









electrical engineers, structural engineers, and some consultants in business and the environment are needed. Most times, vernacular situations should be considered, too, if it is an international project. In a word, we have to remember that a fundamental tenet of true sustainability is the integration of all building systems within themselves as well as with the external economic and environmental realities of the project.

On the other hand, building information modeling (BIM) can be used to refine the integrated design. When the entire design team is able to share and influence a three-dimensional virtual model in an effort to gauge the impact of each other's work on the whole building, true integration all of a sudden becomes more real and compelling. But this next generation is yet embryonic in the BIM world of today. Some pieces have already been born. Structural and mechanical models can now interact with architectural models, for example, for purposes of coordination. System coordination can occur more accurately and fluidly within this virtual model rather than the more expensive alternative of on-site field coordination. Still untapped, however, is the capacity of the software to perform all the aspects of modeling and analysis critical for achieving true sustainable design. Instead, versions of the BIM model are recreated in separate virtual worlds (or software), which produce information that is then translated back to the design team for possible adjustments to the design. Further still, information regarding the environmental impact of material and system choices is still collected and integrated in the draconian fashion of catalog and manual referencing as they are being integrated into the model. Alternatively, with BIM, these

parameters could easily be embedded within the model itself.

#### 4. References

- [1] Friedman, Ken. (2003). Theory Construction in Design Research: Criteria: Approaches, and Methods. *Design Studies*, v24,no.26.
- [2] Keeler, Marian. (2009). *Fundamentals of Integrated Design for Sustainable Building*. Wiley.
- [3] Doerfler, James,. & Dong, Kevin. (2009). Teaching Integrated Practice in a Cross-Disciplinary Curriculum after Two Years.
- [4] Raelin, J. A. (2001). Public reflection as the basis of learning. *Management Learning*, 32(1), 11-30.
- [5] Loughran, J. J. (1996). Developing reflective practice: Learning about teaching and learning through modelling. London: Falmer.
- [6] Ryland, E.K. (1998). Greening business education: Teaching the paradigm. *Journal of Management Education*, 22(3), 320-343.
- [7] Russo, M. V. (1999). Environmental management. Boston: Houghton Mifflin.
- [8] Natrass, B., & Altomare, M. (1999). *The natural step for business*. Gabriola Island, BC: New Society Publishers.
- [9] Welsh, M. Ann.,& Murray, Dale L. (2003). The ecollaborative: teaching sustainability through critical pedagogy. *Journal of Management Education*.27, 220.
- [10] Cheng, René (2005), *Suggestions for an Integrative Education*, Report on integrated practice. Washington, DC: American Institute of Architect