Technology and Innovation: The Catalyst for Educational Change

Angela Mattia
Jacksonville University, Davis College of Business
2800 University Blvd N, Jacksonville, FL 32211, amattia@ju.edu

ABSTRACT

To promote change in education, creativity and having technology are not enough. They must be actionable by always putting the learners first. Inventions are the manifestation of creative actions. It is something new. Innovation differs from invention in that innovation refers to doing and/or using something in a new way. It is directly related to educational change. This research defines the link between creativity, technology and educational innovation. Next it offers a vision on how an agile process can enhance viable options for innovative success. In business and economics, innovation is the catalyst to growth and therefore very important to the survival of the organization. In education, innovation is the catalyst to change and therefore important to future generations of learners.

AN AGILE PROCESS FOR EDUCATIONAL INNOVATION

After several years of exploration, the genex framework (Carroll, 2002; B. Shneiderman, 2000; Ben Shneiderman, 2002b) evolved into the framework for mega-creativity and upon further research this study adapts the framework into the Agile Process for Educational Innovation which has five main activities:

- Initialization: Construct a base version of the idea, problem and/or system.
- Collect: Learn from previous and associated works on the topics stored in libraries, the Web, and other sources.
- Relate: Associate technologies with previous and associated works on the topics.
- Create: Explore, compose, and evaluate possible options.
- Invent: construct creative output into viable option.
- Innovate: implements viable options successfully in practice.

It builds primarily on the mega-creativity framework by extending it with an innovative perspective and includes initialization as the first activity and innovation as the last activity which is defined as an implementation of a process that users work through for themselves successfully. It requires motivation on the organizations part. Technological tools and how they are to be used

are worked through by the users (Tornatzky & Fleischer, 1992). This is important because in an educational environment we must manage the processes and ensure that they result in useful outcomes. Indeed, management includes the act of getting people and ideas together to accomplish desired goals and objectives using available resources efficiently and effectively. The problem has been that creativity and innovation activities have not been conducive to efficiencies and effectiveness in the short term.

To address the problem, the basic idea is to identify an agile process that through repeated cycles (iterative) and in smaller portions at a time (incremental) (Figure 2), allows educators to take better advantage of a variety of software tool features that promote creative and innovative efforts. The repeated cycles (iterative) and in smaller portions at a time (incremental) would be conducive to efficiencies and effectiveness because of its incremental nature, while promoting creativity and innovation short term (1 iteration) or long term over many iterations.
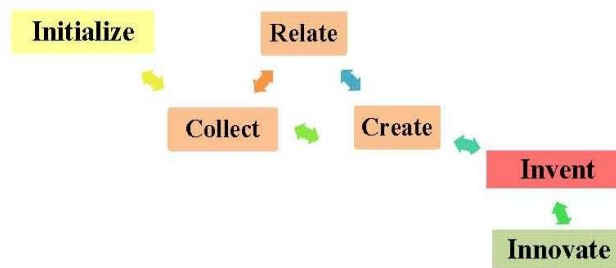

Figure 1

We can capitalize on the interdependency of current and past technological tools to gain some efficiencies and effectiveness, while promoting tools that enhance creativity and innovation. For example, we can continue to use the tools of the 1990s (word processor, spreadsheet, presentation, email), while promoting the use of software tools that incorporate collaboration, reuse, living documents features as well as quicker authoring cycles (Table 1). The strategic promotion by educators of software packages and the specific design features that promote creative moments can make the difference in an organizations ability to innovate. Therefore, agility is the key to addressing the interdependency of current and past software tools while promoting creativity and innovation in educational organizations.

Proposition 1a. Educational organizations will be most agile if they capitalize on the interdependency of current and past technological tools to support educational change.

Proposition 1b. Educational organizations will be most effective at using the agile process of educational innovation if they promote new tools and/or features that promote learning.

Table 1

ACTIVITIES			TASKS
INITIALIZATION		Construct a base version of the idea, problem and/or system.	**Identifying** and defining vision, goals and objectives at a high level
Iteration Activities	**COLLECT**	Learn from previous and associated works on the topics stored in libraries, the Web, and other sources.	**Searching** and browsing digital libraries, the Web, and other resources. **Visualizing** data and processes to understand and discover relationships
	RELATE	Associate technologies with previous and associated works on the topics.	**Connect** technologies with improving data and processes.
	CREATE	Explore, compose, and evaluate possible solutions.	**Thinking** by free associations to make new combinations of ideas **Exploring** solutions—What-if tools and simulation models **Composing** artifacts and performances step-by-step **Reviewing** and replaying session histories to support reflection
INVENT (PRODUCT/ PROCESS)		Manifestation of creative composition.	**Constructing** creative output into viable option.
INNOVATE (PRODUCT/ PROCESS)		Implements change successfully in practice.	**Transitioning** the invention into something that is useful (motivation needed) to the educational organization.

DISCUSSION AND CONCLUSION

The agile process offers great potential for educators to iteratively enhance the evolving creativity of the organization. At each iteration: learning, consulting exploring, composing, evaluating possible solutions are made, and new insights are added until a successful innovation is implemented. This is becoming a necessity as educators face an evolutionary shift in how we interact with software and each other. Old concepts such as collaborative editing are changing as web 2.0 continues to evolve and take hold in educational organizations.

This research capitalizes on these changes and gives educators a process that can strategically take advantage of students who are learning to think in rapidly produced, hyperlinked, searchable content chunks instead of ponderous, static, e-mailed documents. Creativity and innovation should not be caught in the paradigm of the software support tools of the 1990s (word processor, spreadsheet, presentation, email), when there is a need for collaboration, reuse, living documents, and quicker authoring cycles in the twenty-first century. The promotion of creativity can be enhanced by allowing time and assigning the task each week for investigating a technological tool.

In summary, creativity is a process that has long been seen as a mysterious (Boden, 2004; B. Shneiderman, 2000) Indeed, creative ideas are unpredictable and sometimes they even seem to be impossible. Yet they happen and are important to individuals and educational organizations. Times change, but the goal still remains the same; to enable more people to be more creative more often. The propositions were deduced from the literature and developed into an agile process that

can strategically promote innovation that is a catalyst to change. Future research should follow Shneiderman (2007) and take into consideration the opportunity to enrich the research on creativity and innovation with methods that include process research, case studies, and interviews with small numbers of users over weeks and months. As a researcher, my goal (as I move forward) is "…. to capture the processes that precede breakthrough incidents and to collect evidence that supports hypotheses about how technological tools can used to strategically promote innovation in education and be a catalyst to change that promotes student learning.

REFERENCES

Boden, M. A. (2004). *The creative mind : myths and mechanisms* (2nd ed.). London ; New York: Routledge.

Brennan, A., & Dooley, L. (2005). Networked creativity: a structured management framework for stimulating innovation. *Technovation, 25*(12), 1388-1399.

Carroll, J. M. (2002). *Human-computer interaction in the new millennium*. New York; Boston ; London: ACM Press ; Addison-Wesley.

Couger, J. D. (1996). *Creativity & innovation in information systems organizations*. Danvers: Boyd & Fraser.

Cropley, D. H. (2006). *The role of creativity as a driver of innovation.* Paper presented at the IEEE International Conference on Management of Innovation and Technology.

Farooq, U., Carroll, J. M., & Ganoe, C. H. (2005). *Supporting creativity in distributed scientific communities* Paper presented at the Proceedings of the 2005 international ACM SIGGROUP conference on Supporting group work Sanibel Island, Florida, USA.

Farooq, U., Carroll, J. M., & Ganoe, C. H. (2007). *Supporting creativity with awareness in distributed collaboration*. Paper presented at the Proceedings of the 2007 international ACM conference on Supporting group work, Sanibel Island, Florida, USA.

Gardner, H. (1993). *Creating minds : an anatomy of creativity seen through the lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi*. New York: BasicBooks.

Hessels, J., van Gelderen, M., & Thurik, R. (2008). Drivers of entrepreneurial aspirations at the country level: the role of start-up motivations and social security. *International Entrepreneurship and Management Journal, 4*(4), 401-417.

Mackenzie, K. D. (2000). Processes and Their Frameworks. *Management Science, 46*(1), 110-125.

Maiden, N., Gizikis, A., & Robertson, S. (2004). Provoking creativity: imagine what your requirements could be like. *Software, IEEE, 21*(5), 68-75.

Mattia, A. (2011). *The Strategic Use of Software to Promote Creativity and Innovation in Organizations.* Paper presented at the Southern Management Association Savannah, Georgia.

Mattia, A. (2012). Linking the Creative Process to Innovation Through Software Enabled Activities. *International Journal of Management & Information Systems, 17*(1).

Rank, J., & Frese, M. (2008). The impact of emotions, moods, and other affect-related variables on creativity, innovation and initiative in organizations. *Research Companion to Emotion in Organizations,(New Horizons in Management Series)*.

Shneiderman, B. (2000). *Supporting creativity with powerful composition tools for artifacts and performances.* Paper presented at the System Sciences, 2000. Proceedings of the 33rd Annual Hawaii International Conference on.

Shneiderman, B. (2002a). Creativity support tools. *Commun. ACM, 45*(10), 116-120. doi: http://doi.acm.org.proxy.library.vcu.edu/10.1145/570907.570945

Shneiderman, B. (2002b). *Leonardo's laptop : human needs and the new computing technologies*. Cambridge, Mass. ; London: MIT Press.

Shneiderman, B. (2007). Creativity support tools: accelerating discovery and innovation. *Commun. ACM, 50*(12), 20-32. doi: http://doi.acm.org.proxy.library.vcu.edu/10.1145/1323688.1323689

Shneiderman, B., Gerhard Fischer, Mary Czerwinski, Mitch Resnick, & Myers, B. (2006). Creativity support tools: Report from a U.S. National Science Foundation sponsored workshop *International Journal of Human--Computer Interaction, 20*(2), 61-77.

Terry, M., & Mynatt, E. D. (2002). *Recognizing creative needs in user interface design*. Paper presented at the Proceedings of the 4th conference on Creativity \& cognition, Loughborough, UK

Tornatzky, L., & Fleischer, M. (1992). *The process of technological innovation*: Lexington.

Warr, A., & O'Neill, E. (2005). *Understanding design as a social creative process* Paper presented at the Proceedings of the 5th conference on Creativity & cognition, London, United Kingdom.