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Soumaya Gouider, Marie-Hélène Abel

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Soumaya GOUIDER, Marie-Hélène ABEL

Sorbonne universités, Université de technologie de Compiègne, CNRS, HEUDIASYC, UMR 7253, CS 60 319, 60 203 Compiègne cedex - France

soumaya.gouider@hds.utc.fr
marie-helene.abel@hds.utc.fr

Abstract – Nowadays we participate more in meetings. During meetings, information is often distributed among participants and Information Systems (IS). At the end of a meeting, only reports or formal documents are stored in the IS. However, informal knowledge exchanged is important and we wonder how to take into account informal knowledge in IS? In our work, we are developing means that allow reserving informal exchanges produced during a meeting like any document resources. Therefore, it could be possible to better understand the produced report by consulting the different comments exchanged. Our application domain is brainstorming meeting around a graph. We consider informal exchanges during meetings as annotations concerning the discussion's target (node, cluster). We developed a model and an IS prototype to that end. In this context, this paper deals with how to take into account informal knowledge in Information Systems.

1.   Introduction

In recent years, the field of information systems (IS) has become news theme due to its numerous applications. By the way, "any specific information system aims to support operations, management and decision-making" [BUL 2013].

Although IS are various in nature, they still suffer from limitations such as the traditional way of recording meetings by keeping some general reports. Therefore, restarting last debate in a distributed environment of work becomes more difficult. That's why we need IS that allows keeping informal knowledge exchanged during a meeting and precisely during a brainstorming session. In fact, "brainstorming may be the best-known tool for group idea generation and is widely taught in gifted and talented programs" [ISG 2005].

In order to know how to take into account informal knowledge in IS, we propose a model and an information system prototype dealing with brainstorming meetings around a graph. Our approach is to develop an information system that considers informal knowledge produced during meetings as annotations concerning a target in the visible graph. In addition to that, we treat these meetings as a distributed environment where the information is distributed between the information system and participants.

Our objective is to introduce an information system prototype that permits the capitalization of informal knowledge exchanged during a meeting. In addition, this information system provides support for meetings.

The rest of this paper is organized as follows: In section 2, ISs are discussed and basic evolutions are given. In section 3, we will describe informal knowledge. Then, in section 4 we will mention a collaborative platform in a numeric ecosystem called ECOPACK starting with the platform's objectives and moving to annotations as means of informal knowledge expression. After that, we move forward to the model and architecture of ECOPACK to see its prototype at the end of section 4. Later, we discuss our findings in section 5. Finally we conclude in section 6.

2.   Information Systems and their evolution

In this section we plan to go through various types of Information Systems presented in the literature. While listing these IS, we highlight their evolution through the fact that ISs at their beginning were closely related to databases and information storage than to the progress in IS applications.

As mentioned in [HAN, 2009], "an information system can be seen as a system comprising human beings and/or machines which use and/or produce information."

In the same context, [DDC 2008] attested that "a computer information system is a system composed of people and computers that processes or interprets information."

Then, a new form of IS appears, which is Management information systems (MIS). MIS as an academic discipline studies people, technology, organizations, and the relationships among them. [WIKI 2016]

Likewise, there are Business information systems (BIS). [ARN 2015] attests that "(BIS) comprise technological (e.g. programs), informational (e.g. content) and social artifacts (e.g. collaboration structures). Typically, such systems are constantly and collectively developed (co-developed) further by a variety of individuals within the organization."

IS evolution has been discussed in many researchers conducted since IS first years of development.

A history showing IS evolution was proposed by [RFG 2010] as follow:

"1. Before 1980: the period of IS development

2. 1980 - 1985: the period of IS theorization

3. 1985 - 1990: the period of positivism

4. 1995 - 2000: the period of diversification

5. 2000 - 2005: the period of societal context."

This history shows that IS field is evolving going from theorization and reaching IS contribution in organization's improvement without forgetting technology's involvement.

Evolving through time, a recent research by [SAA 2015] reveals that "information Systems are viewed as a set of services creating a workflow of information directed to specific groups and members. This allows individuals to share ideas and their talents with other members."

3.   Information Systems and Informal Knowledge

In this section we propose some definitions of informal knowledge. Also, we discuss informal exchanges parallel to information systems.

In order to understand the context of informal knowledge, we can compare it with formal knowledge. This can be done by describing how to pass from formal to informal knowledge using information systems -especially those relying on computers- [CEE 2000] writes that " The informal knowledge is richer and familiar to any user while the formal one is more precise and necessary to the computer. Moreover, translating from informal to formal is a common task of knowledge acquisition and providing traceability information is a major requirement. Therefore, this task requires computational support."

In the same context, we can compare informal knowledge processes with formal ones. Informal knowledge processes are the spontaneous and voluntary way of collecting and sharing knowledge, according to [SLH 2006]. These processes can be linked to the SECI (socialization, externalization, combination, internationalization) model proposed by Nonaka and Takeuchi [NO 1995]. Thus, [SLH 2006] demonstrated that the socialization and internalization processes, in particular, exhibit strong characteristics found in informal processes.

Informal knowledge deals directly with a huge quantity of exchanged information so it is related to data storage. When we talk about informal knowledge, we can't neglect the necessity of management and capitalization of knowledge. According to [DFO 2014], in the last few years, Knowledge Management practices have evolved in organizations. Due to the introduction of Web 2.0 technologies, new usages of information and knowledge sharing have emerged. And that's why we aim to information systems. Beside, [ALL 2001] demonstrated that information systems designed to support and augment organizational knowledge management need to complement and enhance the knowledge management activities of individuals and the collectivity. To achieve this, the design of information systems should be rooted in and guided by an understanding of the nature and types of organizational knowledge.

As mentioned by [GIB 2014] "Informal knowledge management solutions are more and more required in flat organizations such as non-governmental organizations (NGO) in which learning is an informal process supported through practice sharing in the field."

4. A collaborative platform in a numeric ecosystem: ECOPACK

In this section, we propose a prototype of an information system designed for collaboration in a numeric ecosystem. It is a collaborative platform called ECOPACK. First, we are going to list ECOPACK objectives. Second, we are going to introduce annotations as means of informal knowledge expression. Then, we will present the architecture of ECOPACK. Finally, we are going to present the prototype.

4.1. *Objectives*

ECOPACK is a platform of collaboration operating in a digital business ecosystem developed to establish new forms of collaborative work. These forms are permitted in a social and technical data processing environment which includes different devices such as tactile boards, tablets and smart phones. Its main objectives are to:

- Define a numeric ecosystem able to response to collaboration's needs identified during brainstorming, innovation and strategic analysis.
- Model a middleware integrating dispositive adapted to link between actors in order to increase ecosystem's performance.
- Capitalize the traces of interactions in order to use them in justifying some decision makings.
- Produce information (including annotations, comments and clusters) as well as editing and diffusing information in a distributed environment.
- Permit retrieving quickly sent annotations or links around a target, by making them visible and accessible.

4.2. *Annotations as means of informal knowledge's expression*

In this subsection, we will review definitions of annotations in the literature, and then we will talk about the way we consider annotations in ECOPACK.

An annotation was defined by [AAM 2014] as follows: "According to us, the annotation is an information resource in its own right. We define an annotation as the "transcription of an idea that have a particular target and a body which is somehow about the target.

In this context, [ROD 2006] stated that "More than the normal use of annotation for document interpretation; annotation tool can be designed to assist in information research."

In ECOPACK, we deal with graphs. The annotation is about choosing a target which can be the graph, a node, an edge or a cluster to annotate. Considering the fact that we are working in a distributed environment, annotations will become means of informal knowledge's expression.

Dealing with this purpose, we can refer to tacit knowledge which is personal knowledge embedded in individual experience and involves intangible factors such as person belief, perspective and values [NOT 1995].

Likewise, [OOO 2010] said that users may share their perceptions of the decision problem or of any information through annotation in a collaborative environment.

4.3. *Model and architecture*

In this part, we are going to present the object model of ECOPACK and its architecture.

In ECOPACK, an annotation has a target which is a resource. In our model, a resource could be simple or composite. A simple resource can be an informatic object or a document. We are working on brainstorming sessions around a graph which is a set of nodes connected through edges. Each edge has a predecessor and a successor. While manipulating a graph, it is possible to create a cluster which is a graph formed by nodes chosen by the user. Thus an annotation target can be a node, an edge and also a cluster. We can even annotate the whole graph.

The architecture of ECOPACK presented in (Fig. 3) is as follows:
- A server related to the platform of collaboration; this one allows loading information to show the graph, capitalizing all informal knowledge sent through the platform and recording them. It uses a REST server allowing communication with other complementary modules developed with other technologies.
- A principal module intended for tactile boards. It displays the main graph containing targets to annotate.
- A complementary module designed for tablets and smart phones to send different comments to the principal module concerning displayed data.
- An additional module that gives a representation of the principal one but on PCs.

All these modules are developed using the same technology and act as peers of a peer-to-peer system. The communication is bidirectional between those peers and based on asynchronous messages.
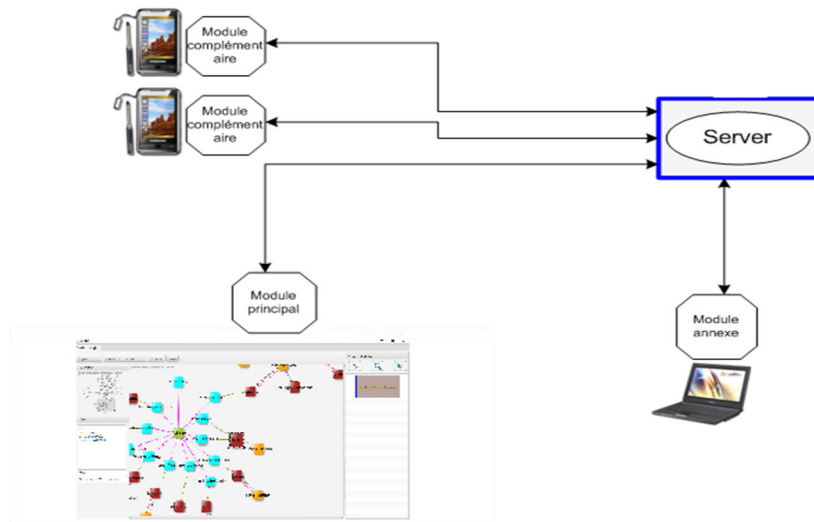
Figure N.3. *ECOPACK Architecture*

4.4.*ECOPACK Prototype*

As already mentioned, we have four modules in ECOPACK. Principal functions are developed and available on the principal module shown at (Fig. 4). These functions include:

➢ Choosing brainstorming theme: a project to work on.
➢ Generating the graph linked of the project.
➢ Receiving annotations (informal knowledge in our case) sent from the complementary module concerning a focus which can be the whole graph or parts of the graph (node, edge, nodes cluster).
➢ Reporting all the brainstorming session including annotations, and clusters.
➢ Searching a node by its name or id.
➢ Creating a cluster.

The annotations menu allows the user of the application to filter the annotations by choosing criteria to filter; it can be through date, contributor's login or both of them. There is also another filter concerning the whole graph. The user can filter the graph depending on an edge category. These filters make the contributor more precious in his annotations.
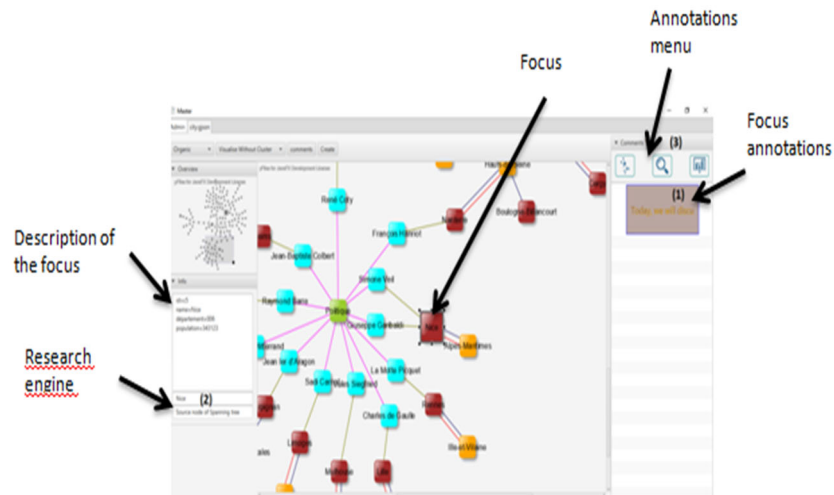
Figure N.4. *ECOPACK Prototype*

In ECOPACK, it is possible to create clusters, which are considered as sub-graphs, and send annotations.

To create a cluster, the animator selects the nodes that he/she desires to regroup. Nodes can be selected by clicking on them or by forming a set with a hand gesture. Then he/she attributes a name to this cluster using an input window. Once the cluster is created, a message is shown with date, time and cluster elements. A cluster can be edited by removing or adding nodes.

To send an annotation in ECOPACK, we proceed as follows:

1) The animator of the brainstorming session chooses the project he wants to work on.
2) The animator invites the participants by assigning them a login and a password allowing them to send annotations.
3) The animator selects a target on the tactile board; a node, an edge or a cluster. Participants can send comments using their tablets or their PCs equipped with the complementary module.
4) Once the target is selected, its ID is registered in the complementary module.
5) The contributor signs in and writes the annotation body by the means of his/her complementary module and sends it to the principle module.
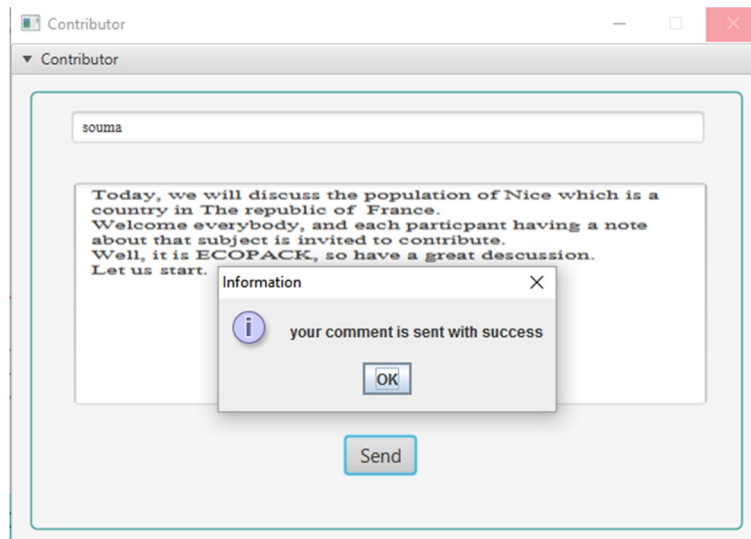6) The annotation is saved with previous ones, and is visible in the principle module for all participants.

Figure N.6. *A screenshot from the complementary module*

Once the brainstorming session is finished, contributors can't send annotations anymore but they can consult contributions established during the meeting; they can consult annotations by selecting a target.

5. Discussion

In the previous section we presented an information system that will grant users the ability to reserve informal exchanges shared during brainstorming sessions around a graph, while considering annotations focused on a target in the graph as means of informal knowledge expression. The questions here are: How to take into account informal knowledge in information systems? What kind of information systems will be more precious for this type of exchanges?

To answer these questions, we can focus on a common point between them which is the distributed aspect of the work environment. Informal knowledge in our case is based on sharing ideas and information during a meeting. In order to take informal knowledge into account in IS we have to choose the adequate information system that supports real time communications and storage of information. ECOPACK, as a collaborative platform, sustains various types of information (graphs, reports, images, etc.) forming a kind of database related to a brainstorming session and reserving after the meeting all the produced informal exchanges.

ECOPACK is a new project that can be classified with new methods of thinking out of the box. To capitalize informal knowledge in an information system during a brainstorming is part of this field's scientific revolution.

6.   Conclusion

This paper deals with informal knowledge in Information Systems. To that end we define a model and a prototype of a collaborative platform in a numeric ecosystem. Our goal was to develop an information system that allows storing informal exchanges during a meeting of brainstorming. To amplify this goal, we undertake this research to determine what is currently available as information systems and to observe informal knowledge in researches.

First, we introduced IS and their evolutions. Then, we defined informal knowledge and discuss it in relation to information systems. Finally, we proposed a collaborative platform, entitled ECOPACK, by listing its objectives, model, architecture and prototype. Also, we discussed in that part how to consider annotations as means of informal knowledge's expression.

The next step is to enlarge our work and procure an information system dedicated to offline brainstorming; we aim to develop a version of ECOPACK that allows users to prepare their annotations beforehand. Also, this version supports versioning by keeping all changes on the graph during different sessions.

7.   References

[AAM 2014] Atrash, A., Abel, M.-H., Moulin, C. Supporting Organizational Learning with Collaborative Annotation. International Conference on Knowledge Management and Information Sharing, Oct 2014, Rome, Italy. pp.237 - 244, 2014, .

[ALL 2001] ALAVI M., and LEIDNER D.E., Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues, MIS Quarterly , 2001, vol. 25, no. 1, pp. 107-136

[DFO 2014] Dudezert, A., Fayard, P., Oiry, E. ASTERIX and 2.0 Knowledge Management. Bill Doolin; Eleni Lamprou; Nathalie Mitev; Laurie McLeod. 5th Working Conference on Information Systems and Organizations (ISO), Dec 2014, Auckland, New Zealand. Springer, IFIP Advances in Information and Communication Technology, AICT-446, pp.186-206, 2014, Information Systems and Global Assemblages. (Re)Configuring Actors, Artefacts, Organizations

[BUL 2013] Bulgacs, S. (2013). "The first phase of creating a standardised international technological implementation framework/software application"

[ROD 2006] Robert, C., David, A. AMIE: An annotation model for information research. 14th International Conference on Computers in Education - ICCE 2006, Nov 2006, Beijing, China. 2006.

[DDC 2008] D'Atri A., De Marco M., Casalino N. (2008). "Interdisciplinary Aspects of Information Systems Studies", Physica-Verlag, Springer, Germany, pp. 1–416

[GIB 2014] Gillet, D., Bogdanov, E. (2014). Cloud-Savvy Contextual Spaces as Agile Personal Learning Environments or Informal Knowledge Management Solutions. Proceedings of the 12th International Conference on Information Technology Based Higher Education and Training, Oct 2013, Antaliya, Turkey.

[CEE 2000] Cerbah, F., Euzenat, J. (2000) Integrating Textual Knowledge and Formal Knowledge for Improving Traceability. In: Dieng R., Corby O. (eds) Knowledge Engineering and Knowledge Management Methods, Models, and Tools. EKAW 2000. Lecture Notes in Computer Science, vol 1937. Springer, Berlin, Heidelberg

[RFG 2010] Rodhain, F., Fallery, B., Girard, A., Desq, S. Une histoire de la recherche en Systèmes d'Information, à travers 30 trente ans de publications. Entreprises et Histoire, Eska, 2010, pp.78-97.

[HAN 2009] Hansen HR, 2009, Neumann G (2009) Wirtschaftsinformatik 1. 10edn.. UTB, Stuttgart

[ARN 2015] Aram, M., Neumann, G. (2015). Multilayered analysis of co-development of business information systems. page 1

[SAA 2015] Saleh, M., Abel, M.-H. (2016). Information Systems: Towards a System of Information Systems. KMIS 2015 7th International Conference on Knowledge Management and Information Sharing, Nov 2015, Lisbonne, Portugal, pp.193-200, 2015.

[NOT 1995] Nonaka, I. & Takeuchi, H. (1995). The Knowledge-Creating Company. New York: Oxford University Press

[OOO 2010] Okunoye, O., Oladejo, B., Odumuyiwa, V. Dynamic Knowledge Capitalization through Annotation among Economic Intelligence Actors in a Collaborative Environment. Colloque International Veille Stratégique Scientifique et Technologique - VSST 2010, Oct 2010, Toulouse, France. pp.1-17, 2010.

[ISG 2005] Isaksen, S. G., Gaulin, J. P. (2005). A Reexamination of Brainstorming Research: Implications for Research and Practice. page 315

[SLH 2006] Siu Loon Hoe, TACIT KNOWLEDGE, NONAKA AND TAKEUCHI SECI MODEL AND INFORMAL KNOWLEDGE PROCESSES. INTERNATIONAL JOURNAL OF ORGANIZATION THEORY AND BEHAVIOR, 9 (4), 490-502 WINTER 2006

[WIKI 2016] Wikipedia, the free encyclopedia. [Online; accessed 04-September-2016].