A new theory of social roles in networks

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Abstract

Theories of social roles neglect social clusters. However, accounting for clusters is essential because individuals in social networks (e.g., social media) cannot oversee the whole network and have to restrict their interactions to local substructures. Roles which do not account for this cluster formation may lead to misinterpretations of the network's dynamics and functions. This article proposes a theory of social roles in large social networks. We group roles detected in previous empirical studies into meta-roles and embed them along two dimensions, strategicness describing whether the person works towards a particular goal or not, and the type of strategy (selfish or group-oriented). We extend this framework by adding a cluster dimension describing to what extent a person's interactions are embedded locally or globally in the network. We argue that empirical role analyses would benefit from our theory by systematically accounting for complex structures specific to the network perspective, generalising empirical findings beyond individual case studies, and understanding human interactions better.

Keywords: social role, theory, communication network, cluster, role detection

1 Introduction

Detecting social roles of individuals is a key method to understand why individuals interact with others. Traditionally, social scientists have applied role detection to small groups where they qualitatively analysed direct interactions between individuals in unconnected case studies (Bales, 1950; Belbin, 2010; Benne & Sheats, 1948). Roles emerge from these interactions in a bottom-up fashion and describe patterns of communication behaviour such as disseminating information, mediating between several factions, and censoring. More recently, researchers have started to apply role detection to social networks which represent interactions and relations between individuals as connections. Networks contain a large number of individuals and connections, and display complex structures that are neither purely regular nor purely random, such as the formation of groups. In contrast, groups are smaller in size and contain simpler structures, such as fully-connected structures allowing for one-to-all communication (Fig. 1).

Despite these differences, role detection analyses in networks do not account for network-specific complex structures which leads to a flawed detection of roles. Moreover, role detection in networks adheres to using case studies, the approach of small group research (Benamar et al., 2017; Combs Turner et al., 2005; de Valck et al., 2009). Results of these case studies are not interrelated in an overarching framework and therefore cannot be used to systematically advance insights and theory-building in role detection.

To study roles beyond small groups, we are faced with the need for a theory that accounts for complex structures of social networks and provides a generalising framework to connect isolated case studies.
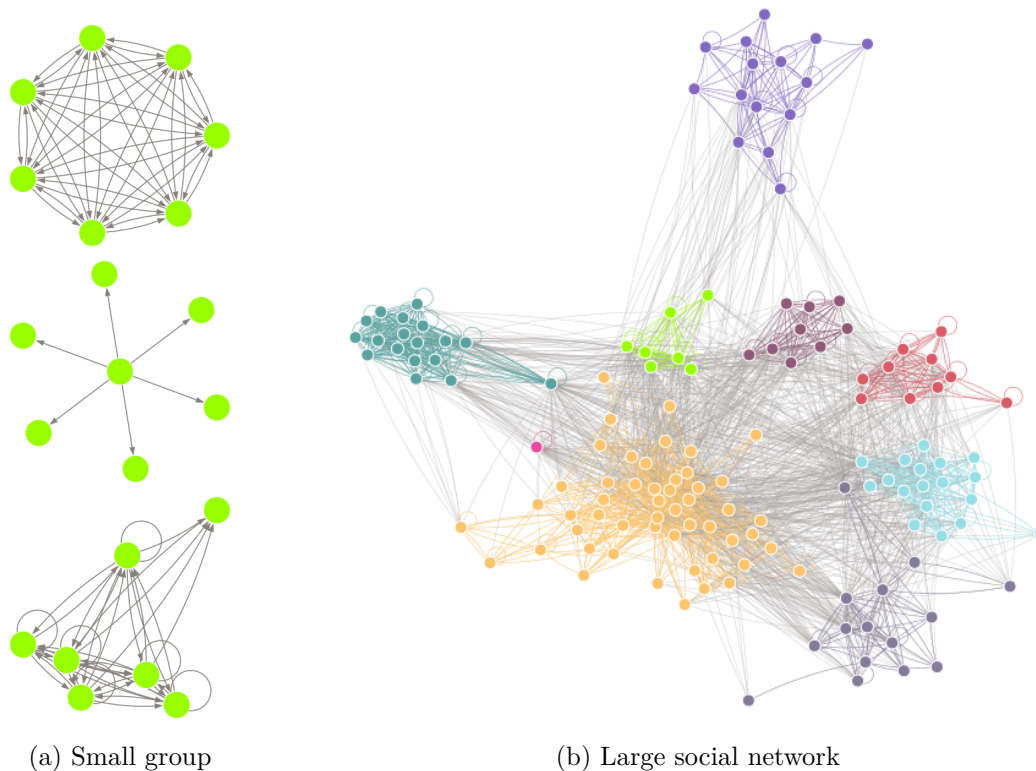

(a) Small group   (b) Large social network

Figure 1: Comparison between a small group and a large social network. A group is fully connected because every member can communicate with all other members (Fig. 1a top). A group displays a one-to-all communication because communication capacity is not restrictive (Fig. 1a centre). A group may represent a cluster of a network (Fig. 1a bottom corresponds to the green cluster in Fig. 1b). A network displays more complex structures, such as clusters (coloured nodes) because connections are only dense in some parts of the network (Fig. 1b).

In this article, we propose a theory of social roles. We argue that an important characteristic of networks are clusters, the tendency of individuals to form groups with stronger attachment within groups than between groups. Clusters are known under different synonyms but are also often mixed up with similar yet different names (Fig. 2). Synonyms for cluster are community and module in network research and group in classic sociology. In network research, clusters may derive from many clusterings, closed connections among groups of three individuals. Clusterings describe a local structure which defines global clusters if it is measured for all groups of three in the whole network (Newman, 2006).

Groups may also form if nodes with similar attributes, called labels, are grouped. These labels are external to the network and are provided in a top-down fashion. For example, in an e-mail communication network, individuals may be grouped by place of residence. This distinguishes label-based groups from clusters which emerge in a bottom-up fashion from connections among individuals. In classic sociology, clusters define groups of people sharing the same purpose, norms, identity, or values (Putnam, 1995). If moral values are applied to these clusters, the clusters become hierarchically organised and display social inequalities (Therborn, 2012). As a consequence, the clusters become social divisions (Ribbens McCarthy & Edwards, 2011). If these social divisions persist across individuals and generations we speak of social stratification (Bottero, 2005; Giddens & Sutton, 2017).

Clusters in networks form because individuals have a limited communication capacity, cannot oversee the global network, and therefore restrict their interactions to groups (de Sola Pool & Kochen, 1978; Dunbar, 1992). Since individuals differ in resources and attributes individuals prefer to interact with similar others, leading to homophilic clusters (Lazarsfeld & Merton, 1954; McPherson et al., 2001). Clusters make social life more manageable as they facilitate social learning (Henrich & McElreath, 2003) and the allocation of limited resources (Sapolsky, 2004), minimise opportunism (Coleman, 1998), mitigate conflict (Simmel, 1964), and maximise individual motivation (Halevy et al., 2011) and group productivity (Koski et al., 2015). Clusters shape social roles by indicating how individuals are expected to behave toward one another (Halevy et al., 2011; Koski et al., 2015; Savin-Williams, 1979).

Classic sociology

| Group |

Network research

| Community |

| Module |

Synonymous names

Subgroup of individuals
Stronger attachment within than between groups

Cluster

| Neutral in values | | Global | Bottom-up |

Similar, yet different names

Cluster: group of inidividuals with same purpose

↓

Social division: moral values applied to cluster leading to hierarchies and social inequalities

↓

Social stratefication: social division that persists across individuals and generations

Local
Clustering: closed connections among groups of three

↓

Global
Densely connected clusters

Top-down
Label: attribute of an individual

↓

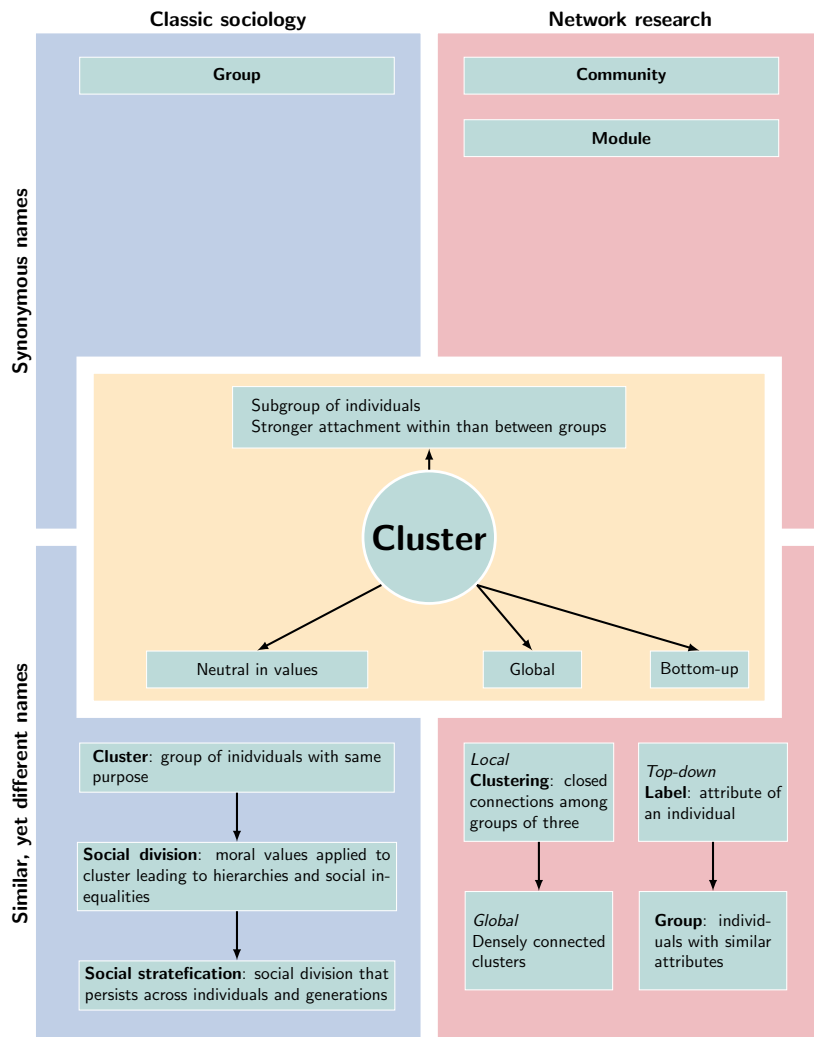**Group**: individuals with similar attributes

Figure 2: Disambiguating the cluster concept. *Clusters* are groups of individuals in a network with stronger attachment within groups than between groups. Synonyms are *communities* and *modules* in network research and *groups* in classic sociology. Clusters are global structures because they are defined for the whole network. In contrast, *clustering* refers to a local structure because it considers the number of closed connections among groups of three individuals. Clusters are bottom-up structures because they emerge from interaction patterns of nodes in the network. In contrast, *labels* are top-down structures because they are external to the network and pre-defined by the researcher. Clusters are non-hierarchical and neutral in values. In contrast, *social divisions* are clusters with moral values that become hierarchically organised and display social inequalities. If these divisions are persistent in individual behaviour and across generations we speak of *social stratification*.
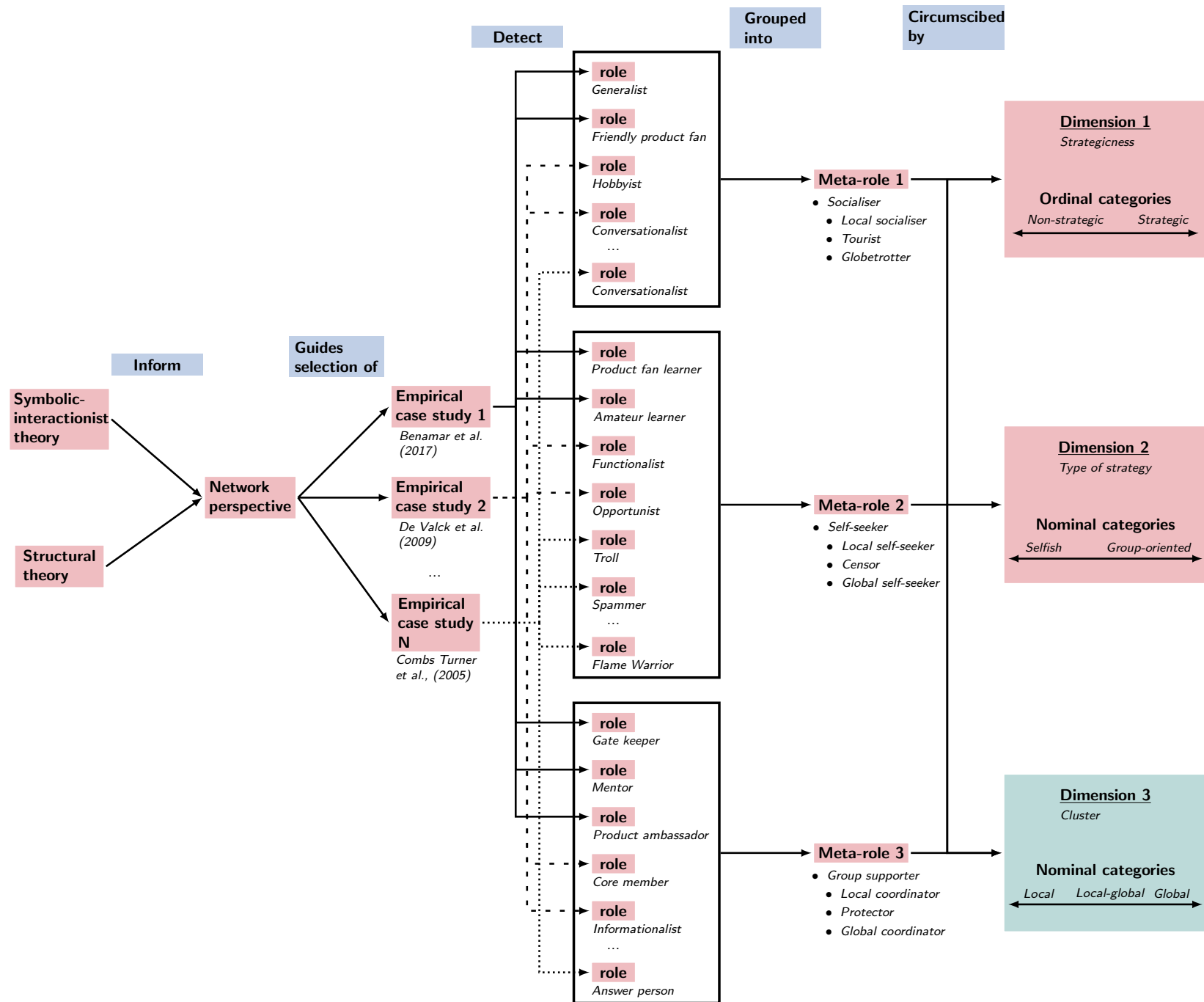
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Figure 3: Our approach. Based on symbolic-interactionist and structural theory, we adopt a network perspective. We select case studies of empirical role detection in networks. Each case study detects several roles. We group these roles according to their conceptual similarities and call these groups meta-roles. Each meta-role is circumscibed by a dimension which defines a meta-role with an abstract concept along a nominal or ordinal category. Bold type text in red and green boxes refers to the general concepts of our approach, italics to examples of these concepts, blue boxes to transitions between concepts. Dimension 1 and 2 (red) were extracted from the reviewed case studies and Dimension 3 (green) extends this perspective.

To build our theory, we examine existing empirical studies on role detection in large social networks and find that the detected roles are very similar and can be grouped into meta-roles. A meta-role is an umbrella term that summarises several roles. We work out three meta-roles: *socialiser*, *self-seeker*, and *group supporter*. For example, the *socialiser* communicates for the sake of fun without pursuing a planned goal. We circumscribe and interrelate the meta-roles along two dimensions. A dimension represents ordinal or nominal categories of an abstract concepts to which the meta-roles are qualitatively assigned. For example, the abstract concept of strategicness describes the skill of individuals to target their actions towards achieving a certain goal. Strategicness can be defined along two ordinal categories indicating whether an individual is (high) or is not (low) strategic. The meta-role of the *socialiser* is categorised to have low strategicness.

We extend these meta-roles with the cluster dimension to build an extended theory of social roles. The cluster dimension is defined along three nominal categories indicating whether interactions occur locally within clusters, globally without clusters, or between clusters. By adding the cluster dimension, each of the meta-roles is split into three new meta-roles. For example, the meta-role of *socialiser* is split into the meta-roles *local socialiser*, *tourist*, and *globetrotter*. The *local socialiser*, the *tourist*, and the *globetrotter* communicate in a non-strategic way and just want to stay in touch with others. Whereas the *local socialiser* mainly communicates with individuals from her own cluster, the *tourist* also communicates with individuals from different clusters. The *globetrotter* cannot be clearly assigned to a cluster and communicates with individuals from many clusters. Figure 3 summarises our approach.

Our approach builds a theory from empirical research. We need such a theory to identify typical interaction patterns in social networks, understand under which circumstances they occur, measure and predict them empirically, and validate them. Addressing roles in social networks, this theory is embedded into classical symbolic-interactionist and structural theories (Biddle, 1986), rather than providing an alternative explanatory mechanism of role formation. It identifies the interaction patterns that form a role rather than identify the effects roles have on individuals or social processes (e.g., social stratification).

2   Theory of communication roles

2.1   Conceptualising 'role' and 'theory'

What is a social role? It refers to the behaviour expected of someone who holds a particular position in a group (Macionis, 2017). In everyday life, individuals fulfill several kinds of roles, often to different extents. For example, a professor is associated with roles such as teaching, mentoring, supervising, publishing, and doing research.

In some settings, holding a position which is officially recognised by some authority (e.g., society, institutions) is considered a role in itself (e.g., professor, mother, spouse). We call these roles 'formal roles' and distinguish them from 'informal roles', which we study in this article. Formal roles are independent of the context, defined in a top-down fashion by some authority, and stable over time. In contrast, informal roles are context-specific, develop in a bottom-up manner through local interactions, and are flexible over time. Informal roles are important because they improve the functioning of the group and inform newly established formal roles (Ang & Zaphiris, 2010; Johnson et al., 2013; Krackhardt & Stern, 1988). Informal roles strongly shape communication among individuals. In future empirical work, we aim to empirically measure roles with topological network measures.

A theory of social roles should define and interrelate roles which are to be expected in a communication network. It should specify the flexible behavioural causes of roles in the form of interactions because we develop it in a network context. The proposed theory neither relates roles to static, external causes (e.g., institutions, cultural norms), nor addresses the effect of these roles on individuals or societal processes (e.g., stratification). The proposed theory is useful if it can be successfully used for validating roles in empirical studies. The development of this theory will therefore reach into the future.

There already exist classic sociological theories that explain the formation of roles from different perspectives, such as symbolic-interactionist, structural, and functionalist theories. However, these theories provide explanations based on general sociological approaches which are too broad and do not incorporate network interdependencies among individuals. While they account for how individuals interact with each other, they neither account for the fact that individuals move in social groups and form clusters, nor for the fact that these clusters affect personal interactions. Still, classic theories provide a useful overarching framework in which our network-specific theory can be embedded. In this way, they serve as guidelines rather than explicit explanatory mechanisms.

2.2 Embedding role theory into classic sociological approaches

Since we are interested in informal roles which emerge out of interactions in a specific context we adopt a micro-sociological perspective manifesting in symbolic-interactionist theory and structural theory. Symbolic-interactionist theory emphasizes socio-psychological dynamics of individuals interacting with others (Blumer, 1969; Mead, 1934). Roles are situational as they are created within interactions. A role is the reponse to others' behaviour and roles cannot be adopted outside these interactions.

Like symbolic-interactionist theory, structural theory focuses on the impact of the local environment (behaviours towards others) on roles. In addition, it emphasizes the social position of individuals in a system which determines their behaviours toward others. Individuals with the same behavioural patterns fulfill the same role and form a social

structure. The structural perspective layed the foundation for mathematical descriptions of roles, such as networks (Burt, 1976; 1982).

In contrast to symbolic-interactionist and structural theories, functionalist and conflict role theories adopt a macro-sociological perspective and are concerned with how broad aspects of society, such as institutions and large social groups, influence the social world. Functionalist theory sees society as a system of interconnected parts that work together in harmony to maintain a state of balance and social equilibrium for the whole (Linton, 1936; Parsons, 1951). Each of these parts contributes a different function to society, e.g., education offers a way to transmit a society's skills, knowledge, and culture to its youth, and politics provides a means of governing members of society. Roles are defined externally by societal norms and imposed on the individual. Like the institutions of society, individuals fulfill different functions by executing different roles.

Whereas functionalist theory assumes a cooperative society, conflict theory assumes a competitive one where different groups compete for power and resources (Marx, 1859). Roles are defined by dominance relations and help to establish hierarchies among different groups. In addition, both functionalist and conflict theories assume that roles are stable (e.g., due to norms) and that some consensus of what the roles are exists in the society (e.g., shared goal). These assumptions do not hold in large communication networks and are not made by the symbolic-interactionist and structural theories.

The assumptions of stability and top-down allocation of functionalist and conflict theories are also present in organisational role theory but on a smaller scale. This theory focuses on social organisations that are preplanned, task-oriented, and hierarchical (Gross et al., 1958; Kahn et al., 1964). Roles in such organisations are assumed to be associated with identified social positions and to be generated by normative expectations. However, norms may vary among individuals and may reflect both the official demands of the organisations and the pressures of informal groups.

Symbolic-interactionist and structural theories focus on socio-structural patterns whereas cognitive role theory focuses on individual characteristics and how they give rise to roles. It examines relationships between role expectations and behaviour and social conditions that give rise to expectations. It develops techniques for measuring expectations and their impact on social conduct. It is concerned with ways in which a person perceives the expectations of others and with the effects of those perceptions on behavior.

All in all, we see that our network perspective is not captured by theories that focus on a top-down allocation of roles, such as functionalist, conflict, organisational, and cognitive theory, but is best embedded into symbolic-interactionist and structural theories.

2.3 Previous research: theory-less case studies

Similar to our approach (Fig. 3), classic studies of role detection have also embedded their analyses into symbolic-interactionist theory. In contrast to our approach, they did not make use of structural theory. As a consequence, studies focused on small, task-oriented groups to describe how roles emerge from interactions of individuals.

The foundation of this classic work was laid by Benne and Sheats (1948) who studied discussion groups. Participants where presented a problem, had to discuss it, and eventually find a consensus. The authors observed interactions during the discussion and qualitatively grouped these interactions into behavioural patterns. This grouping resulted in three role categories, task-, maintenance-, and self-centered roles, each being comprised of about ten specific communication roles (see Appendix A for a complete description of all roles). Group task roles focus on completing the group's goal. Examples include the *initiator-contributor* who elicits facts and information from other individuals and the *orienter* who guides the discussion, keeping it on track. Group-building and maintenance roles focus on building interpersonal relationships and maintaining harmony. Examples include the *harmonizer* who tries to resolve conflict between group members and the *gatekeeper* who regulates conversations so that everyone can have a say. Self-centered roles focus on preventing the group from reaching goals and on disrupting it. Examples include the *aggressor* who attacks other individuals' ideas and contributions in order to maintain high personal status and the *recognition seeker* who seeks to have their own contributions acknowledged by the group. Variations of this classic role classification are still widely used today (De Wever et al., 2008; Savelsbergh et al., 2012; Strijbos et al., 2004).

Similar to Benne and Sheats (1948), Bales (1950) adopted a trisection of roles focusing on differences in valence. In his interaction process analysis (IPA), the author developed a coding scheme for group interactions which categorizes twelve behaviours into a neutral, a positive and a negative category. The neutral category refers to task behaviours including all interactions necessary for task-completion. Examples include *giving suggestions* and *asking for opinions*. In case these behaviours lead to conflict if individuals disagree positive socio-emotional behaviours can restore group harmony. Examples include *giving support* and *joking*. In contrast, negative socio-emotional behaviours damage interpersonal relations, such as *showing antagonism* and *withholding help*. Appendix B summarises the complete IPA coding scheme.

IPA laid the basis for the five-stage group development model (Tuckman, 1965; Tuckman & Jensen, 1977). Groups are assumed to sequentially proceed through five distinct stages, forming, storming, norming, performing, adjourning, each being associated with different IPA interaction patterns. For example, the performing stage should be dominated by task-related behaviour. However, recent empirical research has differentiated this theory as groups may not attain all stages (Rickards & Moger, 2000), may not

progress sequentially (Gersick, 1991), and may not abruptly change their interaction patterns (Arrow, 1997).

Towards the end of the 20th century, the focus shifted from group- to team-oriented research. Teams have a very close structure and are more task-focused than groups. Belbin (2010) developed a taxonomy of team roles based on qualitative observational studies similar to the one of Benne and Sheats (1948). Students at a management training college were put into groups and had to solve management case studies. Their contributions to and interactions with the team were observed and analysed. Belbin (2010) found eight roles including the *monitor evaluator* who analyses ideas and evaluates their feasibility and the *plant* who provides innovative ideas to the team (see Appendix C for detailed descriptions of all roles).

These classic studies are well-embedded into classic sociological approaches, yet they suffer from several shortcomings that impede their usefulness in forming a general theory of social roles. These studies are based on small, task-oriented groups which differ greatly from large communication networks in terms of size, context, interdependence, self-perception, and communication style (DeVito, 2014).

Size   Classic studies examine groups that are small enough that all members can communicate with relative ease as both senders and recipients. In contrast, networks comprise many more individuals and local clusters, and are shaped through hierarchies, social homophily, geographical or language restrictions. As such, they prevent that everyone communicates with everyone else.

Context   Classic studies examine communication that takes place in a small, stable, and clearly defined context whereas the context of networks is broad, flexible, and ill-defined. Thus, individuals in groups share a common purpose and organising rules because they interact with each other for similar reasons. In contrast, in networks, the context determines to what extent the purpose and the organising rules of the global structure or the local group are salient (Hornsey & Hogg, 2000; Tajfel & J. Turner, 1979; J.C. Turner et al., 1987). This context may be defined by relative size of offline societal groups, such as ethnicities, or foci (Hofstra et al., 2017). The authors showed that the larger the offline ethnic group the more homogenous are its members on online platforms because they have more opportunities to meet similar others. The more individuals share foci, social, psychological, legal, or physical entity around which joint activities are organized (Feld, 1981), the more likely they are to share friends online. Moreover, weaker forms of similarity than a shared purpose or rules may shape networks.

Interdependencies   Classic studies rely on groups that are characterised by strong, simple interdependence because the behaviour of one member affects all other members. For example, Giardini and Wittek (2019) identified six interdependencies between the

sender, receiver, and object of gossip which indicate under what conditions a sender decides to share or not to share gossip. In contrast, complex interdependence between local and global structures in networks lead to global phenomena that are more than the sum of their local parts (Mitchell, 2006).

Self-perception   Members of groups have a strong self-perception as a group because they feel that they are part of a larger whole. This may also be the case in networks, however, in addition, members may also strongly identify with their local group because of their limited communication capacity (Dunbar, 1992; Miritello et al., 2013a,b; Saramäki et al., 2014).

Communication styles   Individuals in groups use one-to-all communication whereas in networks they often use one-to-one or one-to-many communication and message forwarding because these behaviours become easier in a digital environment (Fig. 1). This communication style also affects clustering because it fosters the formation of internally homogenous but mutually dissimilar groups, which may become culturally isolated (Keijzer et al., 2018).

All in all, this comparison shows that classic studies of roles in groups are not applicable to networks. Networks are large, generate flexible contexts, form complex interdependencies and self-perception structures, and use a variety of communication styles.

To overcome these differences, modern studies have applied role detection to networks with several methods, ranging from qualitative analyses where roles are known a priori (Gleave et al., 2009; Golder & Donath, 2004; Nolker & Zhou, 2005), over equivalence-based approaches using block models (Borgatti & Everett, 1989; Karrer & Newman, 2011; White et al., 1976), to advanced computational methods such as matrix factorisation (Costa & Ortale, 2012; Henderson et al., 2012; Ruan & Parthasarathy, 2014; Zhao et al., 2013). However, many of these works are purely technical and often theory-free, leaving out any interpretation of the detected roles. Those studies that do provide an interpretation are case studies and neither relate nor explain roles with a general theory. These studies either conduct a purely explorative analysis without using any theory at all, or use a highly specific theory which only applied to the research context at hand (e.g., online forums (Golder & Donath, 2004), coalitions of political interest groups (Box-Steffensmeier et al., 2018), virtual learning environments (Waters & Gasson, 2005), or gossiping (Giardini & Wittek, 2019). To our knowledge, no previous study made use of a general theory of communication roles in the study of social roles in communication networks.

2.4 Towards a generalised approach: socialiser, self-seeker, and group supporter

Despite the unstructured variety of previous studies, their detected roles show some similarities which we can generalise. We qualitatively group empirical roles into three meta-roles, *socialiser*, *self-seeker*, and *group supporter*, and define these meta-roles along two dimensions, strategicness and type of strategy (Fig. 3). In this way, we connect isolated case studies and uncover shared patterns, the meta-roles.

For example, as shown in Figure 3, Benamar et al. (2017) and Combs Turner et al. (2005) represent two case studies each detecting different roles in different settings. Benamar et al. (2017) analysed a dicussion forum on Facebook and Combs Turner et al. (2005) a discussion forum on Usenet. Both case studies detected roles which are characterised by selfish and purpose-driven behaviour, such as the *product fan learner* (Benamar et al., 2017) and the *flame warrior* (Combs Turner et al., 2005). We group these roles together and distill their conceptual similarities into the meta-role of the *self-seeker*. To capture the conceptual characteristics of the *self-seeker* and the empirical roles that are grouped under it we circumscribe the *self-seeker* with the dimensions of strategicness and type of strategy. We do this by categorising the *self-seeker* as strategic, an ordinal category of the strategicness dimension and as selfish, a nominal category of the type of strategy dimension. Other empirical roles such as the *generalist* (Benamar et al., 2017) or the *answer person* (Combs Turner et al., 2005) are conceptually different from the self-seeker. They are grouped into the other two meta-roles, *socialiser* and *group supporter*. Like the *self-seeker* these meta-roles are circumscibed by the oridinal and nominal categories of the dimensions.
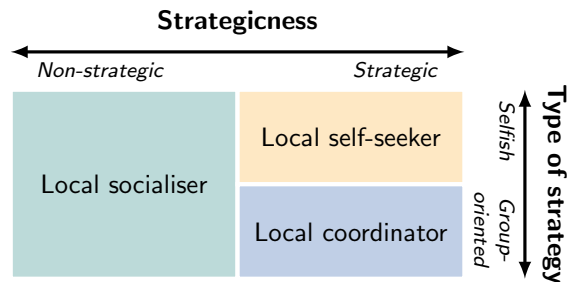

Figure 4: The simple approach to generalise empirical roles into meta-roles without network structures. Three meta-roles, socialiser, self-seeker, and group supporter are defined along two dimensions: strategicness and type of strategy.

This procedure yields a generalising approach which does not incorporate complex network structures but is only defined by simple, small group structures (Fig. 4). We therefore refer to it as 'simple approach' and to its meta-roles as 'simple meta-roles'

(Fig. 6, left box). This simple approach represents the first step towards developing our theory of social roles.

In the following, we define the three simple meta-roles and the conceptual dimensions of strategicness and type of strategy. Table 1 summarises the mapping of empirical roles to the simple meta-roles and Appendix D provides a description of all empirical roles and the corresponding studies we reviewed.

Socialiser   The *socialiser* communicates to keep in touch with others rather than to focus on goals or tasks set by herself or the group. For example, the *amateur* role, identified in a Facebook group about a cooking product, seeks to share aspect of her daily life with the group and socialises around the cooking practice (Benamar et al., 2017). We map the *amateur* role to our *socialiser* role.

Self-seeker   The *self-seeker* exploits information flow for her own interest. She is not interested in group goals, tries to deprive others of information, and ensures that she knows what's going on. For example, the *flame warrior* role, detected in an online discussion forum, uses harsh and negative debate to 'win' an argument and thereby makes herself appear superior to others in the conversation (Combs Turner et al., 2005). We map the *flame warrior* role to our *self-seeker* role.

Group supporter   The *group supporter* ensures that individuals comply to group norms and are involved in the community, gets task-related activities moving, and initiates contact by introducing individuals to one another. For example, the *appraiser* role, detected in an online community on aviation, increases the motivation of the community by recognizing the achievement of others, encouraging further involvement and creativity and ensure that individuals comply to the community's cultural norms (Seraj, 2012). We map the *appraiser* to our *group supporter* role.

To conceptually explain and relate these meta-roles, we embed them along two Boolean dimensions: strategicness and type of strategy (Fig. 4). Strategicness indicates whether someone acts in a determined way to achieve a certain goal (strategic) or in a spontaneous way to take things as they come (non-strategic). If a person is strategic her type of strategy indicates whether the person would like to achieve her own goal (selfish) or the one of the group (group-oriented).

The *socialiser* is non-strategic because she wanders around looking for opportunities to socialise irrespective of her own or group-related tasks and purpose. Of course, one could argue that socialising is a selfish goal in itself, but it is not planned and does not systematically exclude (selfish) or include (group-oriented) goals of others as in the strategic case. The *self-seeker* follows a selfish strategy because she only tries to achieve her own goals irrespective of the ones of the group. In contrast, the *group supporter*

follows a group-oriented strategy because she directs her own actions and the ones of others toward achieving the group's purpose.

Although this simple theoretical framework of communication roles summarises detected roles in previous research well, it is incomplete because it lacks complex structures which are common in large networks. Therefore, we extend the framework by adding a cluster dimension.

Table 1: Mapping empirical roles onto the simple meta-role of the *socialiser*. The *socialiser* communicates to keep in touch with others rather than to focus on goals or tasks set by herself or the group

This approach		Previous work	
Role	Research context	Classify roles by ...	Author
Qualitative			
Mingler focuses on short-term satisfaction and values social intercourse.	Online discussion forum	observing user behaviour and grouping them into four roles: mingler, insider, tourist, devotee, along two dimensions: intensity of user-product and user-user relation, respectively.	Kozinets (1999)
Insider values social intercourse.			
Conversationalist enjoys discussing and communion.	Online discussion forum	visually inspecting descriptive statistics of users' posting activities, such as the number of sent messages.	Combs Turner et al. (2005)
Chatter posts a lot of messages to a few individuals but does not contribute to the community conversation as a whole.	Online discussion forum	conceptually pre-defining roles of users in an online discussion forum and manually comparing them with selected topological network measures of users from the communication network of all users.	Nolker and Zhou (2005)
Discussion person frequently reciprocates messages from many users.	Online discussion forum	handcoding user messages and visually relating the resulting content groups with structural properties of users' ego-networks (e.g., density of edges in periphery) extracted from the communication network of all users.	Gleave et al. (2009)
Player entertains the community.	Online discussion forum	manually coding users' messages and user interviews along Miles et al. (2019).	Seraj (2012)
Initiator maintains a social network of individuals by sending work-unrelated messages to many individuals.	Online learning forum	manually coding users' messages along an extended version of Garrison et al. (2001) coding dimensions of teaching, social, and cognitive.	Waters and Gasson (2005)
Contributor contributes to the debate without changing its course.			
Socializer emphasizes with individuals and enjoys jokes.	Online game	observing players' interactions and grouping them into four roles: socialiser, killer, achiever, explorer, along two dimensions: individuals vs world focus, introvert vs extrovert.	Bartle (1996)
Quantitative			
Conversationalist is socially involved but doesn't have high expertise on the discussion topic.	Online discussion forum	applying k-means clustering to users' survey scores about usage of discussion forum (e.g., amount of supplied information to discussion) and comparing resulting clusters with an ANOVA.	de Valck et al. (2009)
Hobbyist uses the community for leisure and entertainment.			
Social network uses social chitchat rather article collaboration to build strong relationships with other users.	Online discussion forum	using a linear regression to infer handcoded content groups of user messages (roles) from structural properties of users' ego-networks derived from the communication network of users.	Welser et al. (2011)
Socialiser contributes with social interactions rather than ideas.	Online discussion forum	applying k-means and hierarchical clustering to users' topological measures of their communication network (e.g., number of sent messages, i.e. out-degree) and users' feature of platform usage (e.g., number of posted ideas), and comparing resulting clusters with an ANOVA.	Füller et al. (2014)
Generalist focuses on community life and social intercourse.	Online discussion forum	handcoding user messages and visually relating the resulting content groups to descriptive statistics of users' activity features (e.g., time spent in the discussion group) and to structural properties of users' ego-networks (e.g., number of sent messages (out-degree)) extracted from the communication network of all users.	Benamar et al. (2017)
Friendly product fan engages in animation activities, and community life.			
Amateur seeks to share aspects of her daily life with the group.			
Immersion-focused enjoys the story-telling aspect of the game.	Online game	conducting a factor analysis based on players' likert scale scores on survey questions such as 'I like to feel powerful in the game.'.	Yee (2006)
Relationship-focused forms supportive relationships with others.			
Social player nurtures a friendly and welcoming atmosphere within the community.	Online game	applying a block model to shared interaction types of players and analysing ego-network structures within and relations between blocks.	Ang and Zaphiris (2010)

Table 2: Mapping empirical roles onto the simple meta-role of the *self-seeker*. The *self-seeker* exploits information flow for her own interest. She is not interested in group goals, tries to deprive others of information, and ensures that she knows what's going on.

This approach		Previous work	
Role	Research context	Classify roles by ...	Author
Qualitative			
Tourist retrieves information from the community but does not contribute at all.	Online discussion forum	observing user behaviour and grouping them into four roles: mingler, insider, tourist, devotee, along two dimensions: intensity of user-product and user-user relation, respectively.	Kozinets (1999)
Devotee is only interested in the discussion topic but not in socialising.			
Celebrity enforces changes in the community.	Online discussion forum	handcoding user messages along the concepts of communicative competence, ability to behave according to social norms (Hymes, 1974), participation inequality (Whittaker et al., 1998), participation rate, and Jones and Pittman (1982) five strategies for interaction: intimidation, supplication, ingratiation, exemplification and self-promotion.	Golder and Donath (2004)
Flamer intimidates others and is aggressive.			
Troll deceives others, lures them into useless discussions, and is not interested in the discussion topic.			
Ranter deceives others, lures them into useless discussions, and is interested in the discussion topic.			
Troll draws others into useless discussions.	Online discussion forum	visually inspecting descriptive statistics of users' posting activities, such as the number of sent messages.	Combs Turner et al. (2005)
Questioner seeks help from others.			
Spammer posts irrelevant messages.			
Flame warrior debates harshly and negatively.			
Flamer insults others and often reciprocates messages.	Online discussion forum	selecting four distinct sub-forums with distinct interaction cultures, respectively, and visually comparing the degree distributions of the communication networks from the forums.	D. Fisher (2005)
Political discussant insults others and does not often reciprocate messages.			
Questioner asks questions but does not reply to other individuals's questions.	Online discussion forum	manually grouping users based on likert scale scores of a survey (e.g., 'I often provide answers to other individuals's questions') and correlating scores within a group with log measures of users' platform behaviour (e.g., time spent on platform).	Brush et al. (2005)
Reader reads messages but neither provides replies nor asks questions.			
Knowledge elicitor seeks help from others.	Online learning forum	manually coding users' messages along an extended version of Garrison et al. (2001) coding dimensions of teaching, social, and cognitive.	Waters and Gasson (2005)
Vicarious acknowledger seeks social recognition from others for her achievements.			
Passive learner freeloads and does not contribute to the community.			
Generator takes the initiative to fulfill her personal goals.	Online learning forum	pre-defining roles based on a literature review on computer-supported collaborative learning environments and matching these roles to hand-coded user messages.	Strijbos and Weinberger (2010)
Lurker pretends to contribute to the project but in fact tries to fulfill her goals by being passive.			
Killer annoys other players by demonstrating her superiority in game skills.	Online game	observing players' interactions and grouping them into four roles: socialiser, killer, achiever, explorer, along two dimensions: individuals vs world focus, introvert vs extrovert.	Bartle (1996)
Achiever aims to rise in game levels.			
Explorer aims to learn more about the game and get new ideas.			

Table 2: Mapping empirical roles onto the simple meta-role of the *self-seeker* (cont).

This approach		Previous work	
Role	Research context	Classify roles by …	Author
Quantitative			
Functionalist retrieves information from the community but does not contribute often.	Online discussion forum	applying k-means clustering to users' survey scores about usage of discussion forum (e.g., amount of supplied information to discussion) and comparing resulting clusters with an ANOVA.	de Valck et al. (2009)
Opportunist retrieves information from the community but does not contribute at all.			
Active member mainly talks about herself and posts a lot.	Online discussion forum	handcoding user messages along five dimensions, including empathetic content and user-centered content and comparing the resulting user groups to regular equivalent users computed on the communication network with the Continuous REGE algorithm of the UCINET software.	Pfeil et al. (2011)
Passive member mainly talks about herself but does not post a lot.			
Product fan learner uses the community to improve her own skills and knowledge.	Online discussion forum	handcoding user messages and visually relating the resulting content groups to descriptive statistics of users' activity features (e.g., time spent in the discussion group) and to structural properties of users' ego-networks (e.g., number of sent messages (out-degree)) extracted from the communication network of all users.	Benamar et al. (2017)
Amateur learner uses the community to share her achievements.			
Friendly learner uses the community to improve her own skills and knowledge.			
Teammate does not cooperate with other interest groups because their goals are not aligned with hers	Dyadic communication	extracting topological network measures from the ego-network of a stakeholder and using them to predict the network topology of another stakeholder with an exponential random graph model (ERGM). If the prediction was successful the two stakeholders were assigned the same role.	Box-Steffensmeier et al. (2018)
Peripheral specialist only cooperates with other interest groups whose goals are as specialised as hers			
Achievement players wants to become powerful in the game.	Online game	connducting a factor analysis based on players' likert scale scores on survey questions such as 'I like to feel powerful in the game.'.	Yee (2006)
Manipulation players manipulates other players for her personal gains (e.g., deceiving).			
Free-loader uses other players to advance in the game.	Online game	applying a block model to shared interaction types of players and analysing ego-network structures within and relations between blocks.	Ang and Zaphiris (2010)

Table 3: Mapping empirical roles onto the simple meta-role of the *group supporter*. The *group supporter* ensures that individuals comply to group norms and are involved in the community, gets task-related activities moving, and initiates contact by introducing individuals to one another

This approach		Previous work	
Role	Research context	Classify roles by ...	Author
Qualitative			
Motivator keeps conversations going.	Online discussion forum	conceptually pre-defining roles of users in an online discussion forum and manually comparing them with selected topological network measures of users from the communication network of all users	Nolker and Zhou (2005)
Leader spreads knowledge and works towards a cohesive community.			
Low-volume replier answers other individuals's questions.	Online discussion forum	manually grouping users based on likert scale scores of a survey (e.g., 'I often provide answers to other individuals' questions') and correlating scores within a group with log measures of users' platform behaviour (e.g., time spent on platform).	Brush et al. (2005)
Answer person provides advice to others.	Online discussion forum	visually inspecting descriptive statistics of users' posting activities, such as the number of sent messages.	Combs Turner et al. (2005)
Answer person answers other individuals's questions.	Online discussion forum	selecting four distinct sub-forums with distinct interaction cultures, respectively, and visually comparing the degree distributions of the communication networks from the forums.	D. Fisher (2005)
Social supporter helps new users and keeps in touch with active users.			
Mentor helps other users and enjoys a good reputation in the community.	Online discussion forum	observing discussions in pre-selected forums, asking comprehension questions to the forum's manager, running focus groups with members of the forum, and visually analysing temporal frequency plots showing the number of initiated and answered messages per user and day.	Combs Turner and K.E. Fisher (2006)
Manager ensures that individuals adhere to the rules and norms of the community.			
Mogul answers complex questions and helps when problems escalate.			
Answer person anwers other individuals's questions.	Online discussion forum	using a logit regression to infer the answer person role (based on hand-coded messages) from user's operationalised ego-networks, degree- and temporal frequency distributions.	Welser et al. (2007)
Answer person anwers other individuals's questions.	Online discussion forum	handcoding user messages and visually relating the resulting content groups with structural properties of users' ego-networks (e.g., density of edges in periphery) extracted from the communication network of all users.	Gleave et al. (2009)
Discussion catalyst initiates new discussion threads that other individuals pick up on.			
Substansive expert resolves disputes and contributes to content-related discussions.			
Technical editor enforces formatting standards.			
Substansive expert resolves content-related disputes and contributes knowledge to the discussion.	Online discussion forum	using a linear regression to infer handcoded content groups of user messages (roles) from structural properties of users' ego-networks derived from the communication network of users.	Welser et al. (2011)
Technical editor enforces formatting standards.			
Counter vandalism editor sanctions users who do not comply to the rules of the community.			
Facilitator keeps the debate moving by encouraging other users to partipate and by solving problems.	Online learning forum	manually coding users' messages along an extended version of Garrison et al. (2000)'s coding dimensions of teaching, social, and cognitive.	Waters and Gasson (2005)
Complicator provides an alternative perspective.			
Closer synthesizes open issues.			

Table 3: Mapping empirical roles onto the simple meta-role of the *group supporter* (cont).

This approach		Previous work	
Role	Research context	Classify roles by ...	Author
Qualitative cont.			
Seeker gets the discussion going by asking questions.	Online discussion forum	manually coding users' messages and user interviews along Miles et al. (2019) theory building process.	Seraj (2012)
Governor ensures that users comply to the rules and norms of the community.			
Educator shares her knowledge with the community.			
Challenger questions the provided information and provides alternative perspectives.			
Appraiser recognizes the contribution of other users and encourages them to get further involved in the community.			
Innovator provides an alternative perspective.			
Pillar engages in group activities to get the collaborative task done.	Online learning forum	pre-defining roles based on a literature review on computer-supported collaborative learning environments and matching these roles to hand-coded user messages.	Strijbos and Weinberger (2010)
Hanger-on aims to contribute to the collaborative tasks but does not manage to live up to her own expectations.			
Quantitative			
Core member extensively contributes knowledge to and retrieves knowledge from the community.	Online discussion forum	applying k-means clustering to users' survey scores about usage of discussion forum (e.g., amount of supplied information to discussion) and comparing resulting clusters with an ANOVA.	de Valck et al. (2009)
Informationalist moderately contributes knowledge to and retrieves knowledge from the community.			
Moderating supporter provides support to other users and has a strong interest in the community.	Online discussion forum	handcoding user messages along five dimensions, including empathetic content and user-centered content and comparing the resulting user groups to regular equivalent users computed on the communication network with the Continuous REGE algorithm of the UCINET software.	Pfeil et al. (2011)
Central supporter provides and receives support to/from other users.			
Technical expert provides support to other users but does not receive much support back in return.			
Master provides a lot of useful postings for other users.	Online discussion forum	applying k-means and hierarchical clustering to users' topological measures of their communication network (e.g., number of sent messages, i.e. out-degree) and users' feature of platform usage (e.g., number of posted ideas), and comparing resulting clusters with an ANOVA.	Füller et al. (2014)
Gatekeeper ensures that the group identity and values are in place.	Online discussion forum	handcoding user messages and visually relating the resulting content groups to descriptive statistics of users' activity features (e.g., time spent in the discussion group) and to structural properties of users' ego-networks (e.g., number of sent messages (out-degree)) extracted from the communication network of all users.	Benamar et al. (2017)
Mentor helps other users with the technical functionalities of the forum.			
Product ambassador shares information to improve other users' knowledge.			
Coordinator mediates coalitions between others.	Dyadic communication	extracting topological network measures from the ego-network of a stakeholder and using them to predict the network topology of another stakeholder with an exponential random graph model (ERGM). If the prediction was successful the two stakeholders were assigned the same role.	Box-Steffensmeier et al. (2018)
Knowledge-player helps other players and encourages the group to do so, too.	Online game	applying a block model to shared interaction types of players and analysing ego-network structures within and relations between blocks.	Ang and Zaphiris (2010)

3 Constructing a new theory of social roles

3.1 Cluster extend the simple approach: nine-meta roles emerge

What is missing from the previous simple approach are clusters. We embedded communication roles from previous empirical research into the three simple meta-roles defined along two dimensions, strategicness and type-of strategy. However, this approach does not account for the complex structure of networks. Clusters separate the global communication into several interconnected local structures with distinct interactions within and between them.

Since these interaction structures have a large impact on social life in terms of facilitating social learning (Henrich & McElreath, 2003), resource allocation (Sapolsky, 2004), and boosting productivity and motivation (Halevy et al., 2011; Koski et al., 2015), they also affect the roles individuals fulfill.
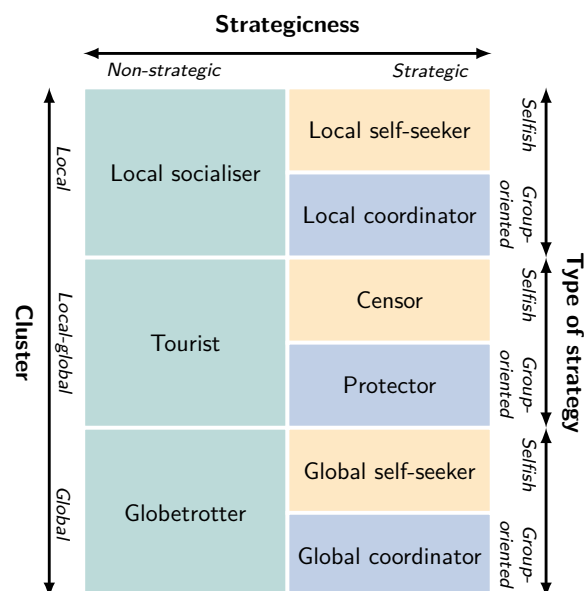

Figure 5: The complex approach to provide a theory of social roles accounting for network structures. Nine meta-roles are circumscribed along three dimensions. The nine meta-roles are: *local socialiser, tourist, globetrotter, local self-seeker, local coordinator, censor, protector, global self-seeker, global coordinator*. The dimensions are strategicness, type of strategy, and cluster. Each dimension is defined by ordinal or nominal categories and each meta-role is placed into one of these categories per dimension. For example, the green meta-roles are categorised as non-strategic along the strategicness dimension whereas the yellow and blue meta-roles are categorised as strategic. The cluster dimension indicates whether interactions occur within clusters (local), between clusters (local-global), or within the whole network (global).

In order to account for clusters in our theory, we extend the simple approach from Figure 4 with a third dimension for clusters. Since this extended approach incorporates complex network structures, the clusters, we refer to it as 'complex approach' and distinguish it from the previously defined simple approach in Figure 6. Adding the cluster dimension increases the number of meta-roles from three in the simple approach to nine in the complex one (Fig. 5). We remind ourselves that the simple meta-roles, *socialiser*, *self-seeker*, and *group supporter*, were circumscribed along two dimensions. Strategicness distinguishes whether someone acts in a determined (strategic) or spontaneous (non-strategic) way. If the person is strategic her type of strategy indicates whether she aims to achieve her own goals (selfish) or the goals of the group (group-oriented).

Simple approach

- Based on simple structures of small groups

- Considers fully-connected, homegenous groups

Complex approach

- Based on complex network structures

- Considers clusters in heterogenously connected networks

Figure 6: Comparing the simple and the complex approach. The simple approach takes a small group perspective. It represents the first step towards building our theory of social roles. The complex approach extends the simple one with a network perspective. It represents our developed theory of social roles

The new third dimension accounts for the grouping of the global communication network into sub structures. The three cluster levels local, local-global, and global indicate how the communication behaviour of a person is embedded into the overall network. In the local case, communication is mainly restricted to the cluster the person belongs to. In the local-global case, the person is still strongly embedded within her cluster but increasingly bridges to other clusters and communicates with the individuals there. In the global case, the person is only weakly embedded in a cluster and communicates with many other parts of the network. For each of the three meta-roles in the simple approach (Fig. 4) three new meta-roles are created in the complex approach, one for each level of the cluster dimension (Fig. 5).

Socialiser   The *socialiser* in the simple approach is split into three non-strategic roles in the complex approach: *local socialiser*, *tourist* and *globetrotter*. Like the simple *socialiser*, these roles all communicate for the sake of fun without pursuing a planned goal. They just want to stay in touch with others. Whereas the *local socialiser* mainly communicates with individuals from her own cluster, the *tourist* also communicates with individuals from different clusters. The *globetrotter* cannot be clearly assigned to a cluster and communicates with individuals from many clusters.

Self-seeker   The *self-seeker* in the simple approach is split into three strategic, selfish roles in the complex approach: *local self-seeker*, *censor* and *global self-seeker*. Like the simple *self-seeker*, all exploit information flow for their own interest. They only focus on pursuing their own goals rather than group-related ones. Whereas the *local self-seeker* mainly communicates with individuals from her own cluster, the *censor* also communicates with individuals from different clusters. The censor also withholds external information from her own cluster and cluster members may be forced to get external information via the censor rather than directly communicating with other clusters. The *global self-seeker* cannot be clearly assigned to a cluster and communicates with individuals from many clusters.

Group supporter   The *group supporter* in the simple framework is split into three strategic , group-oriented roles in the complex approach: *local coordinator*, *protector* and *global coordinator*. Like the simple *group supporter*, all direct information flow to pursue a group goal. Whereas the *local coordinator* mainly communicates with individuals from her own cluster, the *protector* also communicates with individuals from different clusters. The *protector* also amplifies external information so that many members of her own cluster can access it and also protects her community against harmful external influences. The *global coordinator* cannot be clearly assigned to a cluster and communicates with individuals from many clusters.

3.2   Clusters in existing empirical roles

Existing empirical research already hints at these local-global relations but does not incorporate them explicitly into the role detection analysis. For example, authors detected roles whose meaning is based on interactions between different local groups, which are inbuilt into the architecture of the global network by some members of the network. These local groups are not external to the network, like labels (Fig. 2), yet they are not fully emergent like clusters because only some members of the network can affect the formation of local groups, such as adding new discussion groups to a forum. The *jumpy questioner* switches between discussion groups of one news forum (Combs Turner et al., 2005). The *gatekeeper* controls the flow of information between the inside and the out-

side of a discussion group (Benamar et al., 2017). The *leader* spreads knowledge across different threads of one discussion group (Nolker & Zhou, 2005). In online gaming, the *explorer* switches between the known gaming world and new settings (Bartle, 1996). The role of *escapism* points to the distinction between the gaming world and the real one (Yee, 2006).

However, many previous authors were unable to detect roles which mirror the cluster structure of the network because authors often restricted their analysis to interactions within local groups rather than also considering those between local groups. For instance, individual discussion groups of one forum were analysed in isolation and assigned individual roles (D. Fisher, 2005; Gleave et al., 2009; Welser et al., 2011). Roles were defined by the local communication patterns of individuals (ego-network) and analysed in isolation without considering interdependencies (Box-Steffensmeier et al., 2018).

Besides considering inbuilt local groups, some studies also hint at the bottom-up attribute of clusters which emerge from the interaction dynamics. For example, roles distinguish between active users who send and receive messages and passive users who only receive messages. Interestingly, many of the reviewed roles which could not be matched into the simple approach (Appendix D: undefined roles) are either highly case-specific or can be explained with an active-passive clustering in the complex approach. Ang and Zaphiris (2010) distinguish the active roles of *socialiser*, *free-loader*, and *knowledge player* from the passive one of the *newbie*. Golder and Donath (2004)'s active roles are the *celebrity*, the *flamer*, the *troll*, and the *ranter*, whereas the passive roles are the *lurker* and the *newbie*. Brush et al. (2005) contrast the active roles of *questioner*, *low-volume replier* with the passive ones of *reader*, *disengaged observed*, and *key contributor*. Pfeil et al. (2011) contrasts the active roles of *active member*, *passive member*, *moderating supporter*, *central supporter*, and *technical expert* with the passive role of the *visitor*. Füller et al. (2014) detected the active roles of *socialiser*, and *master* as well as the passive ones of *passive*, *idea generator*, and *efficient contributor*. Moreover, other emergent clusters developed on the basis of differences in reputation (Combs Turner et al., 2005), payed membership fee, and time spent in premium parts of the forum (Seraj, 2012).

3.3 How to apply this theory in practice

Although previous empirical research has implicitly hinted at cluster-based roles, we argue that this link must be made explicit by applying our theory to systematically advance insights into social behaviour. But how should our theory be applied in practice? We provide suggestions for three areas of application: operationalisation, falsification, and further development of the theory.

Operationalising our theory means translating abstract concepts such as clusters into quantifiable measures and incorporating them into the analysis. We can account for these clusters in a bottom-up or top-down manner by either considering clusters that

emerge from interactions in the network (clustering in Figure 2) or using external labels that group similar individuals (labels in Figure 2). For bottom-up clusters we may use algorithms for community detection from network research (Fortunato & Hric, 2016). Since community detection algorithms differ in the way they define communities it is important to select an algorithm that matches the theoretical and conceptual definition of the to-be-detected clusters. The choice of the algorithm should be motivated explicitly.

Falsifying our theory means checking if empirical studies detect the proposed meta-roles, given that these studies account for network clusters. The theory is falsified if empirical studies do not yield the expected meta-roles and supported in the opposite case. If we support the theory, the theory guides the design of future empirical studies by showing that accounting for clusters in networks substantially improves role detection. Once sufficient support for the theory is established it can be used to validate empirical studies. Importantly, finding support for this theory does not imply that all nine-meta roles are always found in the empirical analyses. Depending on the data, only a subset of the meta-roles may be found. However, each empirically detected role should always match one of the meta-roles. If additional roles are found that cannot be mapped to one of the meta-roles the theory is falsified and has to be adapted.

Further development of the theory means feeding empirical results back into the theory to differentiate it. For example, by comparing different versions of operationalisation and validation the scope of the theory can be refined. This requires a systematic method to compare empirical applications of a theory which will be necessary to develop but is beyond the scope of this article.

The suggested applications of operationalisation, falsification, and further development of the theory show that the development of this theory for social roles is an open process which requires a feedback loop between empirical and theoretical research. In summary, we need a theory for social roles to account for communication in large networks, to generalise empirical findings beyond individual case studies, and to understand human interactions.

4   Conclusion

Empirical research on role detection in large social networks has not been sufficiently grounded in theory, and the lack of testable theories undermines empirical role detection in general.

This article encourages researchers studying empirical role detection to be more theoretically engaged, adapt existing frameworks to modern settings of interest (individuals no longer only communicate in small groups), and actively validate empirical findings with theories. More theoretical engagement facilitates comparisons of different studies and counteracts blindly looking for meaningful patterns in the data which often leads

to mistaking random effects for true ones.

This article develops a theory of communication roles in large social networks based on similarities between detected roles from previous empirical research and a novel cluster dimension which captures the inherent local-global relation in these networks. The theory embeds nine roles along three dimensions which describe the type and range of individuals' interactions. Strategicness indicates whether the person works towards a goal (strategic) or interacts without specific planning (non-strategic). The type of strategy indicates whether that goal is selfish or group-oriented. The cluster dimension indicates to what extent interactions are embedded locally or globally in the system. In the local case, the person restricts her interactions to her cluster. In the local-global case she is still part of a cluster but also interacts with individuals in different clusters. In the global case, the person cannot be clearly assigned to a cluster and interacts with many different parts of the system.

The non-strategic roles are the *local socialiser*, the *tourist*, and the *globetrotter* who communicate just for fun without pursuing a particular goal. The selfish roles are the *local self-seeker*, the *censor*, and the *global self-seeker* who control information flow to accomplish selfish goals. In contrast, the group-oriented roles, *local coordinator*, *protector*, and *global coordinator*, control information flow to accomplish group goals. Specifically, the *censor* withholds external information from her own cluster whereas the *protector* amplifies external information so that many members of her cluster can access it.

Role researchers should debate this theory, the usefulness of conceptualising roles along the proposed three dimensions, and how to operationalise and validate the theory. Testable theories should accompany empirical role detection research to generate hypotheses and validate results.

However, theories can only inform empirical research if they account for important characteristics of the network under study, such as clusters in large communication networks. This is why existing theories need to be updated regularly, which we attempt to do in this article. Applying and further developing our theory of communication roles will help researchers to find similarities in their detected roles and prevent them from reinventing the wheel in every new study.

Summary points

- There has been a lack of theory-driven empirical research on role detection.

- Previous empirical research has conducted isolated case studies and did not account for systematic complex structures in networks.

- This theory is based on grouping similar roles from previous studies into meta-roles which are conceptualised along two dimensions: strategicness and type of strategy.

- This theory is extended by the clustering dimension which accounts for complex structures in networks.

- This theory yields nine meta-roles: The non-strategic ones of local socialiser, tourist and globetrotter. The strategic, selfish ones of local self-seeker, censor, and global self-seeker. The strategic, group-oriented ones of local coordinator, protector, and global coordinator.

- To assess our theory, empirical research has to test how useful the embedding of roles along the proposed three dimensions is to explain social behaviour.

Future issues

- The role detection community should debate the proposed schema of conceptualising meta-roles along three dimensions, and how to classify detected roles from previous empirical studies into these meta-roles.

- Empirical research should discuss how to measure roles in a theory-driven analysis and ensure that the roles can still be interpreted.

- There is a need to establish systematic methods for theory operationalising and validation to compare different empirical applications of the theory.

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A Classic communication roles introduced by Benne and Sheats (1948)

Benne and Sheats (1948) identified three role groups each being comprised of several communication roles.

A.1 Group task roles

Group task roles focus on completing the group's goal.

1. *Initiator-contributor* provides new and keen insight and ideas to the group, and relates statements made by one group member to another.

2. *Information seeker* asks for clarification and ensures that the group has accurate and relevant information.

3. *Opinion seeker* is interested in understanding the group's values.

4. *Information giver* provides helpful information based on authoritative understanding or specific expertise.

5. *Opinion giver* offers suggestions and insight on how the group can employ its values while making specific decisions

6. *Elaborator* expands on others' ideas in meaningful ways, thinks about practical implementation of a decision.

7. *Coordinator* relates statements made by one group member to another, coordinates group activities.

8. *Orienter* shows where the group has been in an effort to understand where the group is right now, points out when the group has gotten completely off topic and try to refocus the group.

9. *Evaluator/Critic* assesses the actual functionality of the group and the decisions that it makes by higher standards.

10. *Energizer* stimulates the group to take action.

11. *Procedural technician* ensures that the routine tasks of the group get accomplished.

12. *Recorder* takes notes in order to help the team understand its own decision making process.

A.2 Group-building and maintenance roles

Group-building and maintenance roles focus on building interpersonal relationships and maintaining harmony.

1. *Encourager* fosters environment where alternative ideas are welcomed. Encourages individuals to come up with new ideas. Praises group or team members for the ideas they generate.

2. *Harmonizer* ensure that the group effectively handles conflict.

3. *Compromiser* realises that her ideas are in conflict with another person or faction of the group, seeks out for a compromise.

4. *Gatekeeper* ensure that all participants are freely and openly involved in the group's decision-making.

5. *Standard setter* ensures that decision-making process meets a certain quality level.

6. *Commentator* evaluates team-working ability of the group.

7. *Follower* serves as an audience for the decision making process during group discussions.

A.3 Self-centered roles

Self-centered roles focus on disrupting interactions and preventing the group from reaching its goals.

1. *Aggressor* improves her own standing within the group by taking others down (e.g deflating the status of others, showing envy toward another's contribution by trying to take credit for it,)

2. *Blocker* hates everything the group is doing, rejects everything the group recommends, keeps rehashing group or team decisions that have been long since decided.

3. *Recognition-seeker* showing how she is such a vital person in the group by trumpeting her achievements.

4. *Self-confessor* ees the group or team as her own therapy session, self-discloses inappropriate information to group members during meetings.

5. *Playboy/Playgirl* actively disrupts the decision-making process through horseplay.

6. *Dominator* highly manipulative, attempts to coerce those in subordinate status positions to her stance within the group, sees their own position within the group as more superior than other group members.

7. *Help-seeker* downplay her own ability to contribute to the group by making other group members care for her or him.

8. *Special interest pleader* speaks on behalf of another interest group (e.g., small businesses, labor, gender, race, etc.) which distracts the group.

B   Classic communication roles introduced by Bales (1950)

Bales (1950) developed a coding scheme for interaction patterns and grouped these behaviours into three categories.

B.1   Neutral task behaviours

Task behaviours are interactions directed at task completion.

1. *Giving suggestions* Proposing particular directions, or making opportunities for other individuals to contribute to the discussion, which imply autonomy for other.

2. *Giving opinions* Expressing one's own feelings, ideas, and wishes, or evaluating and analysing those of other individuals.

3. *Giving information* Providing orientation by repeating or rephrasing previous contributions, or clarifying issues, and contributing new facts.

4. *Asking for information* Seeking clarifications of particular points or issues, asking for repetition and orientation.

5. *Asking for opinion* Asking about individuals's feelings, wishes, analysis, and evaluations.

6. *Asking for suggestions* Looking for ways of taking action and seeking ideas or new directions.

B.2   Positive socio-emotional behaviours

Positive socio-emotional behaviours are directed at interpersonal relations and restore harmony within the group.

1. *Giving support* Building on suggestions or showing acceptance of suggestions that other individuals have made. Showing solidarity, raising other's status, giving help and reward.

2. *Joking* Showing tension release and satisfaction and laughing.

3. *Agreeing* Showing passive acceptance, understanding, concurring, and complying.

B.3 Negative socio-emotional behaviours

Positive socio-emotional behaviours are directed at interpersonal relations and cause conflict within the group.

1. *Showing disagreement* Resistance or rejection of ideas, withholding help or attacking other individuals.

2. *Showing tension* Asking for help, withdrawing out of the field.

3. *Showing antagonism* Deflating other's status, defending or asserting self.

C Classic communication roles introduced by Belbin (2010)

1. *Coordinator* clarified goals, allocates tasks and expresses the conclusions of the group.

2. *Shaper* pushes the group towards agreement.

3. *Plant* advances proposals and makes suggestions.

4. *Monitor/Evaluator* analyses problems and assesses each person's contributions.

5. *Implementer* gets on with the job at hand, transforming talk into practical activity.

6. *Team worker* gives support and help to others.

7. *Resource investigator* negotiates with outsiders to locate rsources or information.

8. *Completer* pushes the group towards meeting schedules and targets.

D Definition and mapping of empirical roles to meta-roles

Our theoretical framework of communication roles is based on roles detected by previous empirical research. Here, we describe the reviewed studies and the detected roles, and group them into our three meta-roles socialiser, self-seeker and group supporter. For a better overview, we group studies based on the type of communication network they analysed. We note that most roles that do not match one of the meta-roles (undefined roles) allude to the missing clustering dimension which we added in the extended framework. In other cases, undefined roles are not defined in terms of communication

behaviour but in terms of aspect that are irrelevent for the conceptualisation of communication roles, such as time spent on the online platform or amount of paid membership fees.

D.1   Online discussion forum Usenet

Usenet is an online discussion forum where users can join topic-related discussion groups. It was mainly used in the early 2000s. In August 2020, Usenet recorded 170.56M postings. For comparison, on Facebook, 350M photos are on averaged uploaded every day.

D.1.1   Brush et al. (2005)

Brush et al. (2005) conducted a survey among Usenet users about their frequency and type of usage of the platform. Users had to answer questions like 'I often provide answers to other individuals's questions' on a likert-scale. These self-reports were correlated with log measures of users' platform behaviour, such as frequency of platform visits. Results revealed that the survey answers matched users' real-world activity patterns. Since roles are mainly defined based on an individual's frequency of usage, which is unrelated to her interactions with others, communication patterns cannot be detected. As a result, many of the authors' roles cannot be matched to our meta-roles.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker

- The *questioner* asks questions but does not reply to other individuals's questions.

- The *reader* reads messages but neither provides replies nor asks questions.

Group supporter

- The *low-volume replier* answers other individuals's questions but does not consider herself to be a key contributor.

Undefined roles

- The *disengaged observer* answered 'neutral', 'disagree', or 'strongly disagree' to all the survey questions that asked about whether she read or posted messages.

- The *key contributor* most commonly visits the newsgroup search homepage and author profile.

D.1.2   Combs Turner et al. (2005)

Combs Turner et al. (2005) visually inspected descriptive statistics of users' posting activities, such as the number of sent messages and the number of active days. Results revealed qualitative patterns in these descriptive statistics which the authors used to group users into roles.

Socialiser

- The *conversationalist* enjoys discussing and communion. She generates valuable social interaction, a sense of belonging for other members, and a sense of community.

Self-seeker

- The *troll* draws others into useless discussions. Mostly initiates threads with seemingly legitimate questions or conversation starters.

- The *questioner* seeks help from otehrs by posting new threads.

- The *spammer* posts irrelevant messages. She initiates high volumes of initiated threads, in which she contributes a single message.

- The *flame warrior* debates harshly and negatively and violates the open spirit of conversation. Her aim is to 'win' an argument and thereby make herself appear superior to others involved in the conversation.

Group supporter

- The *answer person* provides advice to others without the promise of a return on her investment.

Undefined roles

- The *binary poster* uses automated tools to post hundreds of parts of binary files (such as music tracks and movies) to newsgroups. She uses Usenet as a file-sharing space and not to communicate.

D.1.3   D. Fisher (2005)

D. Fisher (2005) selected four distinct sub-forums with distinct interaction cultures, respectively, and tested whether communication was different between these forums. First, they handcoded user messages to establish a ground truth of communication roles. Second, the authors constructed communication networks from the user interactions in

each sub-forum. They compared the sub-forums in terms of degree distribution and ego-networks of the individual users. Results revealed that the sub-forums different in terms of network characteristics, and these differences matched differences in the handcoded messages. The authors concluded that distinctive communication behaviour emerges within every sub-forum and users of one sub-forum can be assigned the same role.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker

- The *flamer* insults others and often reciprocates messages.

- The *political discussant* is similar to the flamer in insulting others but does not often reciprocate messages.

Group supporter

- The *answer person* (technical support) answers other individuals's questions.

- The *social supporter* helps new users and keeps in touch with active users.

D.1.4   Combs Turner and K.E. Fisher (2006)

Combs Turner and K.E. Fisher (2006) observed discussions in preselected forums, asking comprehension questions to the forum's manager, running focus groups with members of the forum, and visually analysing temporal frequency plots showing the number of initiated and answered messages per user and day.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *mentor* helps other users and enjoys a good reputation in the community. She is highly active and can advocate topics and solutions.

- The *manager* ensures that individuals adhere to the rules and norms of the community. This may sometimes make her unpopular among the other users.

- The *mogul* answers complex questions and helps when problems escalate.

D.1.5 Welser et al. (2007)

Welser et al. (2007) handcoded user messages to establish a ground truth of the *answer person* role. They constructed a communications networks from user interactions and extracted degree- and temporal frequency distributions from the users' ego-networks. They used a logit regression to show that these three features can predict whether a user is an *answer person* or not.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *answer person* anwers other individuals's questions.

D.1.6 Gleave et al. (2009)

Gleave et al. (2009) handcoded user messages to establish a ground truth of the communication roles defined in Welser et al. (2007) for Usenet and Welser et al. (2011) for Wikipedia (see section D.2). The authors constructed a communication network from user interactions and visually related structural properties of users' ego-networks (e.g., density of edges in periphery) to the handcoded messages.

Socialiser

- The *discussion person* frequently reciprocates messages from many users.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *answer person* anwers other individuals's ques- tions.

- The *discussion catalyst* initiates new discussion threads that other individuals pick up on.

- The *substantive expert* resolves disputes and contributes to content-related discussions.

- The *technical editor* enforces formatting standards.

D.1.7 Golder and Donath (2004)

Golder and Donath (2004) handcoded user messages along the concepts of communicative competence, ability to behave according to social norms (Hymes, 1974), participation inequality (Whittaker et al., 1998), participation rate, and Jones and Pittman (1982)'s five strategies for interaction: intimidation, supplication, ingratiation, exemplification and self-promotion. Based on these factors users were grouped into roles.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker

- The *celebrity* enforces changes in the community, e.g., by defining community standards and bringing about short-term change.

- The *flamer* intimidates others and is aggressive. It is not her aim to become a accepted member of the community and she is not a competend communicator.

- The *troll* deceives others, lures them into useless discussions, and is not interested in the discussion topic. In contrast to the *flamer* communicative competence is the troll's most important trait.

- The *ranter* deceives others, lures them into useless discussions, and is interested in the discussion topic. Unlike a *troll*, the *ranter* has an agenda. She wants to be in the limelight and be admired by others.

Group supporter   None of the detected roles matched this meta-role.

Undefined roles

- The *lurker* and the 'newbie' are passive users who mostly read messages rather than posting something. So no communication activity is visible.

D.1.8 Nolker and Zhou (2005)

Nolker and Zhou (2005) conceptually pre-defined roles of users in an online discussion forum and manually compared them with selected topological network measures of users from the communication network of all users.

Socialiser

- The *chatter* posts a lot of messages to a few individuals but does not contribute to the community conversation as a whole.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The '*motivator* keeps conversations going.

- The *leader* spreads knowledge and works towards a cohesive community.

D.2   Wikipedia

Wikipedia is a crowd-sourced online encyclopedia. Everyone can write an article on a topic of her choice or modify an existing one. This work is then discussed among editors in the Wikipedia community and finally published on the website.

D.2.1   Welser et al. (2011)

Welser et al. (2011) handcoded user messages to establish a ground truth of communication roles. The authors compared the frequency distributions of edits across name spaces between different role members. They also constructed a communication network of user interactions and visually compared the ego-networks of some editors, exemplary for a role. Results revealed that qualitative roles based on handcoded messages matched patterns in the network and the frequency distribution.

D.2.2   Welser et al. (2011)

Whereas Welser et al. (2011) used a visual comparison of ego-networks networks, Welser et al. (2011) defined quantitative network measures to describe communication roles. The users used a to infer handcoded content groups of user messages (roles) from structural properties of users' ego-networks.

Socialiser

- The *social network* uses social chitchat rather article collaboration to build strong relationships with other users. They utilize 'User Talk' extensively, make 'Wikifriends', and create elaborate profiles that showcase their Wikipedia personalities.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *substantive expert* resolves content-related disputes and contributes knowledge to the discussion.

- The *technical editor* enforces formatting standards.

- The *counter vandalism editor* sanctions users who do not comply to the rules of the community.

D.3 Online learning environment

Online learning environments (OLE) such as 'Moodle' or 'Blackboard' are password-secured platforms where teachers can upload learning material for their students and can discuss questions with them. Often, separate forums exist where student groups can interact and work on course projects.

D.3.1 Waters and Gasson (2005)

Waters and Gasson (2005) handcoded user messages along an extended version of Garrison et al. (2000)'s coding dimensions of teaching, social, and cognitive. Based on this coding, the users were qualitatively assigned a role.

Socialiser

- The *initiator* maintains a social network of individuals by sending work-unrelated messages to many individuals. She look for points of connection such as affiliations, occupations or hobbies.

- The *contributor* contributes to the debate without changing its course. She contributes in a minimal way to fulfill her 'grade-earning' duties.

Self-seeker

- The *knowledge elicitor* seeks help from others.

- The *vicarious acknowledger* seeks social recognition from others for her achievements.

- The *passive learner* freeloads and does not contribute to the community.

Group supporter

- The *facilitator* keeps the debate moving by encouraging other users to participate and by solving problems, e.g., she warns the community if the discussion is wandering off topic.

- The *complicator* provides an alternative perspective by reformulating a problem or uncovering inconsistencies in an argument.

- The *closer* synthesizes open issues. She pulls together a final or coherent answer to the question and often brings a debate to a conclusion. She reconciles differences and combines threads of arguments.

D.3.2 Strijbos and De Laat (2010)

Strijbos and De Laat (2010) pre-defined roles based on a literature review on computer-supported collaborative learning environments and matched these roles to handcoded user messages. Groups only included 7-10 students which weakens the network perspective.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker

- The *generator* takes the initiative to fulfill her personal goals. She jumps right in to make proposals and devotes a lot of energy and time to the project.

- The *lurker* pretends to contribute to the project but in fact tries to fulfill her goals by being passive.

Group supporter

- The *pillar* engages in group activities to get the collaborative task done.

- The *hanger-on* aims to contribute to the collaborative tasks but does not manage to live up to her own expectations.

D.4 Online discussions: miscellenous platforms and topics

Besides research on Usenet (see section **??**), the online dicussion platform from the early 2000s, other, more modern platforms, such as Facebook, and topic-specific private forums have been used to study communication roles.

D.4.1 de Valck et al. (2009)

de Valck et al. (2009) studied a virtual community on culinary matters where users exchange information on cooking products and recipes. The authors conducted a survey among users about their usage of the discussion forum (e.g., amount of supplied information to discussion). The authors applied k-means clustering to the survey scores and compared the resulting clusters with an ANOVA. Results revealed that the clusters were significantly different from each other and the authors concluded that the clusters represent roles.

Socialiser

- The *conversationalist* is socially involved but does not have high expertise

- The *hobbyist* uses the community for leisure and entertainment, e.g., by writing guest book entries.

Self-seeker

- The *functionalist* retrieves information from the community but does not contribute often.

- The *opportunist* retrieves information from the community but does not contribute at all.

Group supporter

- The *core member* extensively contributes knowledge to and retrieves knowledge from the community.

- The *informationalist* moderately contributes knowledge to and retrieves knowledge from the commu- nity.

D.4.2   Seraj (2012)

Seraj (2012) analysed a private online community on aviation. The author handcoded user messages and conducted user interviews. Based on these results, users were qualitatively grouped into roles.

Socialiser

- The *player* entertains the community. She generates social value by making jokes and raising fun content.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *seeker* gets the discussion going by asking questions. She drives content value.

- The *governor* ensures that users comply to the rules and norms of the community. She also ensures the quality of content.

- The *educator* shares her knowledge with the community and actively co-creates content.

- The *challenger* questions the provided in- formation and provides alternative perspectives. She increases content-quality, eliminates biases, and keeps the community democratic and creative.

- The *appraiser* recognizes the contribution of other users and encourages them to get further involved in the community.

- The *innovator* provides an alternative perspective. She brings excitement and novelty to the community and enhances its social value.

D.4.3 Pfeil et al. (2011)

Pfeil et al. (2011) detected roles of users in an online-support community for older individuals. The authors handcoded user messages along five dimensions, including empathetic content and user-centered content. They constructed a communication network from user interactions and computed regular equivalent users with the Continuous REGE algorithm of the UCINET software. They compared the resulting the handcoded user groups with the REGE results and found a match.

Socialiser None of the detected roles matched this meta-role.

Self-seeker

- The *active member* mainly talks about herself and posts a lot.

- The *passive member* is like the active member with a smaller number of postings.

Group supporter

- The *moderating supporter* provides support to other users and has a strong interest in the community.

- The *central supporter* provides and receives support to/from other users.

- The *technical expert* provides support to other users but does not receive much support back in return.

Undefined roles

- The *visitor* has a low volume of postings and rather reads messages. Because she does not communicate a lot she cannot be assigned a meta-role.

D.4.4 Füller et al. (2014)

Füller et al. (2014) studied roles in a jewellery-innovation contest community where users could upload their jewellery designs, comment, and vote on each other ideas. The authors build a communication network from user interactions, and applied k-means and hierarchical clustering to selected topological measures of users' ego-networks (e.g., out-degree) and to descriptive features of users' platform usage (e.g., number of posted ideas). The resulting clusters were compared with an ANOVA and were found to be significantly different. The authors used the results to assign the same role to users of the same cluster.

Socialiser

- The *socialiser* contributes with social interactions rather than ideas.

Self-seeker   None of the detected roles matched this meta-role.

Group supporter

- The *master* provides a lot of useful postings for other users.

Undefined roles

- The *passive* does not actively participate in the innovation-contest community through a high number of comments or designs, or through providing highly attractive designs that capture considerable community attention.

- The *idea generator* uploads a lot of design suggestions but does not actively participate in communication or facilitates information exchange or social relationships, which can be seen from her few, if any, outgoing relationships.

- The *efficient contributor* focuses on idea-generating activities rather than active commenting behavior. With fewer submitted ideas, this role is able to attract the same level of attention as the 'idea generator' with a very high number of submitted designs.

D.4.5 Kozinets (1999)

Kozinets (1999) conducted a qualitative analysis of virtual communities of consumption where individuals with the same interest in a certain product interact. The authors qualitatively observe user interactions and based on these interactions group users into four roles along two dimensions: intensity of user-product and user-user relation, respectively. The authors suggest different marketing strategies to target the individual roles.

Socialiser

- the *mingler* focuses on short-term satisfaction and values social interaction.

- The *insider* values social interactions. For her, social contact of online communication is in itself a valuable reinforcement

Self-seeker

- The *tourist* retrieves information from the community but does not contribute at all. Her communication is individualistic and focuses on short-term personal gain. She lacks strong social ties to the group.

- The *devotee* is only interested in the discussion topic but not in socialising.

Group supporter   None of the detected roles matched this meta-role.

D.4.6   Benamar et al. (2017)

Benamar et al. (2017) analysed a Facebook group about a cooking product. First, the authors conducted an activity analysis where they used a statistical clustering method to group similar users based on activity features such as number of posts and number of likes. Second, they constructed a communication network from user interactions and computed some pre-selected topological network measures for each user (e.g., outdegree). Third, they handcoded user postings resulting in 24 themes. They then computed the frequencies with which users used these themes and grouped users of similar frequency patterns. These qualitative groups matched the roles detected by network and frequency measures qualitatively.

Socialiser

- The *generalist* focuses on community life and social intercourse.

- The *friendly product fan* engages in animation activities, and community life. She wants to create social or emotional connections with other group members.

- The *amateur* seeks to share aspects of her daily life with the group.

Self-seeker

- The *product fan learner* uses the community to improve her own skills and knowledge.

- The *amateur learner* uses the community to share her achievements.

- The *friendly learner* uses the community to improve her own skills and knowledge.

Group supporter

- The *gatekeeper* ensures that the group identity and values are in place. She emphasizes rules and standards, and defends the community from potential threats from competing groups.

- The *mentor* helps other users with the technical functionalities of the forum.

- The *product ambassador* shares information to improve other users' knowledge.

D.5   Dyadic communication

Some of the previous studies have used the nearest-neighbour networks of nodes in a communication network to detect their roles. these nearest-neighbour networks represent the dyadic communication of the focal node with her neighbours. So far, previous studies have enriched these dyadic measures with others computed on the global network and the content of the exchanged messages. In contrast to these studies, the work of this section only uses nearest-neighbour networks for role detection without any other measures.

D.5.1   Box-Steffensmeier et al. (2018)

Box-Steffensmeier et al. (2018) analysed communication between political interest groups in forming coalitions.

The authors constructed a communication network from interactions between interst groups and extracted ego-networks for each node. Based on theoretical considerations, they selected topological network measures which were assumed to capture behavioural patterns in the coalition forming process. The authors applied an ego-exponential random graph model to predict the topological measures of one node from the measures of another node. If the prediction was successful the two nodes were assigned the same role.

Socialiser   None of the detected roles matched this meta-role.

Self-seeker

- The *teammate* does not cooperate with other interest groups because their goals are not aligned with hers. She is an industry-based interest group.

- The *peripheral specialist* only cooperates with other interest groups whose goals are as specialised as hers. She is a pro-environment interest with a niche focus.

Group supporter

- The *coordinator* mediates coalitions between others. She is a pro-environment interest group.

D.6   Online games

D.6.1   Bartle (1996)

Bartle (1996) qualitatively observed interactions between players, i.e. conversations in the game chat. The author qualitatively grouped these interactions into roles which are defined along two dimensions. The first dimension indicates whether a player is rather oriented towards other players or towards the gaming world and the second dimension indicates whether the player prefers acting on her own over interacting with other players.

Socialiser

- The *socialiser* emphasizes with individuals and enjoys jokes. She does not focus on rising levels or killing.

Self-seeker

- The *killer* annoys other players by demonstrating her superiority in game skills.

- The *achiever* aims to rise in game levels. She wants to gain points in the game.

- The *explorer* aims to learn more about the game and get new ideas rather than to socialise.

Group supporter   None of the detected roles matched this meta-role.

D.6.2   Yee (2006)

Yee (2006) conducted a survey among members of online role-playing games where participants provided insights into their motivation to game and their relationships with other gamers (e.g., 'I like to feel powerful in the game.'). The authors ran a factor analysis on the survey scores to group players into roles.

Socialiser

- Players valuing *immersion* enjoys the story-telling aspect of the game. they enjoy to be 'someone else' and to dive into the story of the game.

- *Relationship-focused* players forms supportive relation- ships with others. The disclose real-life problems to other players.

Self-seeker

- Players focused on *achievement* want to become powerful in the game.

- Players focused on *manipulation* manipulate other players for her personal gains (e.g. deceiving).

Group supporter   None of the detected roles matched this meta-role.

Undefined roles

- Players valuing *escapism* use the virtual world to temporarily avoid, forget about, and escape from real-life stress and problems. We note the clustered structure between the gaming world and the real one.

D.6.3 Ang and Zaphiris (2010)

Ang and Zaphiris (2010) manually coded messages in an online game chat along predefined types of interactions such as 'group management' or 'ask for help'. They constructed a communication network from user interactions and applied a block model to it to group structurally equivalent nodes. Results revealed that the blocks had distinct profiles in terms of prevalent types of interactions which were then used to define the communication roles.

Socialiser

- The *social player* nurtures a friendly and welcoming atmosphere within the community.

Self-seeker

- The *free-loader* uses other players to advance in the game. She does feel part of the group because she only uses the guild as an instrumental tool for her task-related interactions.

Group supporter

- The *knowledge player* helps other players and encourages the group to do so, too.

Undefined roles

- The *newbie* is a peripheral player who is new to the guild and the whole game in general.