gas emissions and ruptured wind turbines. These queries, as formulated, are understood as statements related to ongoing concerns among the public. However, queries relating

to disadvantages with wind power only make up a smaller part of the query set. This indicates that there are concerns, but that other topics are of more interest to the information seekers in general.

A significant facet, emerging from the empirical data, related to how search queries shape information seeking about wind power is the formulation of queries as questions. As is visible in the subtheme of disadvantages, replicated in queries relating to wind power advantages as well as in other subthemes, queries are frequently posed as straightforward questions. Lacking search prefixes, field codes and other search engine functions for delimiting the retrieved results, the search queries are expressed as in-verbatim questions as would be posed in human conversation. This form of querying as question posing is understood as part of conversations ongoing in discourses (Talja et al., 2005) and in light of the ubiquity of search engines, as everyday life becomes search-ified and online information seeking turns out to be mundane-ified (cf. Haider & Sundin, 2019; Sundin et al., 2017).

Previous research highlights how search queries expressed to search engines are formulated as questions to various persons (Byström & Kumpulainen, 2020). Still, while online search engines parse and process natural language for the retrieval of search results, the queries posed as questions are not asked to human beings. Rather, the questions are asked to a sophisticated entanglement of indexes, knowledge graphs, algorithms, and crawled web pages. Drawing on the notion that search query studies ought to focus on why people seek information as well as how they do (cf. Rose & Levinson, 2004), and seen in light of previous research accentuating the understanding of information infrastructures in co-constructing credibility and trust through the filtering of claims of knowledge (Haider & Sundin, 2019), there are clear tendencies in the analysed search queries to ask simple questions about wind power for receiving clear-cut replies to complex matters.

The present study has explored search queries relating to wind power in Google Search through a practice-based information studies approach, drawing on previous research emphasising how web search engines shape the access to information (e.g., Haider & Rödl, 2023; Haider & Sundin, 2019, 2022). Future research could for instance investigate queries relating to other sources of energy including solar power, hydro power or nuclear power. Moreover, temporal aspects regarding the utilisation of online search engines for seeking information about energy sources would be possible to investigate by drawing on date and time metadata. Further enquiries into material aspects of online search engines are also possible, for example by considering features such as search operators, search prefixes and other delimiters as well as results page-related elements, e.g., knowledge graphs and highlighted panels. Considering the practice-oriented approach, studies adopting methods such as participant observation or semi-structured interviews would be suitable to further investigate adjacent routinised information-related activities.

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