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The Sustainable Positive Effects of Enterprise Social Media on Employees: The Visibility and Vicarious Learning Lens

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Abstract: The proliferation of enterprise social media (ESM) has resulted in a research domain focused on its potential influence on the sustainable development of enterprises. Visibility has been increasingly applied as a useful lens through which to explore the effects of ESM. However, most prior research either has not addressed the multi-dimensionality of this concept or has not fully explored its dimensions separately. To bridge this knowledge gap, this paper identifies four categories of visibility to explore how they affect the process of an individual’s vicarious learning. We propose eight theoretical propositions and verify them through a confirmatory case study. The results show that each type of visibility affects the vicarious learning process in its own unique manner. Our research makes significant contributions to the literature by extending the existing implications of vicarious learning and ESM visibility and investigating their relationships, laying a strong foundation for further theoretical work. In addition, our research provides valuable insights and guidance for ESM practitioners.

Keywords: vicarious learning; visibility; enterprise social media; individual; case study

1. Introduction

Enterprise Social Media (ESM) has begun to proliferate across organizations [1,2] as executives and managers attempt to leverage the power of their companies’ informal information resources [3], producing sustainable positive effects [4]. ESM is a collection of computer-mediated tools based on the Internet and Web 2.0 [5]. It is an online platform that allows employees to communicate, post, and collaborate in various formats across different communities [3]. Common ESM platforms such as Chatter, Jive, Workplace, and Yammer have greatly facilitated collaboration and communications among employees, adding value to the daily activities of their jobs [6]. According to Leonard, Huysman, and Steinfield (2013), ESM allows workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in an organization; (2) explicitly indicate or implicitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited, and sorted by anyone else in an organization at any time of their choosing.

Among the many ESM applications such as problem solving, idea exchange, and task management, knowledge management has emerged as an important purpose for organizations [7]. However, very few studies have explored the impact of ESM on an individual worker’s learning; this subject is the
focus of our research. Workers’ learning, and more specifically, the learning that can be acquired through training, has become a key strategic focus of organizations seeking to enhance productivity. In addition, information technology has been widely used in facilitating workers’ learning processes [8]. Therefore, it is imperative to bridge this research gap through studies that shed light on the impact of ESM on learning.

Vicarious learning—learning from others’ experiences—is critical for the success of individuals and organizations [9,10], as organizations can avoid reinventing the wheel by allowing employees to learn from the experience of others’ successes and failures and, in turn, lower their learning curves, reduce inefficiencies, and improve output quality [11,12]. Therefore, vicarious learning is one of the most important methods of personal learning. However, most prior research that highlights the role of observers has neglected the participation of knowledge providers [10] and, as such, has limited our ability to gain a deeper understanding of vicarious learning. Due to the inconvenience of observing others in modern distributed and virtual organizations, as well as the difficulty of understanding the complex experiences in other people’s domains, it has become increasingly necessary for learners and knowledge providers to interact and communicate with each other [10]; this is in line with prior findings that people tend to prefer to seek help from human information sources rather than from documents and databases [13]. Thus, it is important to carefully investigate vicarious learning in modern organizations. As ESM is a collaboration and communication tool [14,15] widely used in organizations, workers’ vicarious learning through ESM provides a promising opportunity to explore the role of knowledge contributors.

The visibility of ESM is the essential characteristic that distinguishes it from other communication technologies [14,16–18]. However, most prior studies have either neglected the multi-dimensionality of this concept or have not fully explored its dimensions separately. This knowledge gap limits our understanding of the effects of visibility.

To address the abovementioned knowledge gaps, this research focuses on the following research questions: (1) What are the main types of visibility? and (2) How do different types of visibility shape the process of an individual’s vicarious learning? To answer these questions, our research objects are those employees who need to use ESM frequently in their daily work.

Our research addresses these gaps by exploring individuals’ vicarious learning processes in the ESM context through the lens of visibility. Drawing from existing literature on ESM visibility, we first identify four categories of visibility—communication visibility, identity visibility, collaboration visibility, and process visibility—and then derive eight theoretical propositions to demonstrate how these four types of visibility affect individuals’ vicarious learning. In addition, we conduct case analysis based on DingTalk developed by Alibaba, one of the largest and most commercially successful ESM platforms in China, to validate the proposed propositions. The case research methodology is particularly appropriate for this study because it allows us to robustly illustrate how different types of visibility affect an individual’s vicarious learning process.

There are several reasons why we focus on individuals’ vicarious learning in the ESM context via the visibility lens. First, individuals play a vital role in knowledge management, the success of which depends on whether employees can learn and apply others’ knowledge. Exploring the effects of ESM on individuals’ vicarious learning can help organizations strategically use ESM. Second, ESM’s visibility can facilitate vicarious learning by enabling employees to observe each other and their knowledge. Due to various boundaries in an organization, employees commonly maintain their contact with only a limited number of colleagues, so the information and knowledge that they possess tend to be homogeneous [19]. Thus, it is not easy for individuals to acquire heterogeneous experiences. In the ESM context, visibility affords users the ability to cross various boundaries to learn others’ knowledge [20]. Such characteristics are in line with the early findings of ESM’s use that focused on its potential to identify and interact with relevant external information [14]. Prior studies in the field of knowledge management indicate that successful knowledge management depends on opportunities [21,22]. The opportunities for transferring knowledge often reside in social relationships [23,24] that can be
enhanced by ESM’s visibility. Third, ESM enables learners to receive help from knowledge contributors and others. Since ESM is a communication and collaboration tool that facilitates open accessibility within organizations [25], the context of ESM allows us to study individuals’ vicarious learning in modern organizations. Finally, the visibility and vicarious learning lens can offer a new perspective to understand the role of ESM in facilitating knowledge management and, in turn, an organization’s ability to gain sustainable competitive advantage. The knowledge management literature posits that an organization’s knowledge can, under certain circumstances, form the basis for sustainable competitive advantage [26–28]. Although a growing number of organizations have implemented ESM for knowledge management [6,29], their capabilities in using ESM are advancing gradually [30], and ESM does not consistently help organizations achieve their goals [31]. Our research provides a new perspective on vicarious learning to illustrate ESM’s effects on knowledge management, helping organizations gain sustainable competitive advantages from effectively managing their internal knowledge assets with ESM. Thus, this paper explores how ESM’s visibility affects individuals’ vicarious learning.

The remainder of this paper proceeds as follows. The following section reviews relevant research on visibility and vicarious learning. Drawing from existing literature, Section 3 then develops eight propositions. Next, Section 4 summarizes the paper’s research methods, and Section 5 analyzes case materials based on our theoretical propositions. Section 6 identifies the implications, contributions, and limitations of our research, and Section 7 offers concluding comments.

2. Literature Review

2.1. ESM Visibility

Visibility refers to the state in which users’ information, once invisible or otherwise difficult to see, has become visible to all members in the organization [18]. Existing research suggests that visibility is a distinctive characteristic of ESM, distinguishing it from other communication and collaboration technologies [14,16–18].

2.1.1. The Four Categories of Visibility

The proliferation of ESM is a long-term trend that has rendered different aspects of users’ information and work visible to all members in an enterprise [32]. Prior research on visibility has yielded significant findings and greatly advanced our understanding. However, most prior research has not fully explored the dimensions of visibility separately. For example, Osch and Steinfield [20] examine group visibility, dividing it into two categories—unbounded visibility and bounded visibility—and discuss the extent to which the existence, membership, and content of a group are visible to non-members of the group. This limitation inhibits researchers from reaching a greater understanding of how visibility shapes users’ processes and interactions; as such, there is a compelling need to further explore the meaning of visibility. Treem and Leonardi [18] suggested that there are “three types of information or actions that are made visible through the use of social media in organizations: workers’ behavior, metaknowledge, and organizational activity streams” (p. 150). Later, Leonardi [17] proposed a nascent theory of communication visibility, which corresponds to meta-knowledge. Communication visibility has been widely accepted and examined by scholars [32,33]; however, other types of information remain unexplored, serving to limit our understanding of the impact of visibility on employees and organizations. According to Treem and Leonardi’s classification of visibility information, we categorize three types of visibility: communication visibility, collaboration visibility, and process visibility. Collaboration visibility helps to visualize workers’ behavior of sharing knowledge and information [18] (p. 153), and process visibility helps to visualize the organizational activity streams.

In addition, we extend Treem and Leonardi [18] work by identifying a new type of information that is made visible through ESM, identity visibility, which refers to visualizing other people’s identity information about their positions and departments. Prior research has found that individuals often
examine colleagues’ profiles to ascertain their identity information, rather than attain such information through off-line meetings [34]. Thus, it is necessary to explore the impact of this type of visibility on employees’ learning. This visibility affords workers the ability to perceive the presence and availability of their colleagues and, by extension, facilitates the ability to discover their useful knowledge [17]. Therefore, the impact of this visibility on employees is different from that of communication visibility, which allows employees to gain knowledge through meta-knowledge. We believe that exploring this type of visibility, as well as the three other types identified, will deepen our understanding of how visibility affects individuals’ vicarious learning. In this paper, therefore, we explore four categories of visibility: communication visibility, identity visibility, collaboration visibility, and process visibility. Table 1 summarizes these four categories of visibility.

| Visibility          | Definition                                                                 | Awareness Enabled                      | Reference |
|---------------------|---------------------------------------------------------------------------|----------------------------------------|-----------|
| Communication visibility | Visualizing the communication that was once invisible for third parties | Meta-knowledge [17,18,32]             |           |
| Identity visibility | Visualizing others’ identity information, including positions and departments, and having the ability to directly communicate with them | Identity information [34]             |           |
| Collaboration visibility | Visualizing the instrumental knowledge of collaborations on ESM | Instrumental knowledge [18,35]        |           |
| Process visibility  | Visualizing an entire workflow and an individual’s activity status         | Workflow, individual’s activity status, and task knowledge awareness [35,36] |           |

Communication visibility represents the capability of visualizing communication that was once difficult to see to third parties. It is not feasible for employees to be aware of all communication occurring in an organization, to the extent that some communication takes place privately. In addition, users may not participate in others’ communication due to a lack of understanding or interest [16]. ESM, by affording communication visibility, facilitates the ability to make communication visible to all the members in an organization. This type of visibility can improve users’ meta-knowledge [17,32,37] by allowing them to observe the content of messages (what they say) and the directionality of those messages (to whom they say it) [17]. Meta-knowledge, “who know what and who know whom” [38], is often related to various positive benefits [33,39]. For example, meta-knowledge can enhance an individual’s ability to use existing knowledge for innovation [17]. However, individuals’ meta-knowledge is generally limited to those with whom they often communicate [32]. Given that the number of colleagues with whom people can communicate directly is limited, the meta-knowledge developed may also be limited, reducing its accuracy [40]. ESM facilitates users’ ability to visualize the communication occurring among others with whom they have never communicated across an organization, enhancing the accuracy and depth of meta-knowledge. Observing colleagues’ communications helps users infer others’ knowledge and their translucent network relationships [17]. Stated differently, through communication visibility, users can know which colleagues they should ask for help, as they know who possesses the knowledge they seek.

Identity visibility represents the visibility of people’s identity information about their positions and departments. Prior research indicates that individuals prefer to examine their colleagues’ profiles and identity information on ESM rather than through offline face-to-face meetings [34]. In addition, individuals tend to post more personal information on ESM than on public social media [41]. With identity visibility, every member in an organization can easily access and view the information of others [34]. Employees who use ESM can build connections [42], or social ties [18], with those they may not know well. Identity visibility affords users the ability to build communication links with all the members in their organizations, influencing the development of novel social connections [20].
Users who find their colleagues by ESM’s identity visibility need not question the authenticity of their colleagues’ identities, to the degree that only members in the same organization can see this information and initiate the communication on ESM. Therefore, this type of visibility can help strengthen the credibility of employees’ identities. This organization-wide visibility, from a network perspective, affords users the ability to maintain weak ties with those they may not know well [20], reinforcing the channels through which information and resources flow within organizations [30,43].

If people do not know what information exists on ESM, they will not spend time attempting to find it [17]. Different from communication visibility, with which users need to spend time finding meta-knowledge and then contacting the person with whom they wish to communicate, identity visibility affords users the chance to find others on ESM effortlessly.

Collaboration visibility constitutes the visibility of the instrumental knowledge of collaborations occurring on ESM. Collaborations between users on ESM are often virtual, with users who are often geographically dispersed or who may not know each other. Virtual collaborations primarily involve sharing knowledge [35], and people using ESM can acquire two types of knowledge: instrumental knowledge and meta-knowledge [18]. Instrumental knowledge refers to knowledge about how to do something [18]. Given that most collaborations on ESM are for the purpose of offering suggestions to solve problems, we consider the knowledge shared during collaborations as instrumental knowledge.

There are two main types of collaboration: organized and ad-hoc [44]. Organized collaborations are long-term and strategic [45], whereas ad-hoc collaborations are short-term, task-specific, and will end after goals have been achieved [46]. Most collaborations occurring on ESM are ad-hoc, in that most of the common collaborations arise from problems encountered by employees who seek help from potential collaborators on ESM. When employees post their questions on ESM, they do not know who may answer. However, after the collaborators provide the instrumental knowledge, everyone in the organization can observe it and have the chance to learn. Thus, when users encounter a problem, they do not need to spend time contacting others for help, improving the ability of users to find the information they seek. A common scenario in which ad-hoc collaboration occurs is between IT and other departments in an organization. When an organization implements a new information system, there is often a group created that includes IT staff and other IS users to facilitate employees’ feedback on issues during system implementation, and IT staff can provide solutions in this group.

Process visibility represents the visualization of the entire workflow from start to end, and an individual’s activity status within the workflow. It is enabled by ESM’s features and standardized business processes [35]. Visualizing the whole workflow can enhance employees’ process knowledge in different departments, helping employees more effectively achieve their goals. By knowing where others are within a particular work process, ESM affords users the ability to improve their collaboration [32,47,48]. Visualizing the whole work processes can help managers assess employees’ duties in these work processes and thus adjust the workloads of those jobs, enhancing their flexibility and improving employee satisfaction. Visualizing this information also helps users develop task knowledge awareness [36], the knowledge of who is doing what in the organization [49,50]. This knowledge can improve collaboration [51], allowing further development and implementation of work plans [52,53].

Visualizing an individual’s activity status allows users to observe the work status of other people. Affording users the chance to see such information helps them to be alerted to what others are doing, so that they can find an optimal time to establish the connections with them. Process visibility brings a number of positive effects, including time-suitable requests and faster response rates [32,36].

2.1.2. The Relationships of Four Categories of Visibility

We next explore how the four types of visibility relate to each other and, in so doing, seek to gain a deeper understanding of these kinds of visibility. Figure 1 summarizes their relationships and interactions.
Collaboration on ESM refers to how individuals engage in collaborative activities through the use of ESM. When someone posts a question on ESM to seek help and others offer their opinions, a typical collaboration will happen on ESM. When the collaboration is complete, the information about the question and answer will still be visible to others, a state that is afforded by collaboration visibility. Communication on ESM refers to the behavior of employees communicating on ESM. There is sometimes confusion between the terms “collaboration on ESM” and “communication on ESM” because most collaboration, especially on ESM, is completed via communication. This argument is in line with some scholars’ belief that tasks are accomplished through communication in the field of social media [54]. However, not all communications on ESM can be considered collaboration. For example, users will communicate with others to share their opinions about their work, some of which may not be directly related to work, but only happens in the context of their daily lives. Therefore, the boundary between communication and collaboration for ESM is whether the content is about work processes. Given that ESM is a communication and collaboration tool within organizations [14,15], the activities of communication and collaboration can be seen as the core for our understanding of the relationships among different kinds of visibility. Therefore, majority knowledge is often observed after interaction on ESM [55].

Identity visibility promotes users’ communication on ESM, and thus enables communication visibility. Identity visibility provides information about others, enabling users to perceive the presence and availability of colleagues [56]. Such enablement is often called “people sense-making” [41] and increases communication [20]. Thus, the novel connections afforded by this type of visibility yield online communication. This visibility facilitates the process of finding potential collaborators in other departments or locating experts within organizations. The ability to directly communicate with them, afforded by identity visibility, increases the number of colleagues communicating with each other on ESM. In addition, for new employees of an organization, this information can help them better understand their colleagues, promoting the communication between newcomers and veterans.

Identity visibility also enables collaboration visibility through facilitating users’ collaboration on ESM. Identity visibility affords users the chance to see others’ information about their departments, jobs, and duties, and to directly communicate with them. Stated differently, identity visibility enhances individuals’ abilities to locate and access the remote information of others across departments and other types of boundaries [16,57], facilitating collaboration in the form of instrumental knowledge sharing.

Finally, process visibility contributes to both collaboration and communication visibility. Allowing employees to know where others are in the work process, process visibility improves collaboration [47,48]. It also affords individuals task knowledge awareness for collaboration [51]. Given that workflows can be completed on ESM, employees in the same work processes may come from different departments. Therefore, the collaboration between them is mostly virtual.

Figure 1. The relationships of four categories of visibility.
collaboration on ESM, and may span various boundaries [35]. Classical organization research suggests that team members can coordinate “organically” through team communication [49], by increasing users’ collaborations on ESM, so process visibility will promote communication on ESM. As well, studies in the field of team cognition proved that developing task knowledge awareness will help collaborations implicitly, as they can predict what others can do and thus improve the efficiency of their interactions [36].

In addition, given that the collaboration occurs on ESM, the exchange of useful instrumental knowledge is carried out through the communication on ESM. The process of a collaboration occurring in the context of ESM is usually implemented via communication, and multiple employees’ communication can facilitate collaborations. Thus, the act of communicating on ESM and the act of collaborating on ESM can promote each other. When more employees communicate on ESM, more knowledge can be found by employees (promoting communication visibility). Similarly, when more employees collaborate on ESM, they can find more knowledge from each other (promoting collaboration visibility).

2.2. Vicarious Learning

2.2.1. Review of Vicarious Learning

The concept of vicarious learning has been applied in many different fields, including organizational learning [9,58], entrepreneurship [59,60], social commerce [61], individual learning [10], fear-learning [62], education [63], and training [64]. Vicarious learning may be viewed as a component of social learning theory, originally derived from the work of psychologist Albert Bandura [65,66]. Bandura suggests that by observing others’ behavior and the resulting outcomes, individuals form an idea of whether a particular behavior is advisable, which, in turn, serves as a guide to future action [67]. As Bruner (1986, p. 122) notes, “most of our encounters with the world, are not direct” [68,69], suggesting that learning may occur through secondhand experiences.

It is worth noting that scholars have adopted other terms representing the concept of vicarious learning in prior literature [70], including observational learning (e.g., Yi and Davis [64], O’Fallon and Butterfield [71]) and social learning (e.g., Chen, Lu and Wang [61]). The definition of vicarious learning also varies in prior research, including “being able to observe or ‘listen in’ on experts or peers as they discuss a new topic” [72] and “learning through the experiences of another” [73]. Regardless of the specific definition, however, there is apparent broad consensus in vicarious learning research that individuals can learn new information and behavior by observing models. Having reviewed the literature on vicarious learning, we follow its original definition as a process by which “an observer learns from the behavior and consequences experienced by a model rather than from outcomes stemming from his or her own performance attempts” [10,65]. Importantly, as Bandura [74] argues, the observed model may entail symbolic mechanisms (e.g., written summaries or video-recorded performances). Therefore, the model not only refers to other people, but also to such symbolic means [10,67].

Vicarious learning does not constitute a simple behavioral imitation. Rather, it includes the observation of behaviors of certain models, perception of effects, and then the production of these behaviors in a similar environment [59]. Scholars suggest that vicarious learning involves four sub-processes: attention, retention, production, and motivation [59,64,67,75,76]. Attention concerns the process of selecting a specific model and determining which experience to learn, and is often referred to as expertise seeking in other fields [77]. Retention involves encoding the observed behavior in a manner the observer readily understands and storing the behavior in memory. Production concerns the transformation of these stored mental guides into action in an appropriate situation. Motivation concerns various incentives that can prompt individuals to perform the vicariously learned behavior. Based on previous research, vicarious learning is modeled as an aggregate second-order construct [78] that consists of four dimensions: attention, retention, production, and motivation [64]. Each of these components plays an important role in the process of learning
through others’ experiences [75]. Thus, the effects of vicarious learning can be promoted if all these components are facilitated [64].

Though prior scholarship has greatly advanced our knowledge of the four components of vicarious learning, our understanding remains incomplete. In particular, the emphasis on observers’ independent, one-way learning of the model’s behavior (i.e., overlooking the role of the model in the processing of observations) [10] in prior research constitutes a significant limitation. Stated differently, earlier research presumes that individuals comprehend the goals of models’ behaviors (know “why”) and know which elements of an action are critical and which are unnecessary. But as modern organizations have evolved from places where employees focus on their own separate and isolated tasks to places where coordinated work should be conducted through networks of relationships among individuals [79,80], the context for vicariously learning from others in the workplace has greatly changed.

The interdependent work in the context of the “knowledge economy” has dramatically altered the manner in which individuals learn at work [81,82]. Indeed, it is much more difficult for employees to observe others in the distributed or virtual work common to modern organizations [83]. Learning in such settings increases in difficulty, as it involves processing complex experiences that include both tacit and explicit knowledge [84]. Thus, the interaction and communication between observers and models that improve the ability of learners to understand are integral to vicarious learning. For example, prior research suggests that vicarious learning behaviors include interpersonal interactions, e.g., inviting experienced others to discuss [85]. That is, discursive interaction is necessary for vicarious learning in modern organizations. Some scholars refer to this type of vicarious learning as coactive vicarious learning [10].

2.2.2. Vicarious Learning in the Context of ESM

Prior research has suggested that ESM allows information sharing and social interaction among employees within the organization [86], increasing opportunities for individuals to learn from others’ experiences and knowledge [25]. Given that ESM is a type of virtual community [20], a learner’s ability to directly observe others’ behavior is not possible. Instead, vicarious learning is mainly achieved through learning the experience shared by others on ESM. In the context of ESM, we suggest that each of two types of vicarious learning (one-way and coactive) discussed above will be affected due to the visibility of ESM, as visibility affords users the ability to more easily observe models (i.e., written case summaries or media recordings [10] shared by others on ESM) and communicate with the experts in distributed or virtual organizations. That is, the visibility of ESM will affect the sub-processes (i.e., attention, retention, production, and motivation) of vicarious learning.

In this research, we build on existing literature on vicarious learning and extend the current theory to suggest that in the context of ESM, models primarily refer to others’ experiences or knowledge (i.e., external knowledge for learners); attention process concerns the process of locating others’ experiences or knowledge (i.e., identify the knowledge and experts that need to be learned); retention process concerns the process of understanding others’ experiences or knowledge and then storing it in the mind as a guide to future actions; production process refers to applying learned external knowledge, including original use and innovative use (in our research, however, we devote greater attention to innovative use, as modern organizations place more emphasis on innovative behavior after learning, e.g., [87]); motivation process refers to learners’ motivations or incentives to apply what they have learned. Table 2 summarizes the main concepts of vicarious learning.
Table 2. The summary of the main concepts of vicarious learning.

| Concepts | Vicarious Learning in Prior Research | Definition | Vicarious Learning in the Context of ESM |
|----------|-------------------------------------|------------|----------------------------------------|
| Models   | not only refers to other people, but also to such symbolic means | refers to others’ experiences or knowledge on ESM |
| Attention| the process of selecting a specific model and determining which experience to learn, which is also called expertise seeking in other fields | the process of locating others’ experiences or knowledge on ESM |
| Retention| encoding the observed behavior in a manner the observer readily understands, and storing the behavior in memory | the process of understanding others’ experiences or knowledge and then storing it in the mind as a guide to future actions |
| Production| the transformation of these stored mental guides into action in an appropriate situation | applying learned external knowledge on ESM |
| Motivation| refers to various incentives that can prompt individuals to perform the vicariously learned behavior | refers to learners’ motivations or incentives to apply what they have learned |

3. Theoretical Propositions

Based on the existing literature, we develop eight propositions that encapsulate the key aspects of the effects of visibility on individuals’ vicarious learning in the context of ESM.

3.1. The Relationship between Identity Visibility and Attention Process

Given that users can directly communicate with others in an organization via identity visibility, this mechanism generally occurs when individuals know who likely possesses the knowledge or experiences they wish to learn, and then directly connect with them. Through identity visibility, individuals can build social ties [18] or social connections [20] with colleagues. It is important to build communication links to an external source of information, as suggested by concepts from social network theory such as structural holes [88] and weak ties [89]. These concepts emphasize the significance of establishing and maintaining external linkages through which useful information flows across an organization [30,43]. Accordingly, these linkages will facilitate the attention process (i.e., the process of locating models and selecting which knowledge or experience to learn). Research in the field of knowledge sharing in organizations proved that networks are one of the most important ways through which different knowledge can flow [88]. The experience and knowledge that individuals receive are likely to be homogeneous if they interact with only a few others. In contrast, individuals who have a wide range of existing and potential connections in an organization are more likely to have distinct experiences [90]. Identity visibility also promotes users’ perceptions about the presence and availability of their colleagues [56] by the function of “people sense-making” [41], helping them more easily locate expertise in an organization [91], reducing the efforts that individuals exert to find them.

Proposition 1. Identity visibility promotes the user’s attention process.

3.2. The Relationship between Communication Visibility and the Attention Process

Users can visualize the communication between others through communication visibility, which can improve their meta-knowledge (i.e., the knowledge of “who know whom and who know what”) [17,92]. Different from the scenario where individuals already know what experience they seek and who may possess this experience, this visibility often applies to settings in which users do not know what external experience exists and who possesses it. Because identity visibility affords users the chance to directly communicate with those who have the desired experience or knowledge, this visibility is mainly achieved by discovering the external experience or knowledge, along with its owner. When people do not know what knowledge exists on ESM, they will not spend time searching for it, i.e., useful external knowledge may exist but remain invisible unless individuals...
know where it is. Meta-knowledge afforded by communication visibility provides individuals with a visual advantage that enables them to observe the content and location of external knowledge rather than reinventing the wheel. While Burt [88] suggests that this advantage comes from “bridging cross structural holes in an organization’s communication network,” ESM that makes communication visible to third-parties provides all users this visual advantage. By observing the communication happening on ESM, individuals can speculate on the actual experience or knowledge their colleagues possess [93]. In other words, the information individuals acquire through their communication enables them to find tacit knowledge [91]. Furthermore, individuals can identify who has the knowledge they desire from the content of their communication with others.

**Proposition 2.** Communication visibility promotes the user’s attention process.

### 3.3. The Relationship between Communication Visibility and the Retention Process

Communication visibility will increase individuals’ abilities to understand diverse external knowledge. It helps users understand the ways that people adopt to communicate with each other, augmenting their capacity for knowledge comprehension and then retaining it in memory. Prior studies show that knowledge sought and shared on ESM is complex and possibly domain-specific [94,95], making it difficult for users to retain this knowledge. The extent to which individuals can understand and retain the external knowledge depends on the degree of overlap between their knowledge bases and the source, given that new knowledge is generally learned by linking it to what they already know [23]. Individuals can facilitate the retention process by constantly visualizing their colleagues’ communication on ESM so as to understand their working approaches, terminologies, and thoughts of problem solving [23,96], helping to increase the overlap between their knowledge bases and the knowledge they wish to absorb.

While people work closely to support the development of language easy to understand and share mental modes that facilitate “local knowledge” exchanges [19], communication visibility provides another way to develop shared mental modes. Individuals who are familiar with other workers’ knowledge bases and ways of thinking can better understand the instrumental knowledge proposed by them and the logic behind such knowledge, helping them be better prepared to keep it in their memory.

**Proposition 3.** Communication visibility promotes the user’s retention process.

### 3.4. The Relationship between Collaboration Visibility and the Retention Process

Collaboration visibility can directly present individuals with instrumental knowledge, reducing their efforts to interpret and synthesize new insights [28,97] and enhancing their ability to retain external knowledge. It is an important way of promoting social learning in organizations by directly exposing instrumental knowledge to workers [16]. Collaborations on ESM may sometimes result in questions being answered by more than one knowledge provider. As well, when knowledge seekers do not fully understand the knowledge provided or the intentions of providers, they may further communicate with the knowledge providers to request clarifications. This subsequent two-way communication process will further extend the depth of collaborations, enhance the quality of instrumental knowledge being sought and shared, and provide useful clues or contexts for additional users to observe and retain knowledge. The purpose of this discussion is to simplify the domain-specific knowledge and to make it be seen and used by others [35].

**Proposition 4.** Collaboration visibility promotes the user’s retention process.

### 3.5. The Relationship between Process Visibility and the Retention Process

Process visibility will promote the process of retaining external knowledge. First, process visibility affords individuals the ability to visualize the entire workflow and their colleagues’ activity statuses,
which means individuals can find the most appropriate person to help them understand and retain the external knowledge related to their workflow by seeking clarification as necessary [6], enabling them to better understand their work and comprehend the required external knowledge that may enhance their work quality and efficiency [35]. Second, process visibility helps individuals develop task knowledge awareness, which allows them to predict how the team facilitating this workflow will react to changing environments [36]. Based on their predictions, individuals will complete the process of understanding external knowledge more purposefully and efficiently. In addition, task knowledge awareness can improve collaborations between workers in the same workflow [51]. During the process of knowledge retention, individuals may encounter problems and not be able to fully understand the knowledge related to their workflow; collaborations between workers (i.e., coactive vicarious learning) will help them articulate such knowledge, facilitating the retention process.

Proposition 5. Process visibility promotes the user’s retention process.

3.6. The Relationship between Collaboration Visibility and the Production Process

Collaboration visibility promotes individuals’ abilities to apply diverse external knowledge in novel ways. Application of external knowledge, also called exploration [98,99], is typically the process of creating new knowledge from the retained knowledge across various boundaries [20]. Because this process aims to integrate external knowledge with an individual’s unique work activities, new knowledge may be generated.

Collaboration visibility affords individuals the opportunity to visualize various ways of digesting contradictory knowledge, exploring different perspectives of problem solving, and helping them generate new ideas [88], so that they know how to apply the retained external knowledge. External knowledge is novel and diverse compared with the knowledge they already have [22]. The diversity of external knowledge will drive continuous innovations for internal applications, allowing workers to easily apply newly acquired knowledge to possible areas. Directly exposed to diverse knowledge, individuals are more likely to generate new applications by combining external knowledge with their existing knowledge [19].

Proposition 6. Collaboration visibility promotes the user’s production process.

3.7. The Relationship between Process Visibility and the Production Process

Because process visibility enables the transparency of the whole workflow, individuals will be able to detect the gaps and opportunities of their own routine activities [35]. Therefore, they can apply external knowledge more effectively to address the challenges and exploit the opportunities in their jobs. In addition, process visibility enhances individuals’ task knowledge awareness, which helps them explore various perspectives of external knowledge [36]. The experience that users accumulate in dealing with diverse knowledge enhances their potential to access external knowledge [19]. Such potential prepares workers for effectively dealing with unconventional tasks, for which they can apply diverse ideas and knowledge to generate creative solutions.

Proposition 7. Process visibility promotes the user’s production process.

3.8. The Relationship between Collaboration Visibility and the Motivation Process

Bandura suggests that motivation processes can be influenced by individuals’ expectations [65]. One of the most important expectations is self-efficacy that refers to individuals’ beliefs about their ability to obtain specific outcomes [100], which has a close relationship with behavioral changes [65]. Existing research has shown that the use of ESM can promote employees’ self-efficacy [100] and thereby influence their motivation [101]. For example, social media can promote knowledge sharing by increasing self-efficacy and the trust among users [102].
Collaboration visibility affords users the chance to directly visualize instrumental knowledge, i.e., the knowledge about how to do something [18], during their virtual collaborations with others on ESM. Most collaborations occurring on ESM are ad hoc, short-term, and task-specific; they arise from workers’ specific questions. Upon the completion of collaborations, various sorts of instrumental knowledge will be documented and stored on ESM, visible to all workers. Such discussions often detail the knowledge or experience in certain fields with which the knowledge learners may not be familiar. This virtual collaboration (i.e., interaction) can enhance the learners’ self-efficacy (i.e., “I learned from this interaction, so I will likely be able to do so again”) [10], as a better understanding of others’ experiences can strengthen an individual’s belief in accomplishing the same feat [10]. In addition, when there are more individuals participating in collaborations, the observed experience will be more detailed.

**Proposition 8.** Collaboration visibility promotes the user’s motivation process.

Figure 2 summarizes these eight propositions, demonstrating the theoretical framework that our case analysis is based upon. Table 3 represents the definition of main concepts discussed in this section.

![Figure 2. The proposed theoretical framework.](image)

**Table 3.** The summary of main key concepts.

| Concept                                      | Definition                                                                 | Reference |
|----------------------------------------------|---------------------------------------------------------------------------|-----------|
| meta-knowledge                               | the knowledge of “who know whom and who know what”                       | [17]      |
| instrumental knowledge                       | the knowledge about how to do something                                    | [18]      |
| virtual collaboration (i.e., collaboration occurs on ESM) | share and integrate others’ knowledge when that knowledge is primarily conveyed through media | [35]      |
| task knowledge awareness                     | up-to-minute knowledge of who is doing what in the team                   | [49]      |

4. **Research Methods**

Case study research methods possess widespread legitimacy in the information systems discipline, despite traditional criticism (e.g., lacking generalizability) [103,104], as they make it possible to explore the phenomenon in its complexity instead of simplifying the study into several variables [105]. The case study method is particularly suitable for this research. First, since our study focuses on the sub-process of individuals’ vicarious learning in the context of ESM, case study analysis is especially useful for examining such processes [106,107]. Second, our research strives to explore how ESM affords users different types of visibility to influence their vicarious learning, for which a case study approach is especially applicable for deriving meaningful results [108]. We conduct a real-world case study to...
examine the extent to which the suggestions of our propositions are demonstrated in our cases. Our case study is not aimed to test a formal theory, but rather to initially validate the power of propositions, laying a foundation for further theoretical research. In this sense, we adopted a confirmatory case study approach [105], an approach widely used in the IS field [109–111]. Specifically, we employed a multi-case-study approach, as it enhances the generalizability and robustness of our propositions and allows us to validate each proposition separately [105,112]. Each case is considered as an experiment that may either support or falsify our propositions [111]. DingTalk, the most popular ESM platform in China, was released by Alibaba Group in 2014; it focuses on the status quo of Chinese enterprise to enhance the efficiency of communication and enterprise operations. Since the release of its first version, DingTalk has been growing its client base rapidly and been adopted by many organizations and a number of local government agencies. By March 2018, more than seven million enterprises and organizations had implemented DingTalk, and the number of users exceeded 100 million. DingTalk is continuously working to help Chinese enterprises develop and fulfill the concept of smart mobile offices, making work easier, safer, and more efficient. Choosing DingTalk as the ESM platform for our research object allows us to derive useful insights to contribute to our study. The existing ESM platforms integrate similar technologies such as profiles, workstreams, and blogs [6]. Although specific features may differ, visibility is a common characteristic for all ESM tools, which means that our findings in this case study are also applicable to other ESM tools to a certain extent. Specifically, the dimensions of visibility are inseparable in some ESM tools, which inhibits us from fully understanding visibility. However, DingTalk’s functions such as approval, profile, and workflow management offer a promising opportunity to explore the dimensions of visibility separately. In addition, interviewing Chinese employees enables us to examine knowledge-related behavior in the Chinese context. Their experiences can provide valuable insights about how to design tools to better support knowledge learning in a global stage where inter-cultural collaboration has become more common.

4.1. Data Collection

Our case analysis involved conducting interviews and collecting qualitative data from two major Chinese enterprises using DingTalk, spanning 12 months. Four interviews were conducted during this period. We chose these cases according to the criteria that an enterprise had been using DingTalk for more than two years, because only when employees integrate DingTalk into their daily work can they provide a wealth of information about ESM usage. In our cases, enterprise D is a car financing lease enterprise and enterprise F is a manufacturing enterprise. We first conducted an interview at enterprise D with three of its managers in January 2018. The second interview was held with four other employees of enterprise D two months later. We conducted the third interview with enterprise F during the idle period of their business in June 2018, in which we interviewed seven employees. The last interview was conducted at enterprise F in January 2019. There are two reasons why we conducted two interviews with the same enterprise. First, we needed to coordinate the interview time with the enterprises. Second, according to the results obtained from the first interview, we could ask follow-up questions to collect additional details and improve our understanding in the second-round interview. Similar to that in Davison, Ou and Martinsons [110], our case study uses the eight theoretical propositions as the guidelines for designing and conducting the interviews, aiming to validate these propositions and build a foundation for future research. The research team, consisting of two professors and several postgraduate and doctoral students, conducted multiple interviews with multiple interviewees in each organization. The interviewees hold positions at different levels, from managers to employees, in each organization. Each interview was conducted with one or more interviewee based on open-ended discussions, which resulted in unexpectedly valuable information and insights. We also asked directional questions to ensure that the interviews do not deviate from our research theme. The examples of guided interview questions are included in Appendix A. These questions, specific inquiry methods, and details were adjusted according to the actual situation during the interview. The interview process typically began with the introduction of the
interviewee(s), and then professors asked questions based on our interview outline. Depending on the responses from the interviewee(s), every member asked follow-up questions in order to gain as much detail as possible and avoid potential bias caused by subjective errors. In order to prevent information loss, we recorded the entire interview process with the permission of the interviewee(s). As well, field notes were used by our interviewers, as some scholars suggest that they can illuminate non-verbal communication and description of the context of information [103]. In the interviews, based on our request, some interviewees presented to the research team how they used ESM, whereas others rejected our request due to privacy concerns; such information helped us better understand what interviewees wished to convey. After the interview, we compiled the recording transcripts in a group of two researchers (one person compiled the transcripts and the other verified their accuracy) to ensure the integrity of the information collected. In total, we conducted 40 interviews and compiled nearly 350,000 words of interview data (see Table A1 in Appendix B and Table A2 in Appendix C). To maintain interviewees’ anonymity, we only use their surname. Moreover, combining the secondhand data we collected from the enterprises’ official websites and internal newspapers within the enterprises, we constructed a database for analysis and coding [103]. Integrating multiple sources of information, also known as triangulation [113], enabled us to improve the accuracy of our conclusions.

In addition, because of DingTalk’s wide adoption by universities and government agencies, the research team itself had used DingTalk for more than two years. Such experience significantly helped us design the interview outlines, ask relevant questions, and understand the meanings of the interview conversations and transcripts.

4.2. Data Analysis

The interview transcripts resulting from the open-ended discussions provided us with valuable semi-structured data for conducting further analysis. Adopting the method used by many prior studies [91,110,114,115] and following guidelines suggested by Braun and Clarke [116], we analyzed the transcripts by using the thematic analysis method to identify data corresponding to the propositions, focusing on the key themes, including communication visibility, identity visibility, collaboration visibility, process visibility, attention, retention, production, and motivation.

The research team members read through all the case data and proceeded with progressive coding, according to the rules proposed by Braun and Clarke [116]. The researchers coded collected case data (eliminating data that was irrelevant) and sorted the sentences with certain meanings into the corresponding categories. The following is an example of an encoding of an interview excerpt:

- **Raw data**: “I have some groups of projects, all the project-related matters, decision-making arrangements, meeting notices are published in the group. I can also see everyone talking about the implementation of the project in this group, because our manager asked us to give feedback to questions in this group”.
- **Code**: visible information, collaboration between group members
- **Subtheme**: project discussion of information visibility
- **Theme**: collaboration visibility

Subsequently, the researchers cross-checked the results of the code, discussed the controversial items, and reached consensus. Tables 4 and 5 show the results of our thematic analysis. Because we interviewed numerous people, some items were repeated many times, all of which were carefully analyzed by researchers. Given that we looked only at those dimensions within the cases that illustrated different kinds of visibility and its impacts on employees’ vicarious learning, and used the propositions as our interview guidelines, we finally identified the key themes.
### Table 4. The results of the thematic analysis of enterprise D.

| Key Themes          | The Number of Items | Typical Item                                                                                                                                                                                                 |
|---------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| communication visibility | 102                 | We may communicate on the group now, or if the leader has something to share, it will be posted on DingTalk, because it is visible on the DingTalk and more convenient than communicating in offices. |
| identity visibility  | 113                 | Because it means to say that on the DingTalk you may have a very clear cognition about what position and which department he is in, because you can see that information. |
| collaboration visibility | 119              | This is to say that when someone has any problems, or when they are directly looking for answers in group, and if I know how to do that, I will offer guidelines about how to deal with these problems on DingTalk. |
| process visibility  | 101                 | I will pay attention to whether he is in the working state, such as whether he is in a meeting.                                                                                                             |
| attention           | 62                  | We have someone who collects suggestions from employees. Generally, this person will post them on time. If there are too many suggestions, he will post them early. If there are not many, he will post them once every two weeks. I often pay some attention to what he posts. |
| retention           | 41                  | If someone sends me a text on DingTalk, I will trust this information because I can see who he or she is in our company.                                                                                       |
| production          | 83                  | I will read some guidance documents in group. If there are any questions, I will ask my colleagues and discuss how to do this in my work.                                                                    |
| motivation          | 26                  | Sometimes my colleagues will come to help me, and my heart will be more solid and the whole work will be faster.                                                                                               |

### Table 5. The results of the thematic analysis of enterprise F.

| Key Themes          | The Number of Items | Typical Item                                                                                                                                                                                                 |
|---------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| communication visibility | 103                 | As to the information shared on DingTalk, you can see it at anywhere and anytime and also know who has seen it and who hasn’t.                                                                                     |
| identity visibility  | 81                  | If someone sends me a text on DingTalk, I will trust this information because I can see who he or she is in our company.                                                                                       |
| collaboration visibility | 129              | Some new employees who do not know their work very well will go to find some knowledge about how effectively they can do something on DingTalk.                                                               |
| process visibility  | 115                 | I can see the whole work process and who is responsible for what, and I will tend to discuss with them whose works are closely related to my work.                                                               |
| attention           | 57                  | There is a summary meeting every week, and there will be better people to share experiences, then I will generally pay attention to whether his experience is suitable for us to use |
| retention           | 32                  | I will be impressed if I see these similar problems and solutions on DingTalk, I don’t have to ask these questions again.                                                                                       |
| production          | 96                  | Supervisors may release some guiding working documents. These documents are generally summarized by experienced employees, and we will learn to use them.                                                       |
| motivation          | 31                  | People who have better employee training results and those who have made greater progress in their work performance will be publicized on DingTalk and offline. This has a certain effect on motivating the learning of other employees. |
To answer our research question about how the ESM visibility affects an individual’s vicarious learning process, we sorted the transcripts from different interviewees to search for statements that relate a specific type of visibility to the steps in the process of vicarious learning. We identified the evidence from the interview transcripts and validated our eight propositions accordingly. To maintain the chain of evidence, we also provide the sample excerpts from the interview transcripts in Table A3 in Appendix D, consistent with suggestions in prior research [103,105]. Table A4 in Appendix E shows the framework based on prior research, which helped to improve our study’s reliability [103,117].

5. Case Analysis

In this section, we analyze our qualitative data based on the relationships we proposed between visibility and vicarious learning. Each proposition will be illustrated and discussed using case materials. The samples of each proposition’s excerpts from the interview transcripts are shown in Table A3 in Appendix D. We first compare the results of the text data coding of the two enterprises and then identify many similarities between them, including similar themes, how employees leverage different kinds of visibility, and the benefits of vicarious learning employees receive from different kinds of visibility. Therefore, similar to that in Davison, Ou and Martinsons [110], we blend the data of two enterprises in our case analysis. This comparison also shows that our case study analysis results in better generalizability.

5.1. P1: Identity Visibility Promotes the User’s Attention Process

Our interviews found that identity visibility enabled individuals to directly observe the information about their colleagues, which helped them perceive the presence of their colleagues and communicate with them directly. Thus, identity visibility helps employees locate and receive the knowledge they need from experts in an organization. All the interviewees reported that with DingTalk they could easily search and view colleagues’ primary identity information to initiate direct communication. Different from WeChat and other social media platforms, DingTalk supports communication without the prerequisite of first becoming friends. When interviewees were contacted by others on DingTalk, they were assured of the true identity of their colleagues, because only users in the same organization could view the identity information of others and directly communicate with them via DingTalk. Thus, individuals are mutually trusted, enabling them to offer help and knowledge without hesitation. In addition, the personal information of employees made visible by DingTalk also included the departments they belong to and the positions they hold, which improved users’ awareness of the presence and availability of their colleagues. Therefore, DingTalk made it convenient for workers to find and connect with everyone in their organization, saving their time from looking through address books. Because identity visibility will result in weak social ties among workers [89], important channels are thus developed to help individuals get diverse information and locate expertise and knowledge. Our findings support this proposition.

5.2. P2: Communication Visibility Promotes the User’s Attention Process

Our case analysis found that workers were more likely to share useful knowledge or experience due to the communication visibility afforded by DingTalk. Sharing knowledge via DingTalk normally takes place in a one-to-many setting, i.e., knowledge providers will share knowledge with a group of people rather than one person. When workers find useful knowledge related to their work that can help others, such as new tips or improvements, they will share it on DingTalk for people to see and access. For instance, one of the interviewees, the manager of an enterprise, often made posts on DingTalk to share his work-related knowledge, hoping it could be more easily accessible to employees. Because individuals knew what he posted on DingTalk was visible to others due to communication visibility, they were more willing to share their own knowledge or knowledge from external sources, which allowed workers to be aware of the existing knowledge within organizations. In addition, through communication visibility, DingTalk improved individual ability to identify
experts and their potential expertise. For example, when a person often shared a certain type of knowledge on DingTalk, her colleagues would perceive her as an expert in that field. In summary, communication visibility improves the accuracy of individuals’ meta-knowledge [17], which helps them perceive what knowledge exists in organizations and who owns it. The visual advantage afforded by communication visibility helps workers find tacit knowledge and locate expertise.

5.3. P3: Communication Visibility Promotes the User’s Retention Process

Retention requires learners to understand the meanings of knowledge and information others shared on ESM. When using DingTalk, interviewees found that it was important to understand the intentions of others, which helped them understand the meanings of specific concepts and terminologies of others’ knowledge. As interviewee Li said in No. 13 interview, “During the running of the program system, there are always some people in other departments asking me how to operate, what buttons should be clicked on this interface, and how to operate to open the background. Sometimes I will use some terms to answer their question. Some people don’t understand what I mean. But others, usually who I work more with them, they can understand these meanings, and then do it, otherwise I can’t teach them online.” Such comprehension allows employees to establish common ground, increasing their mutual trust and willingness to share knowledge. Directly observing what others were talking about and the ways they communicated on DingTalk enhanced the mutual understanding between workers. As one of the participants, Ding, in No. 39 interview said: “When I share some articles and knowledge, if other colleagues click the button ‘I like’ under my post, I will feel the support and appreciation from them. In fact, it also shows a kind of consensus that I can explore a common topic with them.” This statement indicates that the contents visualized by DingTalk helped build tacit agreements between employees. Thirteen participants during our interviews described how DingTalk assisted them in grasping the ways other people speak, the jargon used in their languages, and different thought-provoking words by visualizing the communication processes.

5.4. P4: Collaboration Visibility Promotes the User’s Retention Process

Participants reported that collaboration visibility afforded by DingTalk helped them grasp the knowledge and experience shared by their colleagues, as seeing each other’s opinions on this experience can deepen learners’ understanding from different perspectives. For instance, a high-performing employee was invited by the manager to share her experience via DingTalk, particularly the skills and tips she used at work. However, the knowledge she shared was not easy to understand for all the listeners because each of them worked in a different context that required them to absorb knowledge in their unique way. Collaboration visibility, especially mass collaboration visibility (see our discussion among many colleagues on DingTalk), enabled individuals to comprehend external knowledge or others’ experiences and find suitable ways to understand it. In summary, collaboration visibility reduces individuals’ efforts to interpret and synthesize new insights by directly exposing them to external instrumental knowledge.

5.5. P5: Process Visibility Promotes Users’ Retention Process

Process visibility attributed to DingTalk provided users the information about their colleagues’ activity statuses. In our case study, enterprises designed their own standardized business processes and completed these processes on ESM. When employees wanted to communicate with their colleagues on DingTalk, they would check the status information above the chat window, indicating whether their colleagues were at a business trip, attending a meeting, or absent for an afternoon. Knowing colleagues’ status information (i.e., the task knowledge awareness about who is doing what in an organization [49]) improves collaboration among workers and the efficiency of the corresponding workflow. Often, certain knowledge in an organization is possessed by more than one colleague, and employees ask someone they know for help. However, this person may not always be available. Knowing their colleagues’ activity statuses can help employees ask for help from those
who are available. For example, as interviewees reported, when DingTalk showed that the colleagues they collaborated with were out for the afternoon, they would directly request help from others via DingTalk, which saved their time and speeded up knowledge acquisition and understanding. DingTalk’s process visibility also provided workers with useful workflow information that helped them comprehend the knowledge of others. For instance, participant He, the manager for one of our interviewed organizations, often shared the latest industrial news that he read with his subordinates. One of his subordinates clearly appreciated his sharing because he recognized the importance of this knowledge from observing his manager’s work processes. As he said: “It is very important for us to relate the process knowledge to the work we usually do. This knowledge is very suitable for us and we will definitely absorb it and apply it in our daily work.” Thus, this proposition is supported by our findings.

5.6. P6: Collaboration Visibility Promotes the User’s Production Process

The knowledge shared on DingTalk was diverse in nature. Each employee holding a specific position posted knowledge and information on DingTalk. Most posts were job-related; some were research-oriented. The information and knowledge posted on DingTalk were typically domain-specific, which made it difficult for employees in other disciplines to apply. Therefore, the collaboration among employees on DingTalk was crucial for the effective application of such knowledge. When managers convened virtual collaborations among employees to discuss the best practices shared by high-performance workers at DingTalk, different perspectives were brought up to stimulate ways for employees to integrate external knowledge with their own. Therefore, employees had the chance to learn about different alternatives and then choose the most suitable ways to apply knowledge shared by others. In a different setting, when an individual’s need was similar to the problem posted on DingTalk, he or she could directly use the provided instrumental knowledge. For example, employees may subscribe to some groups that share content closely related to their needs on DingTalk, as Cai in No. 2 interview explained: “I have joined several groups, including groups of recruiting classes, or groups with some other classes, which often released a video at some point of time. Then I will go check this content.” In summary, collaboration visibility afforded by DingTalk enabled individuals to explore alternative methods of problem solving, so they could effectively apply the knowledge learned from their colleagues.

5.7. P7: Process Visibility Promotes the User’s Production Process

Process visibility enabled individuals to view the entire workflow. Observing the requirements of the next process on DingTalk, workers could be well-prepared for the challenges and opportunities of their subsequent routine activities [35]. To address the challenges, workers could search for knowledge and tips on DingTalk and apply them to streamline their work processes. To fully exploit the potential opportunities, workers would engage in innovative activities through knowledge integration from various sources, including their own knowledge and that observed from DingTalk. Furthermore, the transparency from process visibility on DingTalk allowed workers to better understand other perspectives in the same workflow, improving their collaboration and work performance. The task knowledge awareness that workers acquired through process visibility facilitated their knowledge application. Therefore, this proposition is also supported by our interview data.

5.8. P8: Collaboration Visibility Promotes the User’s Motivation Process

Because collaborations occurring on ESM are usually virtual collaborations for the purpose of knowledge exchange, collaboration visibility affords users the chance to visualize the instrumental knowledge; this, in turn, renders it easier to learn more about the details of various knowledge. For instance, when employees answered a question on DingTalk, a virtual collaboration was initiated. The instrumental knowledge embedded in the question was made observable to all other employees by DingTalk. Since the communication on DingTalk was primarily text-based, users, including those who
joined the conversation later, could view the entire history of the communication and the documents being shared. As the interviewees reported, new employees were more likely to take the initiative to search the previous records of knowledge and information being shared on DingTalk, which helped them quickly gain familiarity with their work processes.

Additionally, DingTalk facilitated the brainstorming process (as it was called by one of the interviewees, Zhu), in which multiple employees participated in the virtual collaboration when knowledge providers were present to help address their questions. Therefore, individuals would obtain detailed knowledge or experience that improved their self-efficacy, as one of the interviewees stated that “I can apply this knowledge as many people confirmed that this method is feasible.”

5.9. Summary of Analysis

The interviews we conducted provided strong evidence to corroborate all the proposed propositions. We summarize the working mechanisms of the four categories of visibility facilitating the vicarious learning in Table 6.

| Table 6. The summary of working mechanisms. |
|---------------------------------------------|
| **Vicarious Learning** | **Attention** | **Retention** | **Production** | **Motivation** |
| **Identity Visibility** | Identity visibility | weak social tie, people sense-making | locate expertise, access various information | |
| **Communication Visibility** | communication visibility | meta-knowledge | visual advantage | find some tacit knowledge, identify who has knowledge |
| **Collaboration Visibility** | collaboration visibility | instrumental knowledge, mass discussion | reduce efforts to interpret and synthesize new insights, simplify the domain-specific knowledge | collaboration visibility | visualize various instrumental knowledge and different perspectives | multiply the opportunities to combine others’ knowledge with existing knowledge |
| **Process Visibility** | process visibility | workflow information, task knowledge awareness | comprehend the necessary others’ knowledge, improve collaboration | process visibility | workflow information, task knowledge awareness | see the gaps and opportunities, understand other perspectives |

| Identity Visibility | |
|---------------------|---|
| strong social tie, | |
| people sense-making | |
| locate expertise, | |
| access various information | |
6. Discussion

This research explores how four categories of visibility (identity visibility, communication visibility, collaboration visibility, and process visibility) affect an individual’s vicarious learning in the context of ESM. We develop eight theoretical propositions built on existing research. These propositions are then validated with evidence from our interviews with enterprises using DingTalk. These propositions constitute a theoretical framework (see Figure 2) that can be further explored and corroborated. This theoretical framework lays the foundation for future research on the relationships between vicarious learning and ESM visibility.

The evidence from our case study clearly indicates that ESM’s visibility has significant, positive impacts on individuals’ vicarious learning and reveals how visibility affects vicarious learning. Specifically, ESM’s visibility promotes the four sub-processes of vicarious learning (attention process, retention process, production process, and motivation process).

Our case study shows that identity visibility promotes an individual’s attention process because individuals can observe others’ identity information and thus make it easier for them to access each other’s knowledge. Communication visibility enables individuals to obtain more precise meta-knowledge (i.e., who knows what), enabling them to better observe tacit knowledge. It also allows individuals to understand what their colleagues proclaim and share, helping individuals understand others’ knowledge. Collaboration visibility affords individuals the chance to directly perceive instrumental knowledge and allows them to view discussions and communication during collaborations, helping them simplify others’ knowledge, improve their self-efficacy, and facilitate their knowledge applications. Process visibility helps individuals learn others’ knowledge by improving their comprehension of the necessary external knowledge of their work. It further strengthens the collaboration among colleagues, as they will be cognizant of how to apply others’ knowledge to their work processes. The summary of these mechanisms is shown in Table 6.

6.1. Implications

This research extends prior work by deepening our understanding of the effects of ESM’s visibility on an individual’s vicarious learning and, more specifically, how these effects develop in the context of visibility. Our research offers significant theoretical and practical contributions to the literature and organizational practices.

6.1.1. Theoretical Implications

First, our study extends the existing research on ESM’s visibility by dividing visibility into four categories. Particularly, we advance Treem and Leonardi [18] classification of visibility by proposing identity visibility. Drawing from existing literature, our research provides theoretical insights on the four categories of visibility. We also explore the relationship between these four types of visibility (see Figure 1). Although communication visibility is very important, it cannot substitute for other types of visibility. In this research, we find that each type of visibility affects the vicarious learning process in a distinct manner. Our classification of visibility can help researchers expand their understanding of the implications of visibility and provide guidelines for future research on the effects of visibility, especially for research on the impact of visibility on individual learning in the context of ESM.

Second, our research explicates the role of knowledge providers in individuals’ vicarious learning processes via a visibility lens. Because individuals can observe various information and knowledge in the context of ESM due to visibility, the learning mechanisms may be different. We indicate how different kinds of knowledge (i.e., meta-knowledge, instrumental knowledge, and task knowledge awareness) and information (i.e., identity information, process information, and others’ activity status information) afforded by specific categories of visibility influences individuals’ vicarious learning. These findings also shed light on existing research in the information seeking and retrieval fields [118]. In addition, our research shows that different types of knowledge affect vicarious learning in different ways.
Third, this research uncovers how the sub-processes of vicarious learning are affected by visibility in the context of ESM. Few studies have revealed the mechanisms of vicarious learning in the IS field. Our research addresses this gap by exploring the mechanisms of vicarious learning in the context of ESM; we find the unique working mechanisms of each type of visibility on ESM in terms of their effect on the sub-process of vicarious learning. Thus, this research provides a new perspective to explain why using ESM for knowledge management can help companies develop a sustainable competitive advantage. Our study significantly extends the implications of visibility and vicarious learning and builds a foundation for future research.

6.1.2. Practical Implications

Our research also provides valuable guidance for practitioners. First, our findings suggest that knowledge contributors should continue to provide follow-up help after sharing knowledge with others on ESM to improve their vicarious learning effects. The subsequent interactions between knowledge providers and learners are particularly valuable for individuals to identify, understand, and apply others’ knowledge in organizations. Therefore, the more subsequent interactions that occur on ESM, the better the vicarious learning effects for all other employees.

Second, our research suggests that employees should actively search for information instead of passively receiving information on ESM. Prior research suggested that passively visualizing others’ communication can have a positive effect by helping individuals develop meta-knowledge [32]. However, our research suggests that passively receiving knowledge from communication visibility cannot effectively promote the vicarious learning effects because communication visibility only has positive effects on two sub-processes of vicarious learning (i.e., attention and retention); as prior research suggests each of four sub-processes plays an important role in determining the ultimate learning result, employees should actively search for enough information through identity visibility, collaboration visibility, and process visibility. To attain the information through these three types of visibility, people are required to actively seek out (e.g., click on others’ profiles) instead of passively waiting for the information to come in.

Third, our findings also provide useful insights for ESM designers. As this research demonstrates the importance of visibility, designers would be well-advised to add functions to promote visibility when developing software. These functions should make more of the basic information visible to benefit employees. For instance, in our case analysis, we find that DingTalk has such functions that transparently reveal the entire organizational structure to their employees and keep their identity information accurate.

6.2. Limitations and Future Research

Although our study makes significant contributions to the literature and practice, it also has several limitations, which may provide opportunities for future research. First, a common criticism of the case study approach is the issue of generalizability. Our study is closely related to the context, as we collected research data from Chinese enterprises using DingTalk. However, DingTalk may have features different from those used in other cultures and contexts. Thus, the data we collected are context-specific, narrowing their generalizability. Future research should explore our propositions both within and beyond China, verifying their general validity in other contexts. As well, our interviewees were primarily employees who use ESM in their daily work; we did not include non-users (or infrequent users) of ESM, so the applicability of our conclusions is only limited to the group of employees who regularly use ESM. Future research should study ways to motivate employees who are less frequent users of ESM to improve the benefits of ESM in the workplace.

Second, this research identifies only the positive effects of visibility. Although most research on ESM focuses on the positive effects of enhanced visibility of related content and people [3], researchers have also shown that visibility has negative impacts [119–121], including hindering collaboration, minimizing certain voices, and discouraging the willingness to post information.
Thus, it is necessary to explore these impacts on individuals’ vicarious learning. Future research can explore both the positive and negative effects of visibility on vicarious learning.

Third, this study investigates only individuals’ vicarious learning. As vicarious learning is also widely used at the organizational level [9, 122] and the use of ESM will affect both individual and organizational processes [3], future research can explore how the ESM visibility affects organizational vicarious learning. The relevant mechanisms at organizational levels may be different from those at individual levels.

7. Conclusions

This research identifies four categories of visibility from existing literature—communication visibility, identity visibility, collaboration visibility, and process visibility—and then applies the data collected from Chinese enterprises using DingTalk to validate eight propositions. Our findings suggest that ESM’s visibility facilitates the sub-processes of vicarious learning. Specifically, identity visibility promotes an individual’s attention process, communication visibility facilitates the attention and retention processes, collaboration visibility improves the retention, production, and motivation processes of vicarious learning, and process visibility enhances the retention and production processes.

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Appendix A

The examples of guided interview questions:

1. Could you introduce yourself first? And tell us the main content of your job.
2. Could you talk about how you use DingTalk at work? What features do you use frequently?
3. How do you feel that using DingTalk will help you?
4. Do you actively look for information on DingTalk? And what kind of information can you see or find on DingTalk?
5. Do you feel that your colleagues use DingTalk frequently? What content or information do other colleagues post on DingTalk?
6. Do you feel that using DingTalk will help improve your learning ability? If so, how is it realized? Could you give a concrete example to illustrate?
7. Does enterprise use DingTalk to promote employee training or experience sharing? What do you think is the role of DingTalk in this process?
8. Do you think the use of DingTalk can help you discover the knowledge you need faster? If so, how did you find it on DingTalk?
9. What kind of information on DingTalk is helpful for improving or facilitating your learning ability?
10. How did you find others on DingTalk? Do you spend time browsing other people’s profile pages? How you think this information will help you?
11. Will managers praise top performers on DingTalk? Does it promote your desire to learn from them?
12. Could you show us how you used DingTalk on your mobile phone?
13. What help does DingTalk offer in terms of collaboration between you and your colleagues?
14. What do you think of the process management on the DingTalk? And what impact does it have on you?
15. Do you think that communication among colleagues will promote your own learning effect? And what do your colleagues usually do to help you on DingTalk?
16. Can you successfully master the knowledge shared by others, and if you have any questions, how will you solve them?

Appendix B

Table A1. The summary of interview.

| No. | Interviewees   | Enterprise | Interview Date | Interview Time (Minutes) |
|-----|----------------|------------|----------------|--------------------------|
| 1   | Ye, Cai        | D          | 2018.1         | 118                      |
| 2   | Zhu            | D          | 2018.1         | 77                       |
| 3   | Wang           | D          | 2018.1         | 21                       |
| 4   | Zhu            | D          | 2018.3         | 32                       |
| 5   | Lu             | D          | 2018.3         | 43                       |
| 6   | Ding           | D          | 2018.3         | 22                       |
| 7   | Xu             | D          | 2018.3         | 41                       |
| 8   | He, Luo        | F          | 2018.6         | 11                       |
| 9   | He             | F          | 2018.6         | 86                       |
| 10  | Luo            | F          | 2018.6         | 4                        |
| 11  | Jin            | F          | 2018.6         | 123                      |
| 12  | He             | F          | 2018.6         | 7                        |
| 13  | Li             | F          | 2018.6         | 57                       |
| 14  | Wen, Yao       | F          | 2018.6         | 46                       |
| 15  | He             | F          | 2019.1         | 15                       |
| 16  | He, Luo        | F          | 2019.1         | 108                      |
| 17  | He, Luo        | F          | 2019.1         | 33                       |
| 18  | Cheng          | F          | 2019.1         | 86                       |
| 19  | Luo            | F          | 2019.1         | 77                       |
| 20  | Luo            | F          | 2019.1         | 64                       |
| 21  | Song, Luo      | F          | 2019.1         | 23                       |
| 22  | Wu             | F          | 2019.1         | 90                       |
| 23  | Luo            | F          | 2019.1         | 55                       |
| 24  | Ding           | F          | 2019.1         | 70                       |
| 25  | He             | F          | 2019.1         | 53                       |

Total 1362

Some interviews (No.8, No.10 and No.12) were shorter because the conversations took place on the road (e.g., on the way to a conference room). To maintain interviewee anonymity, we only used their surname.
## Appendix C

Table A2. The summary of interview.

| No. | Interviewees  | Enterprise | Job                                          | Interview Word Counts |
|-----|---------------|------------|----------------------------------------------|-----------------------|
| 1   | Ye, Cai       | D          | Department of Legal Compliance Assistant, Director of Personnel Administration | 30,105                |
| 2   | Zhu           | D          | Director of Personnel Administration         | 23,969                |
| 3   | Wang          | D          | Operations Management Division Operations Specialist | 6210                 |
| 4   | Zhu           | D          | Personnel Administration Commissioner        | 11,279                |
| 5   | Lu            | D          | Business manager                             | 10,605                |
| 6   | Ding          | D          | Personnel Administration Commissioner        | 5629                  |
| 7   | Xu            | D          | Collaborative Development Staff              | 10,365                |
| 8   | He, Luo       | F          | Vice president of information, Deputy Manager of Software Development | 1748                 |
| 9   | He            | F          | Vice president of information,                | 15,155                |
| 10  | Luo           | F          | Deputy Manager of Software Development       | 787                   |
| 11  | Jin           | F          | Executive Vice President                      | 32,696                |
| 12  | He            | F          | Vice president of information                 | 1006                  |
| 13  | Li            | F          | Senior engineer                              | 16,097                |
| 14  | Wen, Yao      | F          | Operations Management Manager, production manager | 13,031               |
| 15  | He            | F          | Vice president of information                 | 3050                  |
| 16  | He, Luo       | F          | Vice president of information, Deputy Manager of Software Development | 26,013               |
| 17  | He, Luo       | F          | Vice president of information, Deputy Manager of Software Development | 6717                 |
| 18  | Cheng         | F          | Product manager                              | 22,256                |
| 19  | Luo           | F          | Deputy Manager of Software Development       | 20,434                |
| 20  | Luo           | F          | Deputy Manager of Software Development       | 18,014                |
| 21  | Song, Luo     | F          | Supplier, Deputy Manager of Software Development | 5630                 |
| 22  | Wu            | F          | Deputy General Manager of Cloud Development Department | 25,217               |
| 23  | Luo           | F          | Director of Marketing Management             | 14,094                |
| 24  | Ding          | F          | Product manager                              | 16,287                |
| 25  | He            | F          | Vice president of information                 | 11,490                |
|     |               |            | **Total**                                    | **348,424**           |
### Appendix D

**Table A3.** Sample excerpts from the interview transcripts.

| Proposition | Sample Excerpts Supporting Each Proposition |
|-------------|---------------------------------------------|
| 1           | “There exists the personal information of different colleagues on DingTalk, I can contact my colleague in the first time. We should all be in the same company, so he can find me on DingTalk. He must be my colleagues, and I can be sure of his identity. I can chat directly with him without adding friend. There are some questions about information he or she shared on DingTalk that can be answered directly, unlike chatting via WeChat which I need to confirm my identity by adding a friend first.”  
“The information of the positions in each department for every colleague can be seen on DingTalk. It’s better to know what departments our company has, and it’s more convenient to connect, we can directly connect to everyone in the company to ask for help.”  
“It is also convenient to find some experts in our company, you can find them at any time, no need to go through the address book to find this person, it will be more convenient. Don’t need to spend time looking for this person.” |
| 2           | “Occasionally I see what can help us in our work, such as about the technical aspects and some new improvements. Basically, if this knowledge is closely related to us, I will post it on DingTalk. Our manager (He) also always share some experiences.”  
“When I have some knowledge that may be useful to many people, I will share it on DingTalk directly, publish it in group on DingTalk so that the people who need it can see it. It is a one-to-many sharing.”  
“If there is a person who has published a lot of knowledge on DingTalk and it is also closely related to what we need, then we will look for him next time if we meet some difficulties, or if we have a meeting, we will invite him to attend our meeting.” |
| 3           | “This means that others get my intention, because the most important thing between colleagues is that I can understand what you said, and you know if I understand. This is the most important. I feel that I have a common topic with him, or that everyone can share goals and communication together. when I share some experiences and knowledge, if other colleagues click the button of ‘I like’ under this information, I will feel that it is a kind of consensus that others understand the meaning of my knowledge.”  
“Some technical department staff will answer more professionally, or I can’t understand it, or if the problem is more technical, I will let them go my office offline to help me solve the problem.”  
“If you know your colleague better, like an old saying in China, ‘All is understood, and no words are necessary,’ and you will quickly understand what he wants to express.” |
| 4           | “For example, Zhang San’s performance this month is particularly good, we will let him share his experience, for example, how do you do it. He may share, for example, what method he uses, he will share in the group. Then others will discuss it to better understand it because this knowledge or experience may be only suitable for him.”  
“Maybe you don’t understand what he said, but it’s okay, because we will all discuss about it. Maybe other people who understand have changed the way of expression, maybe you can understand it better, and this situation is quite common.” |
Table A3. Cont.

| Propositions | Sample Excerpts Supporting Each Proposition |
|--------------|--------------------------------------------|
| 5            | “For example, if he will go on a business trip, he needs to go through the process of approval for reimbursement for buying tickets. If he goes through this process, then his chat box will present his activity status, showing during this time he is at business trips. Or if he goes out this afternoon, this information also will be displayed.” “If he is in a meeting and I see this information, then I will not ask for his help or wait his reply and I will ask others for solving my confusions, which improves my experience and comprehend knowledge more comfortably.” “I submit many approvals, for example, a leader may at business trip or meeting, the approval will be faster on DingTalk, so that it can be submitted to the court in time or docked with the bank.” “Manager (He) always shared what he saw about new architecture, and the architecture which is very important for us. The latest product design is related to the work we usually do. This knowledge is very suitable for us and we will definitely understand what it means and then absorb it.” |
| 6            | “The knowledge documents related to our work, knowledge about our project, is equivalent to the data, regardless of the research data, the knowledge materials of everyone, and the reference materials, all posts share and sort it, we can see them.” “I have joined several groups, including groups of recruiting classes, or groups with some other classes, which often released video at some point of time. Then I will go check this content.” “We have a person in our technical department who sorts out the problems and solutions that everyone feedbacks, publishes it in the group, and then updates it every so often until the system runs successfully in the enterprise. This both reduce the burden on technicians and speed up problem resolution.” |
| 7            | “In the past, his approval was made by telephone, the call was made to the buyer, and the buyer called to the warehouse. But now it is how much the supplier were copied, and whether it was in or not in the plan. Buyer can see the entire data. There is no need for any communication, and the result is the buyer’s approval, the warehouse management can see it at the same time. They just don’t need to contact by the phone, realizing real-time collaboration”. “That is to say, you will think differently. If you know your colleague’s work, you can better understand what he means. Combined with your own specific work situation, you can use these experiences more flexely.” |
| 8            | “It’s basically a lot of text communication on DingTalk, you can see what others shared and find it in previous communication, and the documents can be shared, and the people who enter the group later can see the files shared previously.” “This kind of brainstorming is very helpful. The more people shared his experience on how to apply it and the outcomes, the more confidence you will have. Because many people have succeeded in applying this knowledge in their work, you will believe that ‘I can also do that.’ In this situation, some of the difficulties you encounter later will not hinder your confidence in continuing to use this knowledge.” |
### Appendix E

Table A4. Framework to assess case studies [103].

| Research Design                                                                 | Yes, ‘how’                                                                 |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Clear research question                                                          | Yes, two                                                                  |
| Multiple-case design                                                             | literal                                                                   |
| Replication logic in multiple-case design                                        | Employees using DingTalk                                                  |
| Unit of analysis                                                                | Not conducted as it is recommended for highly exploratory nature          |
| Use of a pilot case                                                              |                                                                           |
| Team-based research                                                             | Yes                                                                       |
| Different roles for multiple investigators                                       |                                                                           |
| Data collection                                                                  |                                                                           |
| Elucidation of the data collection process                                       | Yes                                                                       |
| Multiple data collection methods                                                 |                                                                           |
| Data triangulation                                                              | Yes                                                                       |
| Case study database                                                             | Yes                                                                       |
| Data analysis                                                                    |                                                                           |
| Elucidation of the data analysis process                                         | Yes                                                                       |
| Field notes                                                                      |                                                                           |
| Coding and reliability check                                                      |                                                                           |
| There were several ways, as we describe in Section 4. First, the accuracy of one’s compiled transcripts was verified by another member; second, we had several meetings to discuss the interpretations; third, we have the database [105]. Yes |
| Data displays                                                                    |                                                                           |
| Logical chain of evidence                                                        |                                                                           |
| Yes                                                                            |                                                                           |
| Quotes (evidence)                                                               |                                                                           |
| Yes                                                                            |                                                                           |

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