

A Framework for Studying and Evaluating Collaborative Information Seeking Environments

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Collaborative information seeking (CIS) does not happen in isolation; it encompasses some of the aspects of information retrieval/seeking, and it should be considered as a part of a larger collaboration. Due to this configuration, it is imperative that we consider the context of the collaboration that a CIS process is a part of. Classically, CIS processes are laid out on time-space axes [6]. Golovchinsky et al. [3] identified intent and depth of mediation as additional dimensions for classifying CIS systems. We believe there are many more aspects and dimensions to consider while studying and evaluating CIS environments. We propose a new framework that incorporates the following 11 dimensions for a CIS process. They are depicted in two parts in Figures 1 and 2, along with rationale behind incorporating these dimensions, and a few examples.

1. *Intent*

This dimension describes the level of intention one has in a collaborative process, or in other words, how explicitly collaboration is defined. This dimension is introduced to differentiate systems that are true collaborative to those that are merely collaborative filtering systems. An intentional or explicitly defined collaboration is when various aspects of collaboration are clearly stated and understood. For instance, a group of students working on a science project together know that (i) they are collaborating, and (ii) who is responsible for doing what. When collaboration happens without explicit specifications, it can be considered unintentional or implicitly defined. For instance, visitors to Amazon.com receive recommendations based on other people's searching and buying behavior without knowing those people.

2. *Activeness*

The level of activeness is another important dimension in understanding the nature of a collaborative endeavor. This dimension is useful to talk about the involvement of a user in a group activity. An active collaboration is similar to explicit collaboration with the key difference being the willingness and awareness of the user. For instance, when a user of Netflix rates a movie, he is actively playing a part in collaborating with other users. However, since he did not explicitly agree to collaborate with others; he may not even know

those users. A passive collaboration is similar to implicit collaboration with the key difference being the willingness and awareness of the user. For instance, when a user visits a video on YouTube, he passively contributes to the popularity of that video, affecting the ranking and social relevance of that video for other users. The key difference between active and passive collaboration is the user's willingness and control over the actions. In the case of active collaboration, the user agrees to do it (rating, comments), whereas in case of passive collaboration, the user has very little control (click-through, browsing patterns). To demonstrate this difference further, Table 1 lists some examples for these two dimensions.

Table 1: Differentiating between intent and activeness.

	Intended	Unintended
Active	Amazon wedding registry	Amazon book purchase
Passive	YouTube video viewing	Auto-subscribing

3. *Concurrency*

One of the traditional ways of classifying a collaborative process is by its concurrency. A video conference or a meeting typically requires the participants to be present in the same time (synchronous), whereas email could help a team work asynchronously. A chat program can support both synchronous and asynchronous collaborations, even though it is intended as a synchronous communication channel.

4. *Location*

This is another traditional dimension that is often used to place different collaborative systems in context. DiamondTouch [8] requires the participants to be physically present around the system for a collaborative session. SearchTogether [5] and Coagmento [7], on the other hand, facilitate collaboration among remotely located participants.

5. *Role/mediation of system and user*

Collaboration can be entirely done by a group of people, and it could also incorporate support of systems, such as computers or phones. However, this dimension says a bit more than that. In a collaborative project, the collaboration could be mediated by the system, in which case some underlying algorithm would drive the collaboration. Or the people or the users of the system could do mediation themselves, making the system (if

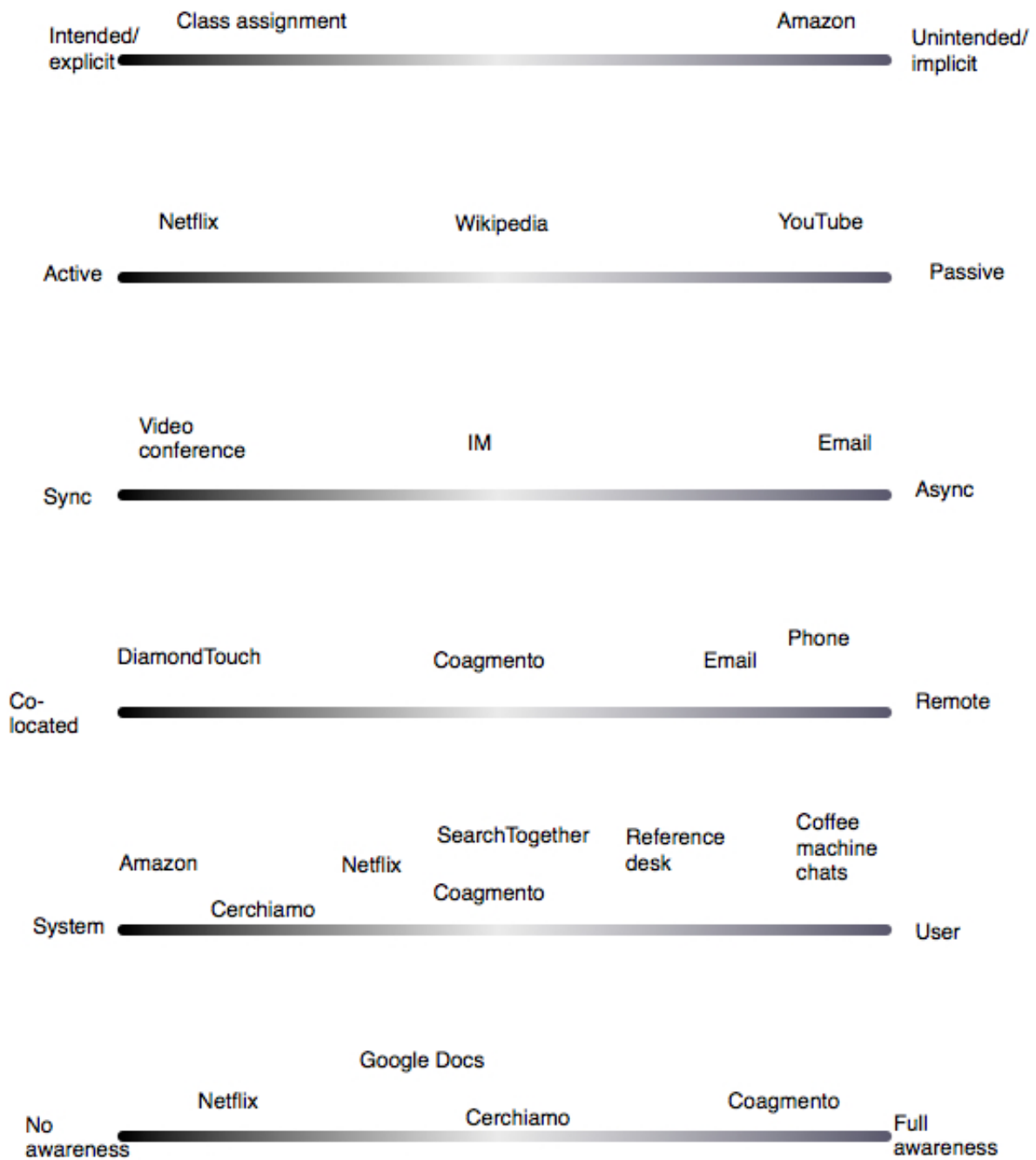


Figure 1: A framework for CIS environments (part 1 of 2).

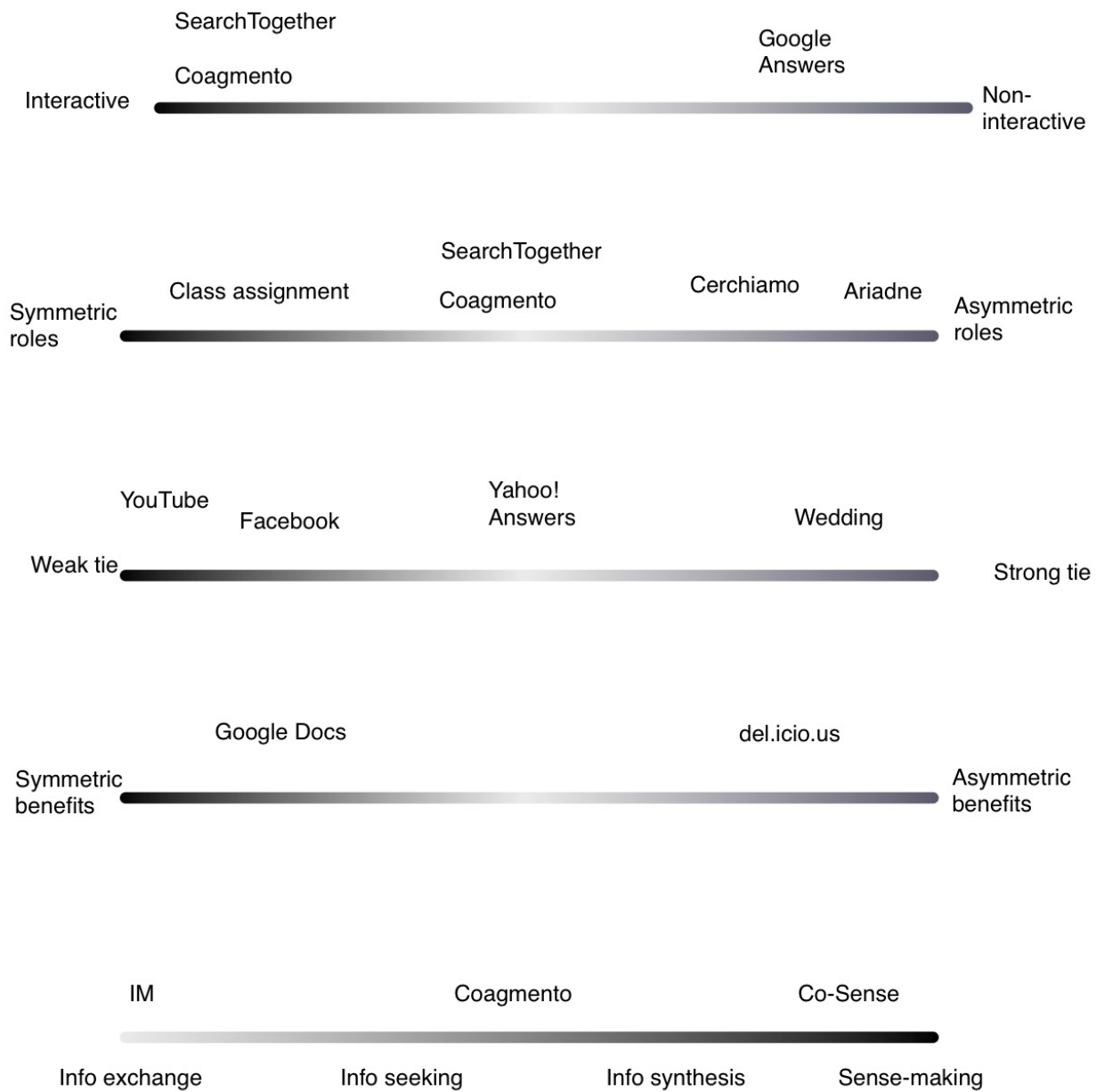


Figure 2: A framework for CIS environments (part 2 of 2).

it is used) a passive component. Cerchiamo [2] is an example of the former, and Coagmento is an example of the latter.

6. Level of awareness

Gaver [1] used awareness as a factor to identify different situations for collaboration. He claimed that less awareness is needed for division of labor, and that more casual awareness can lead to serendipitous communication, which can turn into collaboration. Awareness, therefore, is an important dimension to consider. The amount and the kind of awareness provided in an environment with a group of people depends on several factors, including the cost and benefit of such awareness, available technology, and privacy. On one hand, services like Netflix and Amazon connect multiple users without hardly making them aware of one another. On Google Docs, one has workspace awareness, whereby one can work with the group's artifact in collaboration, but does not see his collaborators' individual contributions. Cerchiamo provides a system-driven collaboration, where the users have limited and filtered access to their collaborators' actions and results. Coagmento, on the other extreme, provides a very transparent interface, in which a user can be aware of the task at hand, the shared workspace, as well as the group's history and products.

7. Level of interaction

Once again, to differentiate systems with very little or no user interaction to those that are highly interactive, a dimension that considers level of user interaction is needed. This dimension defines how interactive collaboration is. Systems such as SearchTogether and Coagmento are designed to support interactive collaboration. Google Answers, on the other hand, was a non-interactive service, where the information seeker could pose their questions to experts and receive answers without going back-and-forth.

8. User roles

While an effective collaboration must be *democratic* and *inclusive*, that is, it must be free of hierarchies of any kind and it must include all parties who have a stake in the problem [4], to include several scenarios of people working together, we should consider their roles in collaboration. Division of labor and combining diverse sets of skills are two of the most attractive appeals for collaborative projects. Invariably, the former assumes symmetric roles, and the latter assumes asymmetric roles of the participants. For example, a group project for a class typically involves students who all have more or less the same background and skills. Ariadne [9], on the other hand, was designed to connect a patron to a reference librarian - each with a different background.

9. Strength of the connection

A big difference between a social group and a collaborative group is the strength of the ties that connect them. Often, one group could be transformed to the other one based on these ties. A collaborative endeavor could involve more or less of the social element. Facebook is a social networking utility, where the users may not have stronger ties or common goals. Co-authoring

a research article, on the other hand, involves multiple parties being connected with a stronger bond.

10. Balance of benefits

This dimension follows the dimension of user roles. A typical collaboration is mutually beneficial for those participating. However, there can be a gradation of these benefits. Co-authoring a research article benefits all the involving authors, whereas one's collection of useful bookmarks on del.icio.us may benefit the author and the subscribers differently.

11. Usage of information

Finally, this dimension allows us to see how the information flows in the system. Often, information exchange is the focus of collaboration. An example is an online help service using chat. The other possible segments on this dimension are information seeking, information synthesis, and sense-making. A collaborative system could support one or several of these elements.

It is important to note here that all of these 11 dimensions are not independent. They have an interaction effect; i.e., fixing or altering of one dimension changes the rest appropriately. For instance, if we fix the 'Location' dimension to co-located, our options for 'Concurrency' dimension are reduced to synchronous, as the collaborators are likely to be meeting with each other at the same place and time. If, on the other hand, the collaborators could not meet face-to-face (remotely located), they may use synchronous (e.g., chat), or asynchronous (e.g., email) communication.

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