Asynchronous Tools and Technologies

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Tools and technologies that are asynchronous in nature support a form of communication where the sending of a message and the reception of the message is separated by a time delay as opposed to occurring in real-time. The use of asynchronous technology in education goes back to the mid-1800s when universities began to offer correspondence courses with print and written documents as the primary mechanism for communications between instructors and students. As a result, print and written correspondence was and continues to be used to support communication where instructors and students are geographically separated and where one-to-one exchanges in communications are delayed, intermittent or distributed over time. From an historical and educational perspective, asynchronous technologies can be at the most basic level defined as a tool that facilitates and mediates communication between instructors and students separated by both time and place. However, rapid advancements in electronic technologies over the last century, particularly in the last decade, have produced such novel and diverse communication tools, the 2x2 (same-versus-different x place vs. time) framework first articulated by Coldeway to define the differences between synchronous and asynchronous technologies (see Figure 1) no longer provides an adequate means of fully distinguish and define the functions that asynchronous technologies can serve as an instructional tool.

To better understand the defining characteristics of asynchronous technologies in general, more elaborate frameworks have been developed to classify the technologies across various dimensions. From the physical aspect of place and time, Grudin expanded on Coldeway's 2x2 framework by making further distinction between "different but predictable" versus "different but unpredictable to form a 3x3 framework. From a social network perspective, Giffin developed a 3x4 taxonomy (see Figure 2) based on direction of exchanges (one-way vs. two-way asynchronous vs. two-way synchronous) and number of participants (1 to 1 vs. 1 to few vs. 1 to many vs. many to many). Giffin's framework reveals that the primary tools that support asynchronous communication/learning are email, web-based groupware, and discussion groups. Among the latest and most comprehensive frameworks is one proposed by Luo, Pan & Jeung that crosses the number of people (public, group, dyadic) with the social mode of communication (presentation, conversation, collaboration) as presented in Table 1. More importantly, Luo, Pan & Jeung crossed this framework with the dimension of time (real-time, intermittent, shift-time) to produce a 3x3x3 framework that they used to characterize/define the latest communication tools. Using this 3-dimensional framework, some of the noted tools that support asynchronous communication (intermittent and time-shift) were email, Twitter, wikis, and Google Wave.

Although these earlier frameworks provide a useful way to distinguish asynchronous from synchronous tools and identify applications that exemplify asynchronous technologies, other frameworks have integrated dimensions that relate to instructional strategies similar to the way Luo, Pan & Jeung's crossed mode of communication (presentation/didactic, conversation/discussion, and collaboration/group learning) with the dimension of time. Frameworks that integrate with instructional strategies can help us better understand how, where,

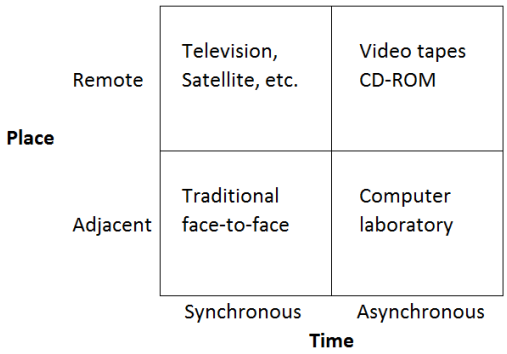

Figure 1. Coldeway's taxonomy for categorizing distance education.

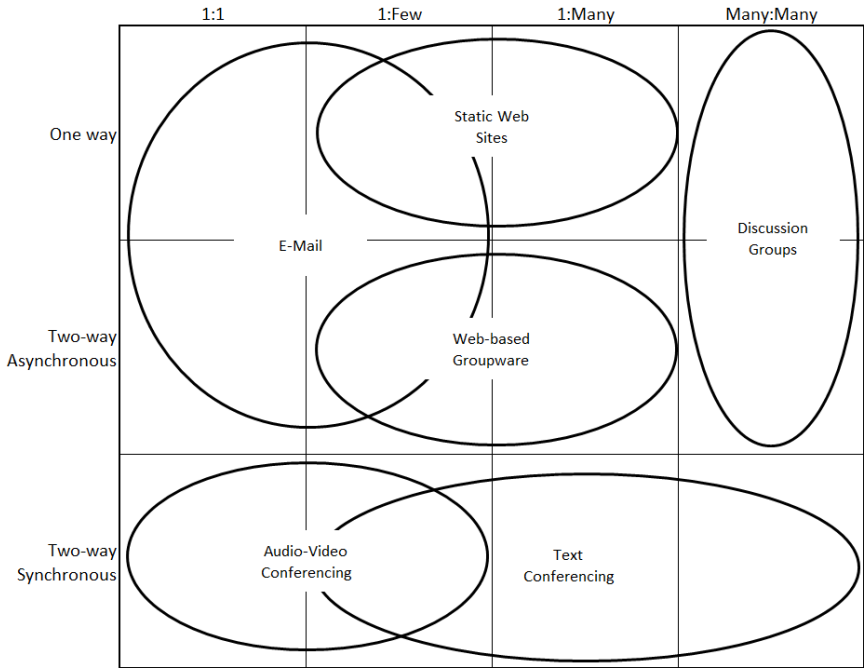

Figure 2. Giffin's taxonomy of Internet technologies on the social dimension.

Table 1.
Taxonomy of communication tools

	Presentation	**Conversation**	**Collaboration**
Public	TV, Books	Electronic bulletin board	Wikipedia
Group	Group presentation	Group discussion	Group collaboration
Dyadic	One-to-one monologue	One-to-one dialogue	Dyadic collaboration

and when asynchronous tools can best be used as an instructional tool. For example, Holden & Westfall identify five tools used to support synchronous communication and five tools used to support asynchronous communication. For each tool, they identify a list of instructional strategies (e.g., narration, modeling, demonstration, case study, simulation, role playing, drill & practice) that can be implemented with each given tool. However, a large overlap exists in the

instructional strategies shared between tools in the synchronous and asynchronous categories. Among the list of seven strategies supported with the use of computer mediated tools, for example, six of the seven noted strategies were also supported with the synchronous tool, video teleconferencing. Holden & Westfall also developed a table that integrates (albeit loosely integrates) the synchronous and asynchronous tools with each of the six levels of Bloom's taxonomy of learning outcomes (knowledge, comprehension, application, analysis, synthesis, evaluation).

Although Holden & Westfall's framework may be preliminary and still under development, the framework is lacking in coherence and does not provide a clear distinction between asynchronous and synchronous tools based on the instructional strategies and learning outcomes they support. More specificity could be achieved by integrating existing frameworks with the cognitive dimensions of learning. A cognitive dimension can be centered around fundamental learning processes defined at the micro-level in terms of specific sequences of cognitive operations (as opposed to global processes associated with instructional strategies), but only processes that have been empirically shown to improve learning. However, the fundamental cognitive processes that are used to achieve specific learning outcomes have yet to be identified, modeled, empirically tested, and validated. Given that the selection of a tool can influence the nature and quality of communication, the extent to which target learning processes are facilitated and inhibited under each combination of tool attributes will need to be systematically tested and measured in order to produce an empirically validated cognitive-based framework. The current and future frameworks described and proposed above will with certainty evolve over time, and will provide us with ever-more sophisticated lens to better define and understand the functional roles of asynchronous tools in learning and instruction.

See also Include related Encyclopedia topics taken from the Headword List in SRT here, separated by semicolons

Further Readings

Coldeway, D. O. (1986). Learner characteristics and success. In I. Mugridge & D. Kaufman (Eds.), *Distance education in Canada* (pp. 81-93). London: Croom-Helm.

Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C. (1996). The evolution of research on collaborative learning. In E. S. P. Reiman (Ed.), *Learning in Humans and Machine: Towards an interdisciplinary learning science* (pp. 189-211): Oxford: Elsevier.

Giffin, S. D. (2002). A taxonomy of Internet applications for project management Communication, *Project Management Journal*, *33*(4), 39-47.

Holden, J., & Westfall, P. (2010). *An instructional media selection guide for distance learning – Implications for blended learning featuring an introduction to virtual worlds*. Boston, MA: United States Distance Learning Association.

Luo, T., Pan, Y., & Jeung, J. (2011). A taxonomy of communication from design perspective. *International Journal of Energy, Information and Communications*, *2*(2), 93-107.