Helper, Sharer or Seeker? – A Concept to Determine Knowledge Worker Roles in Enterprise Social Networks

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Abstract. In order to manage knowledge work, companies need to understand how knowledge is shared, integrated, translated and transformed in organisational practice. However, knowledge work often happens in informal organisational structures, thus, making it difficult to identify and understand the occurring knowledge practices and participating actors. Enterprise Social Networks (ESN), i.e. internally accessible social networking services, have evolved as important platforms for knowledge work. Facilitating knowledge interactions between users, the analysis of ESN data might be well suited for characterising and identifying knowledge actions and different knowledge worker roles. Drawing on an existing knowledge worker role typology as well as findings from social media research, this paper develops a conceptual basis that serves as starting point for determining knowledge worker roles using ESN data. The next steps of this research involve the empirical testing of the typology using data obtained from a real case scenario.

Keywords: Enterprise Social Networks, knowledge worker, social roles, knowledge work.

1 Introduction

While knowledge has been recognised as a key source of competitive advantage, the management of knowledge work is a challenging – and often unsuccessful – task [1]. One reason for knowledge management (KM) initiatives to fail lies in the very nature of knowledge and knowledge work. As such, knowledge work is often conducted in informal organisational structures that exist next to the formal hierarchy and are not fully obvious to the company's management nor to the involved actors [2]. Being emergent and contextual, knowledge and knowledge work are difficult to describe and to measure, and therefore, difficult to manage.

To be able to (better) manage knowledge work, organisations need to understand the components of knowledge work, i.e. knowledge actions, and the different knowledge worker roles performing these actions [1]. Research dealing with informal networks and key roles within these networks [e.g. 2] as well as existing knowledge worker role

typologies [e.g. 3] provide insights regarding different actor roles shaping knowledge work in organisations. Yet, these studies determine roles based on survey data. Thus, the significant manual effort involved in the data collection and analysis makes it difficult to recognise knowledge worker roles in larger populations.

More and more organisations use Enterprise Social Networks (ESN) to support collaboration and knowledge sharing. The users of these platforms engage in use practices such as discussing, asking questions, giving advice, and sharing content [4]. Doing so, they leave a number of digital traces stored in the back end of the ESN [5]. Reflecting knowledge (inter)actions of ESN users, the record of user activity may be well suited for identifying different knowledge worker roles in organisations.

Drawing on the knowledge worker role typology by [3], this paper establishes a conceptual basis for determining knowledge worker roles using ESN data. Based on a systematic literature review, ESN use cases are analysed and compared with the knowledge actions specified in [3]. The knowledge actions are operationalised using a set of metrics characterising user activity, i.e. quantitative and qualitative information on the users' posting behaviour, in ESN. As a result of the literature analysis, the paper proposes a revised typology which will be empirically tested in a follow-up project.

This paper contributes to KM research by presenting the initial steps for determining knowledge worker roles in ESN. It advances the field of ESN data analytics by proposing a set of metrics to characterise ESN user behaviour. As for practitioners, awareness of the knowledge worker roles that employees take on can improve decision-making at the intersection of human resources management (HRM) and KM.

2 Theoretical Background and Related Work

This paper draws on KM research and social media research to derive a concept to determine knowledge worker roles in ESN. The following sections contrast perspectives on knowledge and introduce research on KM-related roles in organisations. Section 2.3 deals with ESN features and ESN data. Also, selected works on the identification of roles in online social spaces are presented.

2.1 Knowledge and Knowledge Work

Two main perspectives regarding the study of knowledge can be distinguished: The possession perspective and the practice perspective [6]. Scholars taking up the possession perspective consider knowledge as an object that is held by an individual knower [e.g. 7]. Accordingly, KM strategies focus on the extraction and explication of individual knowledge in order to make it accessible to others [8]. On the other hand, researchers adopting the practice perspective argue knowledge to be created and shared through social interactions between individuals [e.g. 9]. Consequently, this perspective suggests the management of knowledge work, i.e. activities "characterised by an emphasis on theoretical knowledge, creativity and use of analytical and social skills" [10, p. 773], rather than managing knowledge [1]. In particular, knowledge work should be stimu-

lated and enhanced, e.g. by connecting individuals from different departments to reinforce knowledge sharing. This paper adopts the knowledge-in-practice perspective since it more adequately reflects how knowledge work occurs on ESN. As such, ESN offer a conversational space for knowledge work rather than a place for storing knowledge [4]. Also, the knowledge-in-practice perspective reflects the dynamics and complexity of contemporary work settings [e.g. 1].

2.2 Knowledge Worker Roles in Organisations

Individuals performing knowledge work, so-called knowledge workers, are primarily occupied with 'non-routine' problem solving [3]. While knowledge work is an important topic in the KM literature, little is known about the different roles that knowledge workers assume during their daily work [3]. In this regard, some role typologies [e.g. 11] link roles to specific KM-related processes, such as *finding*, *packaging*, and *distributing* knowledge. The corresponding roles are named *knowledge packagers* and *knowledge distributors*, for instance [11, p. 28-30]. Yet, linking only one knowledge action with a certain role, these typologies do not seem to adequately reflect the complexity of knowledge work and implicitly treat knowledge like an object. Thus, they are not directly applicable for determining knowledge worker roles in ESN.

Reflecting the knowledge-in-practice perspective, studies investigating informal organisational structures [e.g. 2] offer insights regarding actor roles involved in knowledge work, among them *central connectors*, *boundary spanners* and *peripheral specialists* [e.g. 12]. Moreover, [3] propose a typology including ten knowledge worker roles (cf. [3] for a detailed description of the roles), each of which is associated to different degrees with a set of knowledge actions out of 13 specified knowledge actions (Figure 1).

Knowledge worker role \ Knowledge action	Acquisition	Analyse	Authoring	Co-authoring	Dissemination	Expert Search	Feedback	Information organisation	Information search	Learning	Monitoring	Networking	Service Search
Controller	o	++	+	-	+	-	+	o	o	--	o	--	--
Helper	o	++	-	-	++	o	++	o	++	o	-	o	-
Learner	+	++	-	-	--	o	-	+	++	+	o	o	-
Linker	+	++	o	o	o	-	-	o	++	o	o	o	--
Networker	o	o	-	-	+	+	o	o	o	o	o	++	--
Organizer	o	++	-	--	o	-	o	+	o	-	+	+	o
Retriever	++	+	-	--	-	o	-	+	+	o	+	o	o
Sharer	-	o	+	+	++	--	o	o	o	-	-	+	-
Solver	o	++	-	--	o	o	o	o	+	o	-	-	-
Tracker	o	+	-	--	o	o	o	+	+	o	++	o	o

++ Very important	+ Important	o Undecided	- Less important	-- Not important

Figure 1. Knowledge worker roles and associated knowledge actions (based on [3])

In this regard, Figure 1 depicts the relationships between knowledge worker roles and knowledge actions and indicates the importance of a knowledge action for a certain role [3]. In line with the knowledge-in-practice perspective adopted in this paper, the

knowledge worker role typology by [3] reflects roles identified in informal organisational networks, e.g. *boundary spanners*. Derived based on a literature review as well as an empirical study, the typology includes a comprehensive set of roles, associates specific knowledge actions with each role and indicates the importance of an action for a role. As ESN have evolved as platforms for knowledge work [5], users may perform knowledge actions similar to those specified by [3] and take up similar roles. Thus, the knowledge worker role typology by [3] serves as the basis for determining roles in ESN.

2.3 Functionalities and Analysis of Enterprise Social Networks

In recent years, companies have started to use internal online social networks, i.e. ESN, well-known examples of which include IBM Connections, Jive or Yammer [13]. Relying on Web 2.0 technology, ESN are web-based Intranet platforms that generally offer the following features [19-20]:

- *Profile pages* allowing users to present information about themselves
- *Following* other users to see their updates
- *Activity streams* displaying updates from other users and followed topics within an integrated newsfeed
- *Searching* the content stored on the ESN
- *Group capabilities* that allow interactions within public or restricted groups
- *Discussion threads* where users can start conversations via status updates, share files and participate in conversations by replying to, liking, rating and sharing the messages of other users
- *Tagging* of other users or topics in messages
- *Bookmarks* that allow for saving, organising and sharing content
- *Blog and wiki capabilities* that enable the (collaborative) creation of content and storing of information
- *Social analytics* that provide users with contact recommendations

The actions of users on ESN are visible to other users and persist over time [16]. Specifically, communicative actions are stored as digital traces, i.e. "digitally stored, event-based, chronological records of activities of actors" [5, p. 4], in the ESN back end. The accumulated data can generally be classified according to the following categories [17]: *Activities* (usage data), *content* (user-generated data), and *relations* (structural data). A combination of quantitative and qualitative methods facilitates the analysis of ESN data [17]. Usage data enables the development of metrics, e.g. *number of status updates created (per month)*, that quantify user activities. The content of communications, e.g. the content of a status update, can be analysed using qualitative content analysis, for instance to identify communication genres [18], or (partly) automatically, for instance using text mining techniques. Also, different kinds of relations can be inferred from user interactions on the platform, e.g. based on *following* relationships [17]. Structural data can be analysed using social network analysis (SNA) metrics that enable characterising the position of individual actors, e.g. based on centrality measures [19].

2.4 Roles in Online Social Spaces

Interactions between individuals in online social spaces, such as discussion boards, result in communication patterns. Roles can then be described by "structural signatures" reflecting their position in the social network and behavioural patterns characterising their participation behaviour, e.g. how often they contribute to a discussion [20, 21]. Compared to the high number of articles dealing with user roles in public online settings [22], research on user roles in ESN is still sparse. A case study by [23] identifies *discourse drivers*, who primarily disseminate topics, and *information retrievers*, who are interested in finding and using information, as two mutually interdependent actor roles. Other studies analysing knowledge exchange differentiate between *knowledge seekers* and *knowledge contributors* [24], and between *givers*, *takers*, and *matchers* respectively [25]. Additionally, *value adding users*, i.e. users who contribute and share their knowledge in the ESN, are suggested as ESN actor role [26]. Analysing log data, [27] differentiate between *active contributors*, *moderate contributors*, and *readers* as well as *active* and *occasional* users. All in all, the role concepts suggested in ESN research are not very detailed since they are based on relatively few behavioural dimensions and identified using a limited set of metrics. However, metrics used in studies investigating roles in public online settings can inform the development of metrics to determine the knowledge actions suggested by [3] in ESN.

3 Determining Knowledge Worker Roles in Enterprise Social Networks

This paper uses the knowledge worker role typology by [3] as a starting point for determining knowledge worker roles in ESN. While the original typology is based on a literature analysis and a survey, this paper addresses the question how the typology needs to be adapted in order to facilitate the determination of knowledge worker roles using ESN data.

The adaptation of the typology involves three steps: The first step (section 3.1) concerns the identification of ESN use cases that match the knowledge actions specified in [3]. The goal is to find out whether the knowledge actions are reflected in ESN use cases as well as to assess if they can be determined as distinct actions using ESN data. The second step (section 3.2) focuses on the operationalisation of the knowledge actions by developing a set of ESN metrics. Following the approach of explicit role discovery [22], the knowledge actions associated with a role serve as criteria for individual users to be assigned to a certain role as described in section 3.3.

3.1 Applicability of Knowledge Actions in Enterprise Social Networks

Focusing on information systems research on ESN, the literature review performed in step 1 considers studies published in major information systems journals and conferences according to the Association for Information Systems [28] and the rating of the German Academic Association for Business Research [29]. Covering the years 2005-

2015, multiple search terms and combinations of them were considered, among them microblogging, enterprise social network, enterprise social media, social software, and KM. A detailed description of the literature review process and assignment of the selected papers to six metatopics is described in [30]. The contents of the following section are compiled based on the publications primarily assigned to the metatopic "ESN usage and behaviour" as well as on a follow-up search for papers dealing with ESN usage covering the year 2016. Specifically, papers assigned to this metatopic analyse the ways and purposes of using ESN in organisations, thus identifying ESN use cases. Analysing the selected 28 publications in detail, ESN use cases mentioned in the papers, such as *input generation* or *information storage* [18], are matched with the 13 knowledge actions according to their descriptions in [3]. The ESN use case *information storage,* for instance, is matched with the knowledge action *information organisation* since it is related to managing information on the ESN for future reference. Table 1 consolidates the findings of the literature analysis. The subsequent paragraphs detail which and to what extent the different knowledge actions are applicable to ESN.

Acquisition describes the collecting of information with a conscious goal, e.g. to develop skills or advance a project [3]. Actions related to information gathering on ESN have been identified in a number of studies [e.g. 18]. For instance, acquisition of knowledge is explicitly referred to in the definition of "consumptive" ESN use in [31]. However, the second part of the definition of *acquisition* [3], i.e. having a conscious goal, is not explicitly addressed in the existing ESN literature and appears difficult to determine based on ESN data.

Analyse is defined as carefully examining or thinking about something with the objective of understanding it [3]. The action *analyse* is not necessarily linked with a piece of written information that could be submitted and thus, become visible, on an ESN. While the knowledge action *analyse* is not explicitly mentioned in the ESN literature, the analysis of content can be assumed to be part of the knowledge actions *learning* as well as *monitoring*. Thus, users are concluded to analyse content on the ESN by reading it in order to learn or keep themselves up-to-date about something.

Authoring refers to the creation of information objects (by one person), e.g. textual content, using a software system [3]. As such, *authoring* applies to all textual content submitted to the platform, including posts to the main stream. To better differentiate it from other knowledge actions concerning the ESN main stream (e.g. *dissemination* and *feedback*), in this paper, *authoring* is conceived of as initiating conversations, e.g. to propose an idea [e.g. 4], rather than contributing to existing conversations. Moreover, *authoring* is related to the creation of wiki entries, notes or blog posts [32, 33] which are features of most ESN platforms.

Contrary to *authoring*, **co-authoring** means the collaborative creation of content [3]. *Co-authoring* occurs on ESN platforms when users edit the content created by other users, e.g. when updating content to a new version [34], editing a wiki page [32], articles [25], or blog posts [33].

Dissemination refers to the spreading of information or information objects, such as work results [3]. With regard to ESN, employees share factual information in status updates, e.g. information about objects or people [35], and event notifications [18, 36]. Secondly, users employ ESN to share information objects to make them accessible to

others [34], e.g. files in general, project descriptions [37] as well as links to content that already exists [18, 34]. Thirdly, individuals post updates [e.g. 4], regarding their work activity, mood, or physical location [38] as well as "me-statements" that reveal something about them [35]. As a means for impression management [39], users share personal information and information about their professional background.

Expert search refers to retrieving an expert in order to discuss and solve a specific problem [3]. In ESN, retrieving experts is considered as one form of knowledge seeking, i.e. seeking knowledge about people with specific characteristics [24], such as particular skills or connections [4, 18, 40].

The knowledge action **feedback** is described as the evaluation of a proposal or an information object [3]. As for ESN, feedback is part of conversations, e.g. discussions of different options for action to solve a problem [e.g. 18]. Additionally, "social feedback" is recognised as a form of informal communication on ESN [34]. In terms of ESN features, *feedback* can be expressed in liking, rating [34] or commenting on the content created by another user [32] as well as by voting the posted content up or down [41].

The personal or organisational management of collected information is referred to as **information organisation** [3]. In this regard, ESN are used to store information [18, 36]. Furthermore, the labelling of content with a topic [34], e.g. using a tag, can be concluded as a form of *information organisation*.

Information search is described as looking up information on a particular topic and in a specific form [3]. ESN users can "look up" information stored on the platform using the search feature [34]. Moreover, status messages containing questions and information requests are a dominant use case in the ESN literature [e.g. 31] and can be considered as an "explicated" form of *information search*. For instance, employees seek factual knowledge, opinions, and recommendations in status updates [24].

Learning refers to acquiring new knowledge, skills or understanding while performing work tasks, in exchange with others, or using formalised learning material [3]. As such, *learning* appears to be closely related to the action *acquisition* and could be assumed to be one motive of knowledge actions related to search. *Learning* on ESN occurs via a mix of consuming and contributing activities. Browsing the record of activities in project groups, for instance, enables new team members to learn about the history and current status of a project [42]. Also, ESN enable visibility into other users' conversations [16]. As users read and engage in these conversations, they learn about people's expertise and what is important in the organisation [4]. Therefore, ESN facilitate continuous (social) organisational learning [16, 18].

Monitoring is described as keeping oneself informed about selected topics, e.g. using different electronic information resources [3]. Just like the actions *analyse* and *learning*, *monitoring* is difficult to observe based on what employees explicitly post to the network. Yet, ESN enable *monitoring* by supporting different kinds of situation awareness, that is knowing who is doing what (activity awareness), knowing relevant contact persons (structure awareness), as well as knowing what other people are interested in and knowing who is talking to whom (social awareness) [43]. In particular, *monitoring* is facilitated by features related to subscribing to users' updates or topics [19-20]. *Monitoring* may be closely related to *learning* since learning can be an outcome of monitoring activities.

Table 1. Overview of knowledge actions and associated ESN use cases

Knowledge action	Associated ESN use case and sample references	Concerned ESN feature [14, 15]
1 Author-ing	*1a* Initiating a conversation to ask for input / ideas [18]; *1b* Creating a wiki page / blog post [32]	Status updates; Wiki / Blog
2 Co-au-thoring	*2* Editing of a wiki page / blog post [32, 33]	Wiki / Blog
3 Dissemi-nation	*3a* Providing updates (e.g. on work activity) [4, 39]; *3b* Sharing of files / references [36]	Status updates; File sharing
4 Expert search	*4a* Retrieving an expert using search feature [34]; *4b* Requesting for an expert within a status update [44]	Search; Status updates (expert seeking)
5 Feedback	*5a* Providing feedback within conversations [18]; *5b* Providing social feedback [36]; *5c* Liking or rating of content [34]	Discussion thread (participation); Rating / liking
6 Informa-tion organi-sation	*6a* Saving of meeting minutes [18]; *6b* Bookmarking content [26]; *6c* Labelling / tagging of content [34]	File repository; Bookmarks; Tag-ging
7 Informa-tion search	*7a* Retrieving information using search feature [18, 34]; *7b* Asking for information in a status update [31, 36]	Search; Status updates (information seeking)
8 Learning	*8a* Reading past conversations [16]; *8b* Participating in a conversation [4]	Activity stream (browsing); Dis-cussion thread (participation)
9 Monitor-ing	*9a* Reading past conversations [43]; *9b* Subscribing to users' messages or keywords [36]	Activity stream (browsing); Fol-lowing other users / topics
10 Networ-king	*10a* Following other users [32]; *10b* Creating social relations [37]; *10c* Tagging other users [32]; *10d* Talking about non-work related matters [4]; *10e* Commenting on status updates [37]	Following other users; Discussion thread (participa-tion); Discussion thread (social use)
11 Service search	*11* Asking for a solution in a status update [45]	Status updates (solution seeking)

Interactions with other people and organisations in order to exchange information and to establish contacts are described as **networking** [3]. While every interaction between users includes some form of information exchange, *networking* is concluded as "social use" of ESN [31] in this study. As such, it describes communication aimed at the maintenance of existing and creation of new social relationships in order to build per-

sonal context [44]. Messages indicating social use are often related to informal communications [e.g. 18]. For instance, the tagging of other users in messages [32] or the use of emoticons [35] could serve as an indicator for *networking*.

Service search describes the seeking for specialised web services that offer particular functions in order to address a given problem. Compared to *information* and *expert search*, the object to be retrieved is different [3]. On ESN, messages related to seeking solutions or specific resources could be concluded as *service search* [45].

Summarising the findings of the literature analysis, Table 1 lists ESN use cases (citing sample references) associated with the knowledge actions as well as ESN features employed to engage in the use cases. In this regard, one knowledge action can be described by several ESN use cases. In contrast to the knowledge actions by [3], Table 1 does not include the actions *analyse* and *acquisition*. In this regard, no use case could be identified for *analyse* since this action is not explicitly mentioned in the ESN literature. Yet, it is implicitly included in the actions *learning* and *monitoring* as in reading content in order to learn or keep informed respectively. Moreover, *acquisition* is merged with *information search* into the action *information search*. On the one hand, only the component of *acquisition* related to *information search* can be observed on ESN. On the other hand, users are assumed to generally have a goal when searching for information.

3.2 Determining Knowledge Actions in Enterprise Social Networks

Having identified the ESN use cases associated with a particular knowledge action, metrics for recognising knowledge actions using ESN data are designed. As such, the metrics shown in Table 2 reflect the concerned ESN features (Table 1) and facilitate the quantification of the ESN use cases connected to a knowledge action. The numbering of the metrics corresponds to the numbering of the ESN use cases in Table 1. The metrics are designed based on existing studies [e.g. 32, 34] and in accordance with the data generally available in ESN [17]. Moreover, Table 2 indicates the categories of ESN data (section 2.3), i.e. activities (usage data), content (user-generated data), and relations (structural data) [17], required to implement the metrics. The knowledge action *dissemination*, for instance, is connected to the use cases *providing updates* and *sharing of files* in ESN (Table 1). Exemplary metrics to determine the extent to which a user engages in the knowledge action *dissemination* then include the *number of status updates* as well as the *number of status updates that contain an attachment*. These metrics require the collection and analysis of data from the category *activities*, i.e. usage data. Furthermore, Table 2 indicates the complexity and hence effort required to analyse the different knowledge actions using ESN data. In this regard, knowledge actions in rows coloured in grey are recognised as less difficult to analyse than the ones in rows without shading. The effort involved in analysing a knowledge action depends on the data dimensions and data analysis methods (cf. section 2.3) required to implement the respective metrics.

Table 2. Operationalisation and analysis of knowledge actions

Knowledge action [3]	Example metrics to quantify ESN use cases (cf. Table 1)	Data category [17]
1 Authoring	*1a* No. of status updates (first messages); *1b* No. of wiki / blog entries created	Activities
2 Co-authoring	*2* No. of wiki / blog entries edited	Activities
3 Dissemination	*3a* No. of status updates (first messages); *3b* No. of status updates (with links / files)	Activities
4 Expert search	*4a* No. of searches performed (person's name); *4b* No. of questions asked (expert seeking)	Activities; Content
5 Feedback	*5a* No. of replies in threads containing discussions / feedback; *5b* No. of praise messages; *5c* No. of ratings performed / likes given	Activities; Content
6 Information organisation	*6a* No. of files saved; *6b* No. of documents bookmarked *6c* No. of tags created; *6d* No. of documents tagged;	Activities
7 Information search	*7a* No. of searches performed; *7b* No. of questions asked (information seeking)	Activities; Content
8 Learning	*8a* Time spent browsing content; *8a* No. of conversations clicked on; *8b* No. of threads participated in	Activities
9 Monitoring	*9a* Time spent browsing content; *9b* No. of users followed; *9b* No. of topics followed	Activities
10 Networking	*10a* No. of users followed; *10b* No. of new following relationships in a certain period of time; *10c* Out-degree (tagging relationships); *10d* No. of messages (social use) *10e* Out-degree (reply relationships);	Activities; Content; Relations
11 Service search	*11* No. of questions asked (solution seeking)	Activities; Content

Thus, metrics indicating *authoring*, *co-authoring*, *dissemination*, *information organisation*, *learning*, and *monitoring* can be implemented based on data of the category *activities*. Having obtained this data, the corresponding metrics can be calculated in a database or using a spreadsheet software straightaway. Contrary, implementing metrics to describe the knowledge actions in the white rows requires a mix of qualitative and quantitative methods [17]. For instance, metrics indicating actions related to search, such as *expert search* or *information search*, are based on analysing search queries of users (using the search feature) as well as based on questions in status updates. Hence,

the message content needs to be considered to decide *whether* a status update is a question and *what* the user is asking for. Scanning of messages for question marks and question words, e.g. "who" or "how" [46], or applying text mining techniques could help partly automate this task. Having identified questions and their focuses, it is possible to determine *how often* a user has created a question. A mixed methods approach is also suggested for *feedback* which can be recognised by analysing the content of messages regarding the provision of (social) feedback and / or determining how often a user has liked or rated another user's content. Finally, metrics indicating *networking* need to be calculated using log file analysis and SNA. SNA is usually performed using specialised tools, e.g. UCINET, that require the data to be prepared in a certain way.

3.3 Determining Knowledge Worker Roles in Enterprise Social Networks

Besides including conceptually overlapping knowledge actions (section 3.1), the knowledge worker role typology by [3] contains several roles that are associated with the same knowledge actions to similar extents. In particular, this applies to the roles *learner* and *retriever* as well as *organiser* and *tracker* (Figure 1). Engaging in the same knowledge actions to similar degrees, these knowledge worker roles appear difficult to distinguish based on a mainly quantitative analysis of ESN data. Therefore, *learner* and *retriever* are merged into a new role called *seeker*. Further, *organiser* and *tracker* are consolidated into a role called *coordinator*. The extent to which the new roles are associated with the knowledge actions is determined by comparing and averaging their individual degrees for the different actions as specified in [3]. Figure 2 depicts the revised knowledge worker role typology. In this regard, knowledge actions rated as (very) important or less important / unimportant are recognised as significant for characterising the different knowledge worker roles and should be considered first in order to detect the roles in ESN. Knowledge actions marked with "o" are considered less discriminative for the different roles. For instance, to identify *controllers*, metrics (Table 2) suggested to quantify the respective discriminative knowledge actions (marked with ++ / + and -- / - in Figure 2) should be calculated for all users in the sample. Combining the

Knowledge action / Knowledge worker role	Authoring	Co-authoring	Dissemination	Expert Search	Feedback	Information organisation	Information search	Learning	Monitoring	Networking	Service Search
Controller	+	-	+	-	+	o	o	--	o	--	--
Helper	-	-	++	o	++	o	++	o	-	o	--
Seeker	-	--	--	o	-	+	++	+	o	o	-
Linker	o	o	o	-	-	o	++	o	o	o	--
Networker	-	-	+	+	o	o	o	o	o	++	--
Coordinator	-	--	o	o	o	+	+	-	++	o	o
Sharer	+	+	++	--	o	o	o	-	-	+	-
Solver	-	--	o	o	o	o	+	o	-	-	-

++ Very important   + Important   o Undecided   - Less important   -- Not important

Figure 2. Adapted knowledge worker role typology (based on [3])

information presented in Table 2 and Figure 2, individuals meeting the criteria for the role *controller* would exhibit above average values for metrics associated with the corresponding (very) important knowledge actions (++ / +) and below average values for the ones rated as less important / unimportant (-- / -) as compared to other users in the sample.

4 Discussion and Future Work

Drawing on findings from social media and ESN research, this paper adapts the knowledge worker role typology by [3] to an ESN context. In comparison to the typology by [3], the adapted typology includes a reduced set of knowledge actions and knowledge worker roles. Offering metrics to quantify the knowledge actions, the paper provides a conceptual basis for determining knowledge worker roles using ESN data.

The results of this paper need to be weighted up against its limitations. Firstly, the matching of the ESN use cases with the knowledge actions in [3] required some judgement is thus, not entirely objective. Specifically, there is little information on some of the knowledge actions, e.g. *learning*, in the ESN literature. Hence, some assumptions have to be made how *learning* occurs on ESN and how it can be measured. Secondly, knowledge actions that overlap conceptually and correlate for different roles as well as roles associated with the same knowledge actions to similar extents were merged to avoid redundancy. While this is necessary to enable the determination of (distinct) knowledge worker roles based on a quantitative analysis of ESN data, the adapted typology is less detailed and could miss actions and roles involved in knowledge work.

Following-up on these issues, the next step of this research project concerns the testing of the knowledge worker role typology using ESN data obtained from a real case scenario. The planned empirical analysis has implications for the developed metrics, the suggested roles, as well as for the general feasibility of the approach. First of all, the empirical analysis will show whether the proposed metrics can be computed using ESN data. In this regard, metrics may have to be adapted to suit the specifics of the data set or removed if particular data, for instance, the content of messages, is not available. Also, correlations between metrics assigned to one knowledge action should be empirically tested. For determining the roles, adequate thresholds for the metrics in order to distinguish less / unimportant from (very) important knowledge actions have to be specified. The actual role analysis will show whether the suggested roles are valid and point out if and how the typology needs to be further adapted and refined. On the one hand, overlapping roles could be revealed in case many users meet the criteria of several roles. If, on the other hand, many users cannot be assigned to a role, the current typology would be indicated to miss certain, possibly ESN-specific, roles. In this regard, roles identified in public online social spaces, such as *experts* (who, for instance, receive many questions) or *discussion persons* (who join many conversations) [20] could be considered to extend the typology. In conclusion, the planned empirical testing will indicate to what extent ESN data facilitates determining the specified knowledge worker roles.

5   Conclusion

The management of knowledge work requires an understanding of the performed knowledge actions and involved knowledge worker roles. The identification and measurement of these actions as well as the determination of knowledge worker roles is an important and current challenge in KM research and practice.

This paper contributes to KM research by offering a conceptual basis for determining knowledge actions and knowledge worker roles based on ESN data. The study moreover contributes to the emerging body of ESN data analytics by developing metrics that characterise ESN user behaviour. For practitioners, the detection of different roles can improve organisational knowledge transparency and lead to more evidence-based decisions at the intersection between KM and HRM. Facilitating new opportunities for information sharing and exchange, ESN have the potential to significantly change the way knowledge work is conducted in organisations. It remains to be investigated whether similar knowledge worker roles as suggested by [3] can be recognised using ESN data or if interactions on ESN lead to new roles in the context of knowledge work.

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