

## RESEARCH ARTICLE

# Developing an empirical measure of everyday information mastering

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## Abstract

The aim of the study was to develop an empirical measure for everyday information mastering (EIM). EIM describes the ways that individuals, based on their beliefs, attitudes, and expectations, orient themselves to information as a resource of everyday action. The key features of EIM were identified by conceptual analysis focusing on three EIM frameworks. Four modes of EIM—Proactive, Social, Reactive, and Passive—and their 12 constituents were identified. A survey of 39 items was developed in two pilot studies to operationalize the identified modes as measurable EIM constituents. The respondents in the main study were upper secondary school students ( $n = 412$ ). Exploratory factor analysis (EFA) was applied to validate subscales for each EIM constituent. Seven subscales emerged: Inquiring and Scanning in the Proactive mode, Social media-centered, and Experiential in the Social mode, and Information poor, Overwhelmed, and Blunting in the Passive mode. Two constituents, Serendipitous and Intuitive, were not supported in the EFA. The findings highlight that the core constituents of an individual's everyday information mastering can be operationalized as psychometric scales. The instrument contributes to the systematic empirical study of EIM constituents and their relationships. The study further sheds light on key modes of EIM.

## 1 | INTRODUCTION

Everyday information behavior is a multifaceted phenomenon that has been examined since the 1960s. To approach this phenomenon, researchers have developed various models identifying a host of cognitive, affective, and social factors constitutive of seeking, using, and sharing information in diverse domains such as health, job seeking, and leisure (for an overview, see Savolainen, 2017). So far, due to the diversity of theoretical viewpoints, the picture of everyday information behavior has remained somewhat fragmented. We lack studies identifying and integrating key elements common to diverse models, which would serve the conceptual growth in information behavior research. Our study contributes to this research gap

by focusing on a key domain of information behavior, that is, *everyday information mastering* (EIM). In general, EIM deals with how individuals, based on their beliefs, attitudes, and expectations, orient themselves to information as a resource of everyday action. EIM manifests itself in how actively individuals make use of information to solve problems and connect to other people in everyday contexts such as health, consumption, and leisure. EIM can be understood as a subset of *information behavior* (IB), which encompasses the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use (Wilson, 2000, p. 49). Thus defined, IB refers to an overarching term that includes “intentional and planned behaviors (such as

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active seeking) as well as unintentional or serendipitous actions (such as glimpsing or encountering information), and purposive behaviors that do not involve seeking, such as rejecting or avoiding information” (Case & Given, 2016, p. 370).

EIM differs from IB in that the former focuses on how individuals orient themselves to information and make use of it in nonwork and leisure settings, while the latter also encompasses information behaviors of diverse types occurring in work-related and learning contexts. EIM is also related to *personal information management* (PIM). As defined by Jones (2008, p. 5), PIM deals with “activities a person performs in order to acquire or create, store, organize, maintain, retrieve, use and distribute the information needed to meet life's many goals (everyday and long-term, work-related and not) and to fulfill life's many roles and responsibilities (as parent, spouse, friend, employee, member of community, etc.)” To this end, PIM places special emphasis on the organization and maintenance of personal information collections in which information items such as paper documents, electronic documents, e-mail messages, web references, and handwritten notes are stored for (anticipated) later use. EIM differs from PIM in that the former operates at the level of attitudes to information and willingness to use it as a resource of everyday action, while the latter focuses on concrete activities dealing with the organization of information items.

To examine the nature of EIM in greater depth, three major frameworks of information mastering proposed by Ek (2005), Savolainen (1995), and Heinström (2010) were taken as a point of departure. The key constructs of the above conceptual frameworks were examined in order to identify common elements, whose validity could be tested empirically by developing a measure of everyday information mastering.

Theoretical constructs of everyday information behavior are seldom operationalized for measurement purposes (see, however, Niemelä, Ek, Eriksson-Backa, & Huotari, 2012; Timmers & Glas, 2010). To fill the research gap in this field, the present study seeks to answer the following question: How can the conceptual picture of everyday information mastering be specified by means of developing validated measures for its various constituents? Measuring key EIM constituents can result in a more sophisticated and empirically solid picture of the phenomena dealing with information seeking, using, managing, and sharing in mundane contexts. Importantly, the findings enable the identification of the core elements constitutive of EIM. Moreover, our approach opens possibilities for the further refinement and testing of the models of everyday information behavior, thus creating opportunities for theoretical growth (Savolainen, 2016). Our study does not aim at developing an integrated and empirically validated EIM model, but instead takes an explorative approach to this little-investigated field. The aim

was to develop a measure for various constituents of EIM and demonstrate its applicability among a study population.

The article is structured as follows. First, to give background, the phenomenon of everyday information mastering is reviewed by drawing on the studies of Ek (2005), Savolainen (1995), and Heinström (2010). Then, the key constituents from the concepts of information mastering, mastery of life, and information attitudes are compared to relevant empirical findings in the literature review in order to operationalize the concept of everyday information mastering. Thereafter, the process of EIM scale development and the findings obtained from its preliminary validation are reported. The last sections discuss the main findings and draw conclusions from the significance of the research findings.

## 2 | APPROACHES TO EVERYDAY INFORMATION MASTERING

### 2.1 | Information mastering

Our theoretical point of departure for the conceptualization of the phenomena of everyday information mastering is the framework of information mastering proposed by Ek (2005, 2008). Information mastering is based on Antonovsky's (1987, 1993a, 1993b) theory of *sense of coherence* (SOC), which consists of three components: comprehensibility, manageability, and meaningfulness. It highlights the crucial role of information in a person's sense of coherence. Those with a strong sense of coherence feel connected to their environment and are better equipped to interpret and integrate the messages they receive, cognitively as well as emotionally. A person with a weak SOC, on the other hand, feels overwhelmed and disconnected and tends to regard the information flows as incomprehensible and chaotic, or as irrelevant noise. People with a well-functioning SOC act upon messages they perceive to be relevant, communicate with the environment, and feel heard and understood. Drawing on the construct of SOC, Ek (2005, p. 25) argues that our whole life can be conceptualized as a problem-solving process where information is constantly needed in order to master our life. Ek (2005, 2008) further elaborated on the above reasoning by identifying two opposite modes of information mastering:

- *Low information mastering*: experiencing information as chaos, overload, or noise and not feeling heard and understood
- *High information mastering*: the capability to take in, sort out, and integrate information and communicate information to others that are felt to provide appropriate feedback.

Thus far, the SOC scale developed by Antonovsky (1987, 1993a) has been a strong predictor of information mastering in health contexts (Ek, 2005, 2008; Ek & Heinström, 2011;

Ek & Widén-Wulff, 2008). The stronger the person's information mastering, the easier to seek, note, register, understand, reflect, act or not act on the information, and evaluate how it may or may not be relevant in the person's own health situation.

## 2.2 | Mastery of life

The construct of information mastering is closely related to the concept of *mastery of life*, which was introduced by Savolainen (1995) in connection with the model for everyday life information seeking (ELIS). Similar to the construct of information mastering, the concept of mastery of life draws on Antonovsky's (1987) theory of sense of coherence. Another major component of the ELIS model is *way of life*. Informed by the habitus theory proposed by Bourdieu (1984, pp. 170–175), Savolainen conceptualized the way of life as the “order of things” based on choices that individuals make. Such choices are not purely individual because they are affected by a host of social and cultural factors; for example, common societal values, role expectations, and the nature of one's social network. Because the meaningful order of things may not reproduce itself automatically, individuals are required to actively care for it. This caring activity can be defined as mastery of life, implying the importance of the coherence of everyday life projects at large (Antonovsky, 1987). Information seeking is an integral component of mastery of life, which aims at the elimination of continual dissonance between perceptions of “how things are at this moment” and “how they should be” (Savolainen, 1995, p. 272). If there is no dissonance, mastery of life goes on quite routinely, and the information seeking attached to it can be characterized as a rather passive monitoring of everyday life events. In opposite cases, mastery of life may grow into active problem-solving aimed at restoring the disturbed order, usually requiring active seeking of practically effective information. Savolainen (1995, pp. 265–266) identified four key modes of mastery of life:

- *Optimistic-cognitive mastery of life*. Rational systematic information seeking from different sources and channels.
- *Pessimistic-cognitive mastery of life*. Active attempts to seek information for problem-solving despite accepting the possibility that a problem may not be solved.
- *Defensive-affective mastery of life*. Affective factors dominate information seeking, implying the risk of wishful thinking instead of realistic considerations.
- *Pessimistic-affective mastery of life*. Learned helplessness where the person avoids systematic information seeking to improve his or her life situation.

## 2.3 | Information attitudes

The conceptual frameworks of information mastering (Ek, 2005) and mastery of life (Savolainen, 1995) provide useful

but general-level approaches to the phenomena of everyday information mastering. For a more fine-tuned understanding of individual differences in everyday information mastering, we turn to personality research. Personality traits are stable, genetically based dispositions that manifest across situations and contexts while being moderated by situational factors (Boyle, Matthews, & Saklofske, 2008, p. 4). Based on a broad literature review, Heinström (2010) showed that the five-factor model personality dimensions were linked to particular information attitudes. The five dimensions are negative affectivity, extraversion, openness to experience, agreeableness, and conscientiousness (Costa & McCrae, 1992). Openness to experience, conscientiousness, and negative emotionality proved the most influential on information attitudes. As personality is a stable disposition, we may assume that the linked information attitudes would also be relatively characteristic for the individual. The three-component model of attitudes defines the construct of attitudes as consisting of (i) affect (individual's feelings, likes, or dislikes about the attitude object); (ii) cognition (individual's ideas and beliefs about the attitude object); and (iii) behavioral intention (individual's intention to act in a certain way with regard to the attitude object) (Joyce & Kirakowski, 2015). In EIM, the attitude object would be information in the process of mastering everyday life. The construct of information attitudes hence consists of affect, cognition, and behavioral intention toward information in the process of mastering everyday life.

Heinström (2010) identified five information attitudes:

- An *invitational information attitude* dominated by intuition and receptivity. This attitude is linked to openness to experience.
- An *exploring information attitude* consisting of scanning, intellectual curiosity, and enjoyment of information interaction. This attitude is also linked to openness to experience.
- A *purposeful information attitude* characterized by persistence, problem-solving, and drive. This attitude is linked to high conscientiousness.
- A *passive information attitude* dominated by indifference and least possible effort. This attitude is linked to low conscientiousness.
- An *avoiding information attitude* characterized by fear, anxiety, and blunting. This attitude is linked to negative emotionality.

## 3 | IDENTIFYING AND OPERATIONALIZING THE MODES OF EVERYDAY INFORMATION MASTERING

Although the frameworks proposed by Ek (2005), Savolainen (1995), and Heinström (2010) make use of different

terminology, they can be reviewed further by looking at their common features. A comparative approach is particularly useful for the identification of the key constituents of everyday information mastering, as well as their operationalization for the development of the EIM measure. To serve the ends of an exploratory study, an inductive approach was applied. To identify the common features of the above frameworks, conceptual analysis was made. Conceptual analysis is a method that treats the components of the study objects as classes of objects, events, properties, or relationships (Furner, 2004). The analysis involves defining the meaning of a concept and its attributes by identifying and specifying the contexts in which it is classified.

The process resulting in the identification of the EIM constituents summarized in Table 1 was initiated by semistructured discussions and brainstorming among the researchers involved. At this phase, we discussed the potential of the three frameworks mentioned above, with the intent of identifying their common elements relevant to the specification of key EIM constituents. The discussions confirmed our assumption that the frameworks hold good promise in this regard. To test our idea further, a conceptual analysis was conducted to identify relevant text portions (paragraphs and sentences) characterizing the main object of the study, that is, everyday information mastering from the frameworks developed by Ek (2005), Savolainen (1995), and

**TABLE 1** Modes and constituents of everyday information mastering

EIM mode	Key features	Hypothesized constituents	Derived from
Proactive	Active and open orientation to information coupled with the willingness to use it purposefully in everyday problem-solving and decision making	Pondering, persistent, thorough	Ek (2005, 2017) Hamilton, Shih, and Mohammed (2016) Heinström (2010) Litman and Mussel (2013) Manjoo (2008) McCune and Entwistle (2011) Savolainen (1995, 2015)
Social	Active and open orientation to information coupled with the willingness to keep connected with other people	Sharing, experiential, fear of missing out	Bawden and Robinson (2009) Bolton et al. (2013) Bronstein (2014) Ek (2005) Ek & Widen-Wulff (2008) Fisher, Durrance, and Hinton (2004) Heinström (2010) Ji, Ha, and Sypher (2014) Przybylski, Murayama, DeHaan, and Gladwell (2013) Savolainen (1995)
Reactive	Relatively passive orientation to information coupled with the tendency to catch information as it goes by	Scanning, serendipitous, intuitive	Allen (2011) Bates (2002) Baxter, Egbert, and Ho (2008) Ek (2005, 2008) Erdelez, Basic, and Levitov (2011) Foster and Ellis (2014) Hamilton et al. (2016) Heinström (2010) Ito et al. (2008) Savolainen (1995)
Passive	Passive orientation to information coupled with the tendency to ignore or avoid it in everyday problem-solving and decision making	Overwhelmed, blunting, information poor	Barbour, Rintamaki, Ramsey, and Brashers (2012) Bawden and Robinson (2009) Buchanan and Tuckerman (2016) Ek (2005) Heinström (2010) Lingel and Boyd (2013) Niemelä (2006) Sairanen and Savolainen (2010) Savolainen (1995)



Heinström (2010). The first author made a preliminary analysis, which was then elaborated together with the other researchers contributing to the study.

The second step of the analysis identified attributes of everyday information mastering—the modes and their constituents—from the frameworks. In our analysis, we aimed to account for cognitive, affective, and behavioral aspects of the modes and their constituents. A mode depicts a way or manner in which individuals orient themselves to information, how they experience the significance of information, and how they deal with it. The analysis resulted in the identification of four EIM modes. For example, the Proactive mode depicts active and open orientation to information coupled with the willingness to use it purposefully in everyday problem-solving and decision making, while the Reactive mode is characterized by a relatively passive orientation to information coupled with the tendency to catch information as it goes by. A constituent refers to an essential element of a mode. In the analysis, 12 EIM constituents were identified. For example, essential elements constitutive of the Proactive mode were labeled as Pondering, Persistent, and Thorough, while the constituents of the Reactive mode include Scanning, Serendipitous, and Intuitive.

In the third phase of the analysis, we focused on the relationships of the explications of the modes and their constituents. More specifically, the explications of diverse modes and constituents were compared inductively in order to identify similarities. To obtain further evidence and confirmation of the relevance of the above constituents, we expanded the conceptual analysis by examining a number of related studies characterizing the nature of individual EIM components. Studies of this kind are listed in Table 1 (e.g., Bawden & Robinson, 2009; Hamilton et al., 2016).

Importantly, these modes and constituents provided a basis for the development of the EIM measure. The four main modes of everyday information mastering were labeled Proactive, Social, Reactive, and Passive. The diverse constituents of the above modes not only specified the nature of the EIM modes but also provided a basis for the operationalization of the key EIM constituents. The modes and their constituents are introduced below.

### 3.1 | Constituents of the proactive mode

The Proactive mode of everyday information mastering describes a general openness to new information and intellectual curiosity (Heinström, 2010). A major characteristic of this mode is that people are oriented by a need to know (Ek, 2005), and they exhibit optimistic-cognitive mastery of life (Savolainen, 1995). We operationalized this as the cognitive constituent *pondering*, a measure of enjoyment of learning and epistemic curiosity (Litman & Mussel, 2013;

McCune & Entwistle, 2011). The Proactive mode furthermore refers to the ability to address everyday challenges, communicate, and find needed information. This is described in activity (Ek, 2005), overcoming barriers (Savolainen, 1995), and persistence (Heinström, 2010). This suggests that the Proactive mode results in *persistent* EIM: a cognitive-behavioral willingness to invest time and energy in information seeking. McCune and Entwistle (2011) support this view by arguing that our complex information world requires a disposition to understand for oneself, which includes organized effort. Satisficing and the principle of least effort are occasionally employed, suggesting satisficing with a true-enough result (Ek, 2017; Manjoo, 2008). Someone with persistence, however, withstands a little longer than most (Heinström, 2005; Savolainen, 2015). The Proactive EIM, moreover, is *thorough*. The conceptual frameworks of EIM describe this cognitive-behavioral constituent in terms of problem-solving (Ek, 2005), systematic information seeking (Savolainen, 1995), and a purposeful information attitude (Heinström, 2010). This suggests rational decision making where the person actively seeks out information to make sure they make informed decisions (Hamilton et al., 2016).

### 3.2 | Constituents of the social mode

Information mastering is inherently a socially framed phenomenon emphasizing links to the world, smooth communication, and a sense of being heard (Ek, 2005; Ek & Widén-Wulff, 2008). Social aspects are not explicitly underlined in the mastery of life concept (Savolainen, 1995). However, this concept is highly relevant for this mode because it suggests that how people seek and share information is affected by the nature of their contact networks. Similarly, Heinström (2010) found that broad scanning is typical for outgoing and open persons. We operationalized the Social mode of EIM as the activity of information sharing and the aptitude to make use of experience-based social information. The affective-behavioral constituent *sharing* describes a tendency to actively engage with other people in discussions and information sharing both online and face-to-face. This is not necessarily undertaken with the explicit goal of gaining information, but information is likely to be gained as a bonus (Fisher et al., 2004). It describes both receiving and giving information. The affective-behavioral constituent *experiential* refers to the ability and tendency to make use of other people's experiences in dealing with one's own life challenges. By identifying with others going through the same thing, people get ideas, comfort, and strength to deal with their own challenges (Bronstein, 2014). Finally, mastering social media can be seen as part of a new information literacy (Bawden & Robinson, 2009; Ji et al., 2014). An emerging phenomenon is an exaggerated fear of missing out (FOMO) if not constantly online (Przybylski et al., 2013).

Fear of missing out has been identified as a particularly strong mediating variable that influences whether social media use has a negative effect on psychological well-being (Alt, 2018; Buglass, Binder, Betts, & Underwood, 2017). Therefore, we wanted to measure the cognitive-affective constituent FOMO as an increasingly acknowledged phenomenon linked to the inability to master social media in everyday life (Bolton et al., 2013).

### 3.3 | Constituents of the reactive mode

The Reactive mode of everyday information mastering is characteristic of a person who is not in control of their information world but is rather challenged by or even a victim of it. Similarly, low information mastering implies not understanding messages or not feeling heard (Ek, 2005, 2008). Another expression of a Reactive EIM is the preference for passive monitoring of information. According to Bates (2002, p. 5), (passive) monitoring is based on “a back-of-the-mind alertness for things that interest us.” The behavioral constituent *scanning* exemplifies EIM of this type. In Savolainen's (1995) framework, scanning depicts a person's habits to keep up with new developments and seek orienting information. This activity occurs when a person actively follows news and social media flows without a specific goal, but rather just an interest to find out what is going on. This is also a feature of information mastering as part of feeling connected to the world (Ek, 2005) and included in an exploring information attitude as scanning (Heinström, 2010).

Everyday life information behavior is rarely structured, but rather appears as various forms of exploration, for example, on social media (Ito et al., 2008). The role of serendipity is thereby increasingly important due to social media, RSS flows, and so on (Erdelez et al., 2011; Foster & Ellis, 2014). For youth, the majority of information is not actively sought out but received passively (Baxter et al., 2008; Ito et al., 2008). Although not specifically stated in the conceptual frameworks, we regarded this as an essential way to retrieve information in the current information landscape. Serendipitous everyday information mastering suggests an openness to invite and use information that one also encounters in an unexpected context. This, in turn, is a result of a Reactive EIM, either through social networks or scanning behavior. Moreover, research is increasingly acknowledging intuitive decision making as part of information behavior (Allen, 2011). Intuition is included in the invitational information attitude (Heinström, 2010). Despite not being explicitly expressed in the other two frameworks, we regarded this as an essential part of EIM as an acknowledged decision-making style (Hamilton et al., 2016). The cognitive-behavioral constituent *serendipitous* and the cognitive-affective constituent *intuitive* were thereby selected to be operationalized.

### 3.4 | Constituents of the passive mode

Finally, the Passive mode of EIM exemplifies challenges. The Passive mode is particularly characteristic of defensive-affective and pessimistic-affective mastery of life, in which how one copes with challenges can be dominated by learned helplessness (Savolainen, 1995). Information attitudes also recognize avoidance and passive behavior as emotional reactions (Heinström, 2010). *Overwhelmed* as a cognitive-affective constituent of EIM describes a person's inability to handle large amounts of (often conflicting) information online. Information overload is distinctive for low information mastering (Ek, 2005). This is described as dissonance in mastery of life (Savolainen, 1995) and is implied in a passive information attitude (Heinström, 2010). The ability to handle overload has been stressed as new information literacy (Bawden & Robinson, 2009).

Research also acknowledges the choice not to seek information or to avoid it (Barbour et al., 2012; Sairanen & Savolainen, 2010). Low information mastering is strongly related to alienation or a response to informational chaos and noise (Ek, 2005). Similarly, Heinström (2010) presents the avoiding information attitude distinguished by purposeful ignorance. We measured this by the affective-behavioral constituent *blunting*. It is important to emphasize, however, that information avoidance may have an adaptive function in certain contexts (Niemelä, 2006; Sairanen & Savolainen, 2010). The EIM frameworks also draw attention to stigma and shame as information barriers. Low information mastering often entails a sense of being disconnected or not being heard and understood (Ek, 2005). In a defensive-affective mastery of life, affective barriers hinder information seeking despite its potential usefulness (Savolainen, 1995). One expression of an avoidant information attitude is an emotional coping response governed by fear, where the person not only avoids information but also hides the information need (Heinström, 2010). The affective constituent *information poor* is thereby characterized as hiding information needs despite being highly aware of the benefits of information for problem-solving, comfort, identification, and well-being. The sense of shame and stigma, however, is more powerful than acting on the realization that information may help (Buchanan & Tuckerman, 2016; Lingel & Boyd, 2013). This can be a result of learned helplessness or pessimism (Savolainen, 1995), alienation (Ek, 2005), or anxiety (Heinström, 2010).

### 3.5 | Summing up

The conceptual analysis of the common features of the three frameworks developed by Ek (2005), Savolainen (1995), and Heinström (2010) resulted in the identification of four modes of everyday information mastering: Proactive, Social, Reactive, and Passive. The picture of these modes was

elaborated further by identifying 12 constituents describing the key features of the above modes. The modes and constituents are listed in Table 1. These constituents are latent variables that provide the basis for the development of the EIM measure. We originally strived to find purely cognitive, affective, or behavioral aspects, but shortly realized that most constituents reflect two of these aspects combined. Finally, we identified one cognitive, one affective, one behavioral, three cognitive-affective, three cognitive-behavioral, and three affective-behavioral constituents. We aimed for an equal number of constituents per mode, as well as an equal number of aspect types (for instance, cognitive-behavioral or affective-behavioral). This means that some identified constituents were dropped, as we regarded them as superfluous or covered by other constituents. For example, we considered *learned helplessness* to be covered by the other passive constituents and *receptivity* to be covered by Scanning and Pondering. Our goal was to explore which EIM constituents can be operationalized as psychometric subscales and how the constituents relate to each other. The constituents provide the point of departure for the development of the items used in the questionnaire survey, which was administered to conduct a preliminary validation of the EIM measure.

## 4 | METHODOLOGY

The study reported in this article took place within the project, *Argumentative online inquiry in building students' knowledge work competencies*. The goal of the project was to build a deeper understanding of students' online research competencies and their relationship with everyday information mastering. To implement the research plan, we decided to develop a measure for everyday information mastering by investigating each identified constituent of the four EIM modes.

Our approach followed the exploratory stages of scale development introduced in the literature (see DeVellis, 2016; Mackenzie, Podsakoff, & Podsakoff, 2011):

- The multidimensional construct of everyday information mastering was conceptualized and defined by introducing hypothesized constituents for four modes of EIM (see Table 1).
- A pool of items was generated to represent all constituents in a questionnaire.
- The content and construct validity of items were evaluated and the questionnaire further developed into two data sets (see the pilot study subsections).
- The scale was evaluated and refined in a larger data set by applying exploratory factor analysis (EFA) (see the main study section).

We explored and developed a measure for a complex construct lacking earlier examples of related work. Thus, we saw that it is justifiable to use classic exploratory methodological tools such as EFA to investigate an unknown research terrain. The formal validation of the measure by confirmatory factor analysis (CFA) and structural equation modeling (SEM) is a necessary step in future studies.

### 4.1 | Overview of the scale development process

The EIM scale was developed into two pilot studies and the main study. Participants in all substudies were Finnish-speaking upper secondary school students in Finland, each participating in only one data collection. The questionnaires were administered either in print or electronic form, but always in one form within a substudy. The questionnaires were completed either in the classroom or during leisure, the arrangement always being the same within a substudy. A five-point Likert scale ranging from *I totally disagree* to *I totally agree* was applied in all substudies. The pool of items was developed after each substudy according to the validation results.

### 4.2 | The first pilot study

The first pilot study was conducted in April 2016 with a class of 20 upper secondary school students. The questionnaire comprised 39 items and was administered in printed form. Our aim was to test a preliminary version of the scale by first asking students to fill out the questionnaire and then to comment on the items in an interview. The interviews served two purposes: (i) to illustrate young people's information practices in their daily lives as grounds for developing further scale items, and (ii) to test the first set of items by asking respondents to interpret them. The interview material was examined by qualitative content analysis to assess the content validity of the items.

Questionnaire data were analyzed using the SPSS software (IBM, Armonk, NY) to see if descriptive statistics (skewness, kurtosis, distribution histograms) indicated potential problems in individual items. Based on the analysis of item-level descriptive statistics and student comments, we developed a second version of the scale, which included nine well-functioning items that were not changed in the new version, 12 that were rephrased, and 26 new items. Most of the new items were developed by the team. Two items were taken from the rational and intuitive decision-making scale (Hamilton et al., 2016) and added to the Thorough and Intuition constituents (one item per constituent). We also included two items from the epistemic curiosity scale to represent Pondering (Litman & Mussel, 2013). Each constituent listed in Table 1 was represented by three to six items.

### 4.3 | The second pilot study

The second scale version of 47 items was administered as an online questionnaire through Survey Monkey (<https://fi.surveymonkey.com/>). The data ( $n = 140$ ) were collected in upper secondary schools A (in a middle-sized city) and B (in a small city). The basic descriptive statistics were calculated and data distribution histograms drawn by the SPSS software to reveal serious violations against the data normality assumption. The threshold values for accepting an item for further analysis was  $|\text{skewness}| \geq 1.5$  and  $|\text{kurtosis}| \geq 1.5$ . The histograms were also used to examine items' performance. Exploratory factor analysis was conducted to demonstrate the possible structure of the EIM scale. However, the number of respondents per item was only 4.4 (should be at least 5–10, Field, 2013, p. 647), and the results were only indicative. However, the results gave the first evidence that some items loaded well into theoretically justified factors.

All in all, 20 items were accepted without changes, and seven others were accepted into the third questionnaire after editing. There were 12 new items, thereby increasing the set to 39 items. FOMO, Intuitive, Overwhelmed, Persistent, Pondering, Thorough, and Serendipitous were represented by three original or edited items each. Blunting was covered by two original and one rephrased item. Scanning was measured by two original items and one new item. One original item and three rephrased items were included in Sharing. Two original items and two new items represented Experiential. Information poor was represented by one original and three new items.

### 4.4 | The main study

The 39-item scale was tested in the main study with larger data sets gathered in September and November 2016. The questionnaire was administered in printed form and was distributed to students by teachers of the mother tongue and literature in eight upper secondary schools in a middle-sized city and its surroundings. The students were expected to complete the questionnaire in their free time and return it to their teacher in a sealed envelope along with the signed parental consent. They had about 7 days to return the questionnaire. The teachers were responsible for reminding the students of the deadline.

Of the students, 419 returned a completed questionnaire and a positive parental consent form. The data were fed into an Excel file by a research assistant and checked for entry errors by the second author. Excel functions were applied to cross-check the data table for missing data and inappropriate response behaviors. Seven students were excluded from the study because the answers were missing for one or more sections. The checked and anonymized data set was uploaded to the SPSS software.

The number of subjects was 412 (248 females, 158 males, and 6 of unknown gender). The number of subjects per item was 10.6, high enough to use EFA (cf. Floyd & Widaman, 1995). The following procedure was applied in the EFA to evaluate the items of the questionnaire (cf. Field, 2013, pp. 665–706; Floyd & Widaman, 1995):

- High bivariate correlations were checked for multicollinearity ( $< 0.8$ ).
- Severe deviations from normal distributions were identified by calculating items' skewness and kurtosis values (requirement absolute value  $< 1$ ) or by visual inspection of data distribution histograms.
- In the EFA, optional extraction methods (Generalized Least Squares, Maximum Likelihood, Principal Axis Factoring) and rotation methods (Varimax, Promax, and Direct Oblimin with Kaiser Normalization) were applied to develop alternative factorial models fitting the data.
- The number of factors was inferred by examining scree plots and by requiring eigenvalues higher than 1.0. The possibility of optional solutions was checked by fixing the number of factors ( $n = 8$  or  $9$ ).
- In each EFA process, the following acceptance rules for each item were applied:
  - Communality  $> 0.3$
  - Loadings  $\geq 0.4$
  - Cross-loadings  $\geq 0.2$
  - Correlation between factors  $< 0.7$

After an EFA process was completed successfully, the reliability of factored subscales was tested by Cronbach's alpha (goal  $> 0.7$ ).

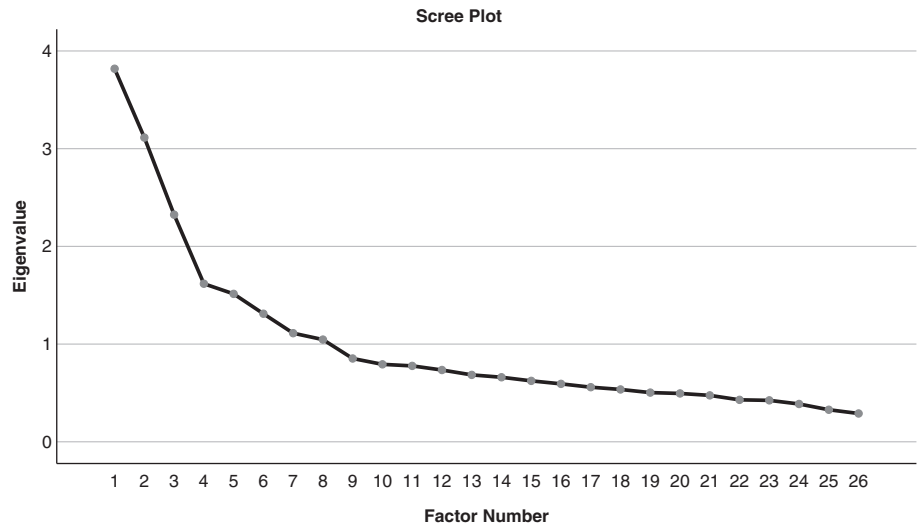
In the following we report the results of the main study. We introduce one of the EFA models as a result, and, in addition, we discuss what noteworthy differences were observed in optional models. These results form the foundation to further develop the measure.

## 5 | RESULTS

The factor structures of different EFA solutions were quite similar to each other. The model presented in Table 3 (see Appendix 1) was achieved using the Maximum Likelihood extractions method and Promax rotation with Kaiser Normalization (see scree plot in Figure 1). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.754, indicating that factor EFA should yield distinct and reliable factors in the collected data set (cf. Field, 2013, p. 647). Bartlett's Test of Sphericity was significant ( $\chi^2[325] = 2,525, p < .01$ ), which indicates that the correlation matrix is significantly different from the identity matrix and thus suitable for EFA. The model explains 44.8% of the



**FIGURE 1** Scree plot for the EFA result (maximum likelihood extraction with Promax rotation)



**TABLE 2** Factor correlation matrix

Factor	1	2	3	4	5	6	7	8
EIM mode	Proactive	Social	Passive	Passive	Social	Reactive	Proactive	Passive
Explored constructs	Inquiring*	Social media-centered*	Information poor	Overwhelmed	Experiential	Scanning	Persistent (rev.)	Blunting
1	1.000							
2	-.116	1.000						
3	-.116	.053	1.000					
4	-.188	<b>.329</b>	<b>.315</b>	1.000				
5	.180	<b>.332</b>	.150	.260	1.000			
6	<b>.331</b>	.168	-.173	-.070	.207	1.000		
7	<b>-.300</b>	.207	-.044	.201	.186	.054	1.000	
8	-.180	.157	.201	<b>.454</b>	.068	.023	.090	1.000

Note: New terms describing concepts that emerged from the analysis are marked with \*. The inquiring construct combines the previous constructs of Pondering, Thorough, and Persistent. The Social media-centered construct combines the previous constructs of FOMO and Sharing.

total variance, of which factor 1 covers 12.1% and factor 2 10.1%, respectively. The result of the chi-square goodness-of-fit test was  $\chi^2(145) = 178, p > .03$ . The goodness-of-fit test was not passed, but this is common in large data sets (cf. Floyd & Widaman, 1995).

Six items from the Pondering, Thorough, and Persistent constituents of the Proactive mode of EIM loaded into factor 1 ( $\alpha = 0.754$ ). The result suggests that three constituents identified in the theoretical construct are difficult to separate in an empirical measure. The combined scale of Pondering, Thorough, and Persistent was renamed *inquiring*. Two items designed for the Persistent constituent deviated from this trend and loaded separately into factor 7. Further, we found a negative correlation ( $r = -.300$ ) between factors 1 and 7 (see Table 2). The reason for this unexpected outcome might be the items' reverse wording in factor 7. In the pilot studies, all reverse-worded items loaded poorly. In hindsight, it was a

mistake to include reverse-worded items, as there is evidence that respondents often fail to recognize reverse wording or perceive it as confusing. Items in the same direction resulted in fewer mistakes in tests (van Sonderen, Sanderman, & Coyne, 2013). Another potential explanation is that reversely (negatively) worded items suffer more of the social desirability bias than positively worded ones (see, e.g., Fisher & Katz, 2008). Therefore, we excluded factor 7 from the proposed model. It is a question for future studies to investigate whether Persistent will turn out to be a measurable EIM construct.

The items designed for the three constituents of the Social mode of EIM loaded into two factors. Three items from the FOMO constituent and one item from the Sharing constituent loaded into factor 2 ( $\alpha = .780$ ). In the merge of FOMO and Sharing items, it is notable that both deal with participation in social media. Items dealing with information sharing outside social media failed to load into any of the

optional factor structures. We named the FOMO and Sharing combination *social media-centered*. Two items of the Experiential constituent loaded into factor 5 ( $\alpha = .794$ ). The correlation between factors 2 and 5 was 0.332 (see Table 2).

Only three items of the Scanning constituent represent the Reactive mode of EIM in the model (factor 6), and even that suffered from low reliability ( $\alpha = .585$ ). In another EFA model (Principal Axis Factoring, Oblimin rotation), two Serendipitous items loaded as separate factors. However, its internal consistency was even lower ( $\alpha = .530$ ). None of the items designed for the Intuitive constituent were retained in the EFA process. Thus, the Reactive mode of EIM reduced to the Scanning constituent.

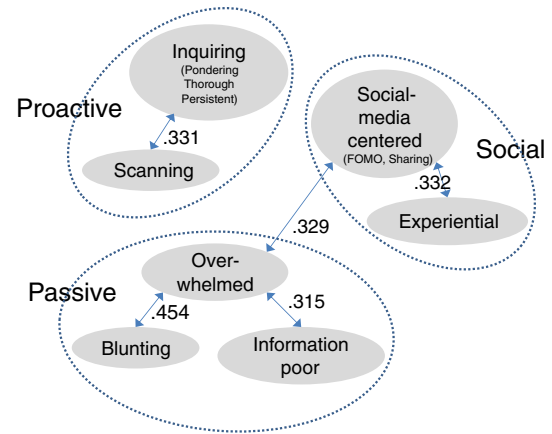
In the Passive mode of EIM, all three constituents turned into the factorial structure. Factor 3 combined three items of the Information poor constituent ( $\alpha = .669$ ), factor 4 three items of the Overwhelmed constituent ( $\alpha = .719$ ), and factor 8 two items of the Blunting constituent ( $\alpha = .557$ ). All factors related to the Passive information mastering mode correlate with each other. The correlations between the factors suggest that they could also work as a unidimensional measure of the Passive EIM mode ( $\alpha = .701$  if item 39 were removed).

The correlation between factors 1 and 6 was .331, which suggests that the Scanning subscale could be transferred into the Proactive mode to complement the Inquiring subscale. Thus, the Reactive mode was left empty of subscales. If the items for Inquiring and Scanning are combined, the resulting scale could be used as the measure of the Proactive mode ( $\alpha = .707$ ). Factors 2 and 5 comprise two constituents of the Social EIM mode but could also be merged as a unidimensional measure of the Social mode ( $\alpha = .759$ ).

## 6 | DISCUSSION

The findings of the present study suggest that the key constituents of everyday information mastering can be operationalized as measurable scales. Building on the conceptual frameworks proposed by Ek (2005), Savolainen (1995), and Heinström (2010), an empirical measure of EIM was developed and validated among a specific study population. The empirical work resulted in a more parsimonious EIM pattern in that the four modes of everyday information mastering identified at the first stage were condensed into three key modes: Proactive, Social, and Passive. These modes incorporate seven key constituents forming the EIM measure: Inquiring, Experiential, Scanning, Social media-centered, Blunting, Overwhelmed, and Information poor. Furthermore, the subscales for the EIM constituents can be merged as unidimensional measures of the three EIM modes.

The measurable EIM constituents and their relationships, which got empirical support in our study, are shown in Figure 2. The arrows between the factors represent at least



**FIGURE 2** The factor structure model of everyday information mastering [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

moderate correlations between the constructs. The constituents are clustered according to the Proactive, Social, and Passive EIM modes (dashed line ovals). Overall, the factor correlations within the EIM modes gave support to this cluster view. One exception is the between-modes correlation of the Overwhelmed and Social media-centered factors. However, the exception does not damage the overall idea of interpreting the EIM modes as second-order latent constructs (see MacKenzie et al., 2011). The EIM modes are complex constructs, which may be quite independent of each other, or relationships are built between some first-order constructs only. For example, the names Proactive and Passive may suggest that these modes are at opposite ends of one dimension. The correlations between the factors of the Proactive and Passive modes were indeed mainly negative, but they were small and remained below statistical significance (Table 2). We need more empirical studies to more thoroughly understand the relationships between the first- and second-order constructs.

It should be noted that Figure 2 does not describe a typology (e.g., being either Inquiring or Experiential, Proactive or Social, and so on). Rather, each person's EIM consists of a combination of more or less strong modes and constituents, the manifestation of which is context-dependent. Each measured EIM constituent characterizes one aspect of a person's everyday information mastering and can be used as an explanatory variable in empirical research (e.g., which EIM constituents predict success in a learning assignment task). The combinations of constituents can also be used to develop EIM typologies. For example, by applying a high/low threshold value for each EIM mode or constituent, one may investigate what kind of high/low constituent combinations are common in a group of people. The resulting EIM typology (profile) is an empirical finding as such, and, furthermore, it can be applied as an explanatory variable in empirical research.

Our findings show that the subscales that worked best in the empirical analysis are based on the operationalization of the main components of the pioneering frameworks proposed by Ek (2005), Savolainen (1995), and Heinström (2010). The findings thus suggest that these components represent fundamental yet distinctive features of EIM. Constituents that were rather implied, like Serendipity, or only indirectly approached in the above frameworks, such as Intuition, suggest that these are outlying features not representing the quintessential EIM. Another possible explanation may be the still-prevailing idea of rational information seeking being the norm. As students filled out the surveys in schools, they might have been influenced by these beliefs, consequently thinking that purposively retrieved information habits would be more important to report. Moreover, the Social mode suggests that the EIM constituents are not necessarily clear-cut, representing positively or negatively valued EIM patterns, but instead they are intertwined. Social activities of sharing are a positive way of mastering everyday life information on social media, but at the same time, such activities may become demanding and evoke negative emotions. This underlines the importance of mastering not only information-related activities but also the emotional reactions that may accompany them.

Our study exemplifies an ambitious project to cover several modes of EIM and their constituents in one scale. A more typical approach in developing psychometric scales is to focus on a few narrow and well-defined constructs (cf. DeVellis, 2016). Our integrative approach resulted in some promising factor structures, but we also encountered difficulties. Some subscales suffer from low internal consistency (Cronbach's alpha below 0.6), and some consist of only two items. We failed to validate subscales for the constituents Intuitive and Serendipitous. Both constructs have been successfully operationalized earlier (cf. Hamilton et al., 2016; McCay-Peet, Toms, & Kelloway, 2015), but in those cases, the instrument covered the specific concept only. The narrow nature of the instrument obviously guides respondents to concentrate on the specific phenomenon in their everyday lives, and the responses are likely to form a more systematic pattern. We tried to cover a large variety of constructs characterizing everyday information mastering, and this might mean that only the strongly experienced phenomena are caught. In the pilot interviews, we observed that students did not talk about serendipity without a direct question leading to the phenomenon.

We consider the current version of the EIM scale as the first blueprint version, to be further developed in future research. There is a need to develop subscales suffering from low reliability to have a balanced overall EIM measure. Another potential approach is to focus on individual EIM modes. For example, the Proactive mode can be measured in more detail by making use of the studies of personal information management (PIM). This is because, similar to the

Proactive mode, PIM emphasizes the importance of systematic gathering, and organization of information in work-related and nonwork contexts (Jones, 2012). Finally, as the EIM scale was tested among a specific group of people, that is, upper secondary school students, it needs to be explored in other populations too. The EIM measure was designed to be generic, striving to measure tendencies across contexts. Future research should validate this assumption by testing the measure with the same persons at different times by instructing them to think of different contexts (e.g., leisure or health concerns) each time. Although we attempted to approach EIM as broadly as possible, some central and emerging issues were excluded. These include, for example, creation of information, organization of information, and ethical information use (Burford & Park, 2014; Robson & Robinson, 2013). Ito et al. (2008) argue that youths' information behavior is fundamentally different from that of previous generations because of the rapid development of new media. On the other hand, our study demonstrated that EIM incorporates generic behaviors such as pondering, sharing, and blunting that are not necessarily dependent on the use of particular technologies like smartphones. EIM, moreover, is particularly focused on cognitive, affective, and behavioral interaction with information content, which further underlines that the format in which this content is presented is of less importance. As EIM is an individual's way of making sense of their everyday world, we regard technology as tools rather than as determining factors. Whether information is accessed through print, the Internet, or on apps, the degree of being inquiring, connected, or reactive to information remains an essential part of how an individual masters their information world.

## 7 | CONCLUSION

Information behavior research is characterized by the growing number of models describing various aspects of information seeking, sharing, and use (Case & Given, 2016, pp. 141–175). To see the forest for the trees, there is a need to identify common elements to such models and develop integrative frameworks incorporating the core elements of information behavior. However, it is equally important to examine the validity of such frameworks by developing and validating empirical measures. The findings highlight the view that theory growth in information research cannot be attained by conducting conceptual analysis alone. As our study demonstrates, the testing of an empirical measure can result in a more integrative and solid picture of the key constituents of information behavior. As our explorative study exemplifies a first step in this direction, the findings need to be refined by conducting comparative studies and making use of more demanding methods, such as confirmatory factor analysis. We invite other researchers in EIM into this

collaborative effort by publishing recommendations to guide scale development work (see Appendix 2).

EIM includes cognitive, affective, and behavioral aspects of how people interact with information as part of mastering their everyday lives. Particularly in our world of easily accessible information on the Internet and through social media feeds, the cognitive and affective aspects of EIM are becoming increasingly important. EIM is, thereby, a holistic framework for understanding information behavior in the process of mastering the routines and challenges of everyday life.

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## SUPPORTING INFORMATION

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