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To cite this version:

Flore Barcellini, Catherine Delgoulet, Dominique Fréard, Julien Nelson. Interactions in an online community in ergonomics: from sharing information to comparing practices?. 31st Annual European Conference on Cognitive Ergonomics (ECCE 2013), European Association of Cognitive Ergonomics, Aug 2013, Toulouse, France. pp.a22, 10.1145/2501907.2501955 . halshs-00860622

HAL Id: halshs-00860622

https://shs.hal.science/halshs-00860622v1

Submitted on 10 Sep 2013

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Interactions in an online community in ergonomics: from sharing information to comparing practices?

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ABSTRACT
The goal of our research is to characterize practices shared in an online community dedicated to ergonomics in order to understand how these online discussions are a means to construct co-elaborated knowledge about ergonomics and its practices. This communication presents a preliminary study of the nature (purpose of interactions, topics) and structure (relations between participants, purposes and topics) of exchanges on *Ergoliste*, a French speaking online mailing list dedicated to ergonomics. We show that the mailing list is mostly dominated by ergonomists (consultants, ergonomists working in private companies, institutions, students) seeking and sharing resources: information about jobs and resources (documentation, literature, etc.) and experiences about various topics (methodology, trades of ergonomics, specific tools or work settings…). It also opens some prospects for more longitudinal investigations of the contents of the list, to analyze more deeply how the list can be viewed as an efficient tool to co-elaborate knowledge about ergonomics and its development.

Author Keywords
Online communities; sharing practices, trade of ergonomics; Graphical modelling.

ACM Classification Keywords
H.1.2. "User/machine systems > human factors

General Terms
Human Factors

INTRODUCTION
The development of information technology tools over the Internet has enabled mediated communications between large numbers of people. Groups of people sharing a common interest can now "connect together" through mailing-lists or online fora. These groups form so-called "online communities" 15]. These communities may be constituted around different goals; to co-elaborate piece of knowledge, *e.g.* in the design of online encyclopedias (such as the Wikipedia community), or software (as for various Open Source Software projects), or to exchange practices or social support [6].

Ergoliste[1], a French-speaking mailing-list dedicated to ergonomics, is one of these communities whose goals explicitly refers "*to address issues related to evolutions within the profession…to host exchanges regarding ergonomics, (…) to allow its members to share experiences, (…), to ensure some kind of apprenticeship*" (our translation). It is structured around one of the two major French-speaking electronic mailing lists, along with *ErgoIHM* (which focuses on HCI issues).

In this context, our general goal is to characterize practices discussed and/or elaborated in *Ergoliste* in order to understand how online discussions are a means to structure the community and/or to co-elaborate knowledge – in our case, knowledge about ergonomics and its practices.

THEORETICAL FRAMEWORK
The approach we have developed articulates two fields of research: the first one deals with research on the working practices of ergonomists [14, 4, 5]); the second one deals with research on online communities, in particular online epistemic communities [6] or communities of practices [18, 25].

Exchanges about practices as a key resource for professional development
Attempts to define the profession ergonomics (e.g. the definition proposed by the International Ergonomics Association) stress that ergonomists intervening in work

[1] https://groupes.renater.fr/sympa/info/ergoliste. *Ergoliste* was founded in February 2003 and, at the time of this study, numbered 2 942 registered members.

settings may have to continuously develop their knowledge concerning rules, values, concepts and practices needed in order to develop a "quality practice".

These developments are particularly needed for the profession of ergonomics, in order both to contribute to structuring a relatively new job and discipline, and to help ergonomists cope with difficulties encountered in "real world" interventions: managing sometimes conflictual relationships, dealing with an intervention damaging one's own values, dealing with managerial and strategic skills [20, 8].

To deal with these difficulties and develop their own job, practices, ergonomists may rely on various resources (training…), but in particular on the possibility (*1*) to conduct reflexive analysis about his/her practice: about the mechanisms underlying transformation of work settings or concepts used to support reflection in action [20, 13] or (2) to mobilize a network of peers [21]. This is close form the notion of *community of practices* seen as a persistent and active network of people who share a common knowledge, values, history and practices concentrated around a common practice and/or a joint enterprise [24]. However, classical definitions of the profession of ergonomics do not describe the ways in which peer networks are constructed, or how reflective activities and exchanges are supported in these networks. In this sense, exchanging regularly among mailing lists, i.e. belonging to an online community may be a key resource to support reflexive practices. Our purpose is thus to understand in which way exchanges in *Ergoliste* may effectively support this reflection.

Approaches to analyze activities in online communities

The analysis of interactions between members of online communities has been the focus of many research works [1, 6, 7, 9, 10, 16]. Most of the methodologies focus on structural analysis of discussion, using for instance Social Network Analysis method (e.g. [11]). Based on this theory, several tools have been developed to explore the Web and to model its underlying social structure [see notably 2], some explicitly referring to Actor-Network Theory [11]. These quantitative approaches often process large amount of undifferentiated data (e.g. all messages posted among a mailing-list). They are very helpful in revealing global structures of participation (e.g. centrality or periphery of some participants). However, they are very poor in supporting interpretation as they suffer for a lack of contextualized data (e.g. what is the status of a participant within the list? What is the problem being discussed by participants?).

Some research, especially in ergonomics has extended these approaches by developing more qualitative analyses [1, 6, 9, 17, 18] These analyses focus on the contents of interactions between participants engaged in goal-oriented and situated tasks (to develop a piece of software or an article in Wikipedia). They complete the analysis of the structure of interactions by seeking to reconstruct the co-elaboration phenomena that occur online [6]. To do so, they are strongly grounded in models of activities performed online by participants: collaborative design [1], co-elaboration of knowledge [6] or social support [16, 17]. They reveal, for instance, specific roles of participants in ensuring the quality of the co-elaboration of knowledge, in particular the role of boundary spanners or of champions of new ideas, who organize co-elaboration of knowledge [1].

RESEARCH QUESTIONS

The research work presented in this communication is a first step in fulfilling our general objective of investigating to what extent online interactions on the *Ergoliste* mailing-list support development of the profession of ergonomics.

To do so, our first concern is the general characterization of actual participants to the list (professional, students, etc.), the purpose of their interactions (search for documentation, for experience, for advice, etc.) and of topics they address in relation to the field of ergonomics. A second concern is to obtain an overview of the structure of interactions between participants and topics discussed during a certain period of time. This general characterization will subsequently help identify relevant models of activity in which participants are engaged to perform a full qualitative analysis.

METHODOLOGY

Description of the corpus

The analyses presented here focus on the activity on the list during the year 2010. This was the complete year that was closest to the beginning of our study. It seemed important to maintain this proximity in time, should we choose to complement these analyses with interviews with the protagonists themselves. During the year 2010, 959 messages were sent on the list by 388 different authors. The messages were divided up into 345 separate discussion threads.

Coding scheme of interactions

Each message was coded by three of the authors according the following dimensions: (1) the status of the sender of a message; (2) the purpose of the messages; and (3) the topic addressed in the message. We have completed this analysis by specifying the nature of the addressing relationship (to a specific participant or to the list as a whole).

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Participant status

Three main types of status were distinguished based on the contents of email signatures: Ergonomist, Student, and Other (Table 1).

Category	Contents
Ergonomists	Consultants; tenured teachers or researchers; junior researchers; retired; company practitioners; institutional ergonomists; occupational Safety and Health (OSH) ergonomists; job-seekers
Students	Students in ergonomics (Master's degree) or other fields (Bachelor's degree)
Other professionals	Other OSH professionals (engineers, company doctors, health and safety officers); recruiters, trainers, managers, Human Resources professionals

Table 1 - Coding scheme for participant status

Type of information shared

Four types of information exchanged were coded, based on a categorization scheme proposed by [16]– see Table 2 below.

Category	Contents
Exchanges of resources, (search and share)	References from the literature, online documentation, etc.
Announcements of events	Upcoming conference or publication, job offer, job-seeking.
Sharing experiences	Requests for/sharing feedback, voicing an opinion (*e.g.* analyzing a situation, evaluating a solution, or offering advice)
Other purposes	Thanking a participant, ending a discussion, or any other message related to the social aspect of the online interactions

Table 2 – Coding scheme for message purpose

Message topics

Sixteen possible message topics were distinguished based on the corpus of messages exchanged on the mailing list in 2010 (see Table 3).

Category	Contents
Training	Degrees in ergonomics, training programs in early or adult education
Technical solution	Products, pieces of equipment, technical systems, or work tools
Specific situations and professions	Specific professions (e.g. drivers, barbers), specific workstations, well-defined work settings (control rooms)
Conditions of work	Environmental conditions of work, major constraints (*e.g.* technical, organizational, physical, psychological)
Occupational health	Prevention and management of occupational hazards and illnesses, operator safety.
Trade of ergonomics	Ethics, deontology, position of ergonomists, employment status, salary, approach to the ergonomic intervention.
Employment	Job offers and job-seeking
Organization	Work organization and prescription
Methodology	Methods and tools for data collection and analysis
Disability and employability	Situations of impairment and disability, and accessibility to the disabled
Performance	Criteria of reliability, productivity, and quality of work
Working world	Trends and evolutions in the world of work.
HCI	Design and evaluation of human-computer interfaces
Design	Other design-related activities, including architectural design and workspace design
Operating the list	Rules for writing, running the list, and netiquette. These messages are sent by moderators
Others	Political and philosophical discussions

Table 3 - Coding scheme for the message topics

Revealing global structure of interactions through graph modeling

Online discussions are transferred into a graph structure, which comprises the following nodes and links. Nodes are messages labeled in reference to participants posting the messages (and his/her status; see table 1) and message topics (Table 3). We then associated two links to each message sent on the list: the first link describes the interactive function of a message, by connecting the sender of a message to its recipient (including a virtual participant "the list" since several messages were addressed to the list as a whole); the second link describes the communicative function of the (epistemic) contents of the message, and connects the sender with the topic of the discussion.

Afterwards, we used the Gephi program, which is based on a spatial management algorithm - *Force Vector* [*2*]. This algorithm made it possible to reveal central and peripheral positions [13]: groups and nodes that are strongly related to other nodes are attracted to the centre of the graph, whereas others are projected to the outside.

RESULTS

Global description of discussions on the list

Results show that *Ergoliste* is a place of expression that was primarily populated with ergonomists (70%; 281/388) of participants (85% if one adds the students to this toll). One third of this group is represented by consultants (27%; 75/281) followed by corporate ergonomists (15%; 42/281).

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Moreover, the distribution of participations on *Ergoliste* is as follow: 75% of "occasional" participants (175/388) posting only one message (175/388) or 2 messages (91/288); and 12% (46/388) more "regular" posting more of 5 messages during the year. Seven participants posted more than 15 messages. The most active participant is an ergonomist working in a Occupational Health Service, (posting 52 messages) followed by a retired researcher in ergonomics (posting 32 messages), one of the list's moderators (27 messages) a company-based ergonomist (22 messages), and three consultants, and another company-based practitioner, each posting between 15 and 21 messages.

Concerning message purpose, we confirm that seeking and sharing resources is a key function of the list, with seeking/sharing experience feedback corresponding to 41% of the 959 messages followed by the requesting/sharing of resources (36%), and announcements of events (19%).

Finally, our analysis reveal that more than half of all e-mail exchanges were accounted for by four topics: employment (15%), specific situations and professions (14%), methodology (11%), Technical solutions (11%); followed by the other topics and the trade of ergonomics (10%), Occupational health (6%), and Disability and employability (4%).

Relation between participants, purpose and topics

If we examine more closely the relation between participants, topics and purpose, we note that:

- Messages dedicated to sharing and seeking resources focus on all categories of topics;
- For messages dealing with sharing experience, central topics are the "Trade of ergonomics", "Methodology", "Occupational health", and "Technical solutions". "Employment" and "Specific situations and professions" are less central for this purpose.
- Each major participant has a specific pattern of participation. For instance, the ergonomist working in an Occupational Health Service is the participant whose messages cover the widest span of topics. The retired ergonomist focuses more on Specific work situations and professions, but also on Methodological issues. They also occupy central positions concerning sharing and searching for resources.

Global structure of discussions during 2010

Graph modeling helped characterize the structure of the mailing list and the distribution of messages among participants, and topics (see Figure 1).

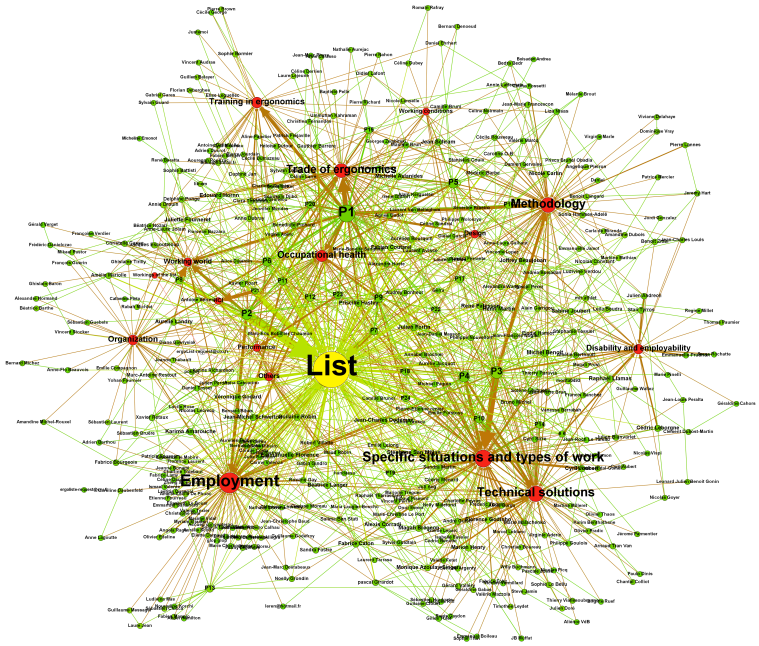

Figure 1 Structure interactions (participants * topics)

Figure 1 shows that 4 main areas of interactions can be identified, according their positions in the graph.

1. the "Employment topic" (south-west of the graph) is isolated : a large number of participants (40) have sent messages related to this topic and only this one. This suggests an opportunistic mode of participation: some

participants (who are external to the list, and sometimes to ergonomics) posted job offers, others signaled that they were seeking a job. This reveals that *Ergoliste* is a well-identified channel of communication to address at least some of the needs of the ergonomics community. However, we assume that none of them co-elaborate knowledge in other topics.

2. A second area is found (south-east of the graph) organized around "Specific situations and professions" and "Technical solutions" located close together. This suggests a common interest of participants around these two topics. This pattern highlights a major purpose of the list: to exchange specific knowledge about new tools (e.g. a new tool to raise a patient in healthcare settings) or about specific work settings (e.g. supermarket cashier). The retired researcher in ergonomics (P3, who is a preeminent sharer of resources) and a company-based ergonomist (P4) occupy a key position at the crossroads between these topics. The first tends to invite contributors to a more critical approach (not to go straight on to the solution) and the second shares solutions he/she had heard about or experimented before.

3. A third area (north-west of the graph) is organized around "Trade of ergonomics" and its satellite topics (Training, Conditions of work, Occupational health, and further away, Organization). The main participant (P1, an ergonomist working in an Occupational Health Service) occupies the dominant position in this region, where she provides a bridge with the topic of Methodology. Another important participant, because of his status of moderator (P2), provides a juncture with the Employment topic.

4. Finally, a fourth area (north-east of the graph) is organized around the "Methodology". We assume that this topic appears less central as there is a lot of question regarding methodology but few answers provided to these questions (by P1, P3).

Peripheral topics are those that are seldom addressed on the list (Employment, Disability and Employability, Specific situations and professions, Methodology, Working conditions, and Training) whereas topics in a more central position are those towards which conversations tend to drift (Trade of ergonomics, Design, Performance, HCI). Based on these first results, we might suggest that in this community of ergonomics, the former topics may not lead to extensive discussions, although they are a concern to participants. Conversely, the latter topics are more likely to lead to constructive and evolving exchanges.

DISCUSSIONS AND PROSPECTS

This work allow us to characterize contributors and contributions to *Ergoliste* but also to model the structure of exchanges, the relationships between participants, and the topics addressed on this electronic mailing list over the course of an entire year of operation. Our results show that seeking/sharing experiences or resources is a major activity for contributors to this mailing list. In this sense, it might contribute to some kind of co-elaboration of knowledge about the trades of ergonomics and methodological aspects in various situations. In this sense, this study raises several new prospects for future research.

First, this work calls for the development of a refined qualitative research methodology in order to qualify the effective co-elaboration of knowledge (if this does indeed occur on the list), in a more situated approach [6]. Among the topics discussed we will focus on "major debates" in terms of their contribution to the construction of the trade. Our coding scheme will need to be grounded in a model of discursive activity to take into account what is being constructed within the list in terms of the construction of the trade, following elements recently proposed by [3] and [7]. At the same time, interviews will be carried out with members interacting on the list, but also with readers of the list, in order to identify their concerns with rules of the trade, what needs the mailing list caters to, and the rules governing communication on the list which were implemented over the years, both within and outside of the list. These analyses should contribute to the on-going debate on the development of the profession of ergonomics.

Furthermore, other analyses might focus on the dynamic aspects of the development of topics on the list. For the time being, the nature of the corpus itself, which comprises one year of activity on the list, does not allow this question to be investigated. Early attempts suggest that all topics are addressed concurrently, with the exception of seasonal effects such as students requesting work experience in November-December and February-March. In order to better study these aspects, it would be interesting to study the conditions in which these topics emerge, how they are dealt with and how they are capitalized in the long term.

Finally, the modelling approach proposed here allowed us to create a new artifact that can represent a process in all of its dimensions. This artifact may serve as a constructive tool – an intermediary object, in Vinck and Jeantet [22]'s sense – serving as a basis for exchanges between participants on the list. Furthermore, our methodology might be used for the study of other processes or communities, as has been the case in the recent past with the Wikipedia community [9, 10].

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