From the Editor: It's not your fathers printing!

This month the focus is on a high-tech process that is changing how manufacturing is conducted in a growing number of areas and could provide a very useful tool in a wide variety of instructional settings on campus. For example, being able to move from a drawing to a prototype in an engineering, physics or architectural laboratory could change the way those disciplines are taught. Faculty in statistics or economics or sociology might welcome the means to display changes in data over time in a landscape format. How about manufacturing in-house, hard-to-find tools or spare parts for which drawings exist? There was no mention of potential medical uses but reason suggests there might be applications in that area as well. A process known as 3-D printing may eventually be able to do all that. A recent article in the *Harvard Business Review* outlined some of the capabilities of this relatively new process and urged readers to get on board early. The challenge for purchasing professionals is probably to learn as much about this new capability as they can and the HBR article provides useful information and points the way to more. Take a look!

Commentary: 3-D/Additive Printing on Campus?

By: Neil Markee
Editor in Chief-Purchasing Link

The full-length article in the May, 2013 issue of the *Harvard Business Review* by Richard D'Aveni was titled “The 3-D Printing Revolution” and the subhead was, “It's happening. And It Will Transform Your Operations and Strategy.” On a personal level, I have been interested in 3-D printing since an aerospace engineer who was president of a technology-oriented model-airplane club I belonged to brought in samples of 3-D printing he was experimenting with and explained the process. They were able to produce tiny to fist-sized, incredibly detailed components formed, in a plastic resin for use in investment casting. They hoped to eventually manufacture the operational parts directly or via investment casting.

Historically, investment-, or lost-wax casting, has involved forming full-size models of an item in wax, encasing the wax form in clay, melting out the wax and solidifying the clay in an oven, and then filling the cavity with molten metal to produce a duplicate of the wax form sacrificed. The casting might be used as is or further processed. Generally, the clay shell was destroyed along with the wax form. The basic lost-wax concept isn't new. Some of the precious-metal jewelry we see in museums was made using this technique in ancient times. Creating and sacrificing highly detailed wax models and the associated molds can be very expensive in a production setting and one corporate goal was to find a much less expensive way to mass produce sacrificial plastic forms in place of the wax versions—or to skip the investment-casting process and produce the items directly. As I understand the process, the computerized description of the item can be envisioned as an incredible number of very thin cross-sections, which could, for example be printed on paper, cut out, and stacked to form a paper version of the product. The associated dimensional data can be used to shape the desired product itself or create a form to be used in investment-casting, if the item itself cannot be printed directly because material required is not printable.

The *Harvard Business Review* article concedes, in general, that 3-D or additive manufacturing can’t always compete with processes such as injection molding in terms of economy of scale. Some of those processes can spit out thousands of identical copies in a short period of time. But 3-D printing is much more flexible, “Because each unit is built independently, it can easily be modified to suit unique needs or, more broadly, to accommodate improvements or changes in fashion.” The article points out the process can be used to make large numbers of complex identical one-piece items that might otherwise have had to be assembled from separate components. “That's why GE Aviation has switched to printing the fuel nozzles of certain jet engines. It expects to churn out more than 45,000 of the same design a year, so one might assume that conventional mass-manufacturing methods would be more suitable. But 3-D printing allows the nozzles that used to be assembled from 20 separately cast parts to be fabricated in one piece. GE says this will cut the cost of manufacturing by 75%.”

The article reports, “In 2014 sales of industrial grade 3-D printers in the United States were already one third the volume of industrial automation and robotic sales. Some projections have figures
Cooperative Services lending library of specialized 3-D printing software? Maybe there are areas. Others may have invested in an existing corporation or startup. How about an E&I organization, intended to eventually be profit-making, that could become a major player in this world of 3-D printing.

Some entity is going to develop and license the software needed to serve higher education and its suppliers effectively. I would not be surprised to learn that some university has already established a cooperative services lending library of specialized 3-D printing software. According to a recent article, "...the range of printable materials continues to expand." Plastics, photosensitive resins, ceramics, cement, glass, numerous metals, and thermoplastic composites infused with carbon nanotubes and fibers are on the list. "Among the numerous companies ramping up 3-D printing to ramp up production are GE (jet engines), Lock heed Martin, Boeing (aerospace and defense), Aurora Flight Sciences (unmanned aerial vehicles), Invisalign (dental devices), Google (consumer electronics), and the Dutch company LUXeXcel (lenses for light emitting diodes, or LEDs).

Large size is no longer the limiting factor it once was in this area. The article notes, "At the current extreme, the U.S. Department of Defense, Lockheed Martin. Cincinnati Tool Steel, and Oak Ridge National Laboratories, are partnering to develop a capability for printing most of the endo and exoskeletons of jet fighters, including the body, wings, internal structure panels embedded wiring and antennas, and soon the center load-bearing structure. So-called big area additive manufacturing makes large-object fabrication possible using a huge gantry with computerized controls to move the printers into position. When the process has been certified for use, the only assembly required will be the installation of plug-and-play electronics modules for navigation, communications, weaponry, and electronic countermeasures systems in bays created during the printing process. In Iraq and Afghanistan the U.S. military has been using drones from Aurora Flight Sciences, which print the entire body of these unmanned aerial vehicles—some with wing spans of 132 feet in one build."

No institutions of higher learning were mentioned, probably because the list was focused on industrial users producing items for commercial sale, and I don't expect many in higher education to acquire the huge industrial machines any time soon. However, it's safe to assume at least a few departments in such disciplines such as engineering, physics, industrial design and architecture have, or would like to have, 3-D printers available now to produce components, models or prototypes. The same is true for economics, social and other departments seeking 3-D displays to help better understand and explain data. The capability would be an attractive option in many research settings. There may even be a viable application involving the production of expensive spare parts needed for plant maintenance.

If/when 3-D Printing comes to the campus, purchasing professionals will be involved in the specification, procurement and support of the machines and software. Understanding basically how they function and their capabilities will enhance the ability of purchasing to evaluate proposals and contribute to the decision making involved. Providing even a basic tutorial is well beyond my ability but product information obtained from suppliers and others has long been one of the tools procurement officers have used to add value to transactions and I suspect such tutorials are available. Maybe a good first step would be to acquire a copy of the article from HBR, as it provides much more information than I have. In any case, the article mentions several of the major players involved. Apparently, "...the two leaders are Stratasys and 3D Systems, rivals that have staked out positions in additive manufacturing. They hold 57 and 49 nonduplicative patents respectively. As befits its printing heritage, Xerox, too, has invested heavily in additive technologies for making electronics and has developed a strong alliance with 3D Systems, Panasonic, Hewlett-Packard, 3M and Siemens likewise hold numerous patents."

If you have not already done so, maybe now would be a good time to call in representatives of these companies and others to determine how their products and services might be or are being used within higher education. A visit to a variety of campuses might be a productive educational experience for them. The results could be an eye-opener for both. The article seems to divide suppliers into two cooperating/competing categories: those who invest in providing printing services perhaps using "printing farms" and probably other companies that will develop and provide the software needed to drive the printers. Although the author doesn't explicitly say which of the two will be more profitable, it is clear that he is betting on the knowledge purveyors.

"Here's what we can confidently expect: within the next five years we will have fully automated, high-speed, large quantity additive manufacturing systems that are economical even for standardized parts. Owing to the flexibility of those systems, customization or fragmentation in many product categories will then take off, further reducing conventional mass production's market share."

"Smart business leaders aren't waiting for all the details and eventualities to reveal themselves. They can see clearly enough that additive manufacturing developments will change the way products are designed, made and delivered. They are taking the first steps in the design of manufacturing systems. They are envisioning the claims they will stake in the emerging ecosystem. They are making the many layers of decisions that will add up to advantage in a new world of 3-D printing."

There may be an opportunity here for entrepreneurial institutions and purchasing professionals. Some entity is going to develop and license the software needed to serve higher education and its suppliers effectively. I would not be surprised to learn that some university has already established an organization, intended to eventually be profit-making, that could become a major player in this area. Others may have invested in an existing corporation or startup. How about an E&I Cooperative Services lending library of specialized 3-D printing software? Maybe there are partnering opportunities available.

What's happening on your campus?
**From the President: Tactical to Strategic and BHAGs—How Do We Get There?**

Lisa Deal, C. P. M.
University of Florida
NAEP President 2015-2016

What’s a BHAG? It’s a Big Hairy Audacious Goal.*

At our Procurement Team retreat one year we were brainstorming visions for our unit. “What if everything campus needed was covered under contract?” That’s a BHAG (pronounced BEE-hag), if ever I heard one. I love the goal, but don’t think it is 100 percent achievable. That being said, we are working on increasing the volume of spend under management by increasing the number of contracts available to campus. We are using data tools to categorize spend and identify what areas need contracts but don’t have them yet. That work will move us towards the aforementioned BHAG, which could be described as a strategic or visionary goal. If everything campus needed was covered under contract, then campus could spend more time teaching, doing research, and providing service and less time shopping to meet needs. In the shorter term, procurement touches/handles transactions for items not covered under contract, and we always will (at least some—hopefully fewer).

The problem we have is finding time to carve out—away from transactional or daily work, towards the strategic. To do it, our team needs to stay focused on the team-set strategic goals. The key is to execute solicitations or create relationships that result in agreements/contracts that cover more institutional spend. That’s hard to do when the number and complexity of transactions continues to increase as the institution grows. I think it’s hard even when you have positions dedicated to strategic initiatives like sourcing and Supplier Relationship Management. In my experience, once we roll out a new strategic initiative (contract or technology solution) we have to manage it to ensure continued quality and value, and that requires time and resources, which challenge us to remain focused on the next strategic goal.

One way to staying focused on strategic goals is to work on holding each other accountable for progress. Having worked in higher education in Florida since 1995, I can say that the culture of accountability on campus has improved but still has a ways to go.

On a personal note, my Dad was a tenured history professor and a great teacher, but frankly, I don’t know that he ever met a deadline in his life. So how did he become a tenured faculty member? My mother held my Dad accountable for completing his PhD and all the steps along the way to tenure. Today in our office, we are working on developing a culture where not only supervisors can hold staff accountable, but buying teams, strategic and professional colleagues hold each other accountable for progress on goals they have identified as important to campus. Simple tools like writing down the goal, breaking it down into steps, assigning steps to individuals, and checking in on a regular basis sound easy, but the workday crises can prevent progress, if you let it. Keeping the entire team focused on the BHAG and steps to achieve the vision helps make way for progress. The NAEP Annual Meeting is designed to help you identify BHAGs and ways to achieve them, so please consider bringing your team to San Antonio, May 22–25, 2016. Good luck on your journey.

* BHAG, from Built to Last; Successful Habits of Visionary Companies by James Collins and Jerry Porras, HarperCollins 2009.

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**Fall Is Here, Do You Know What That Means?**

For many, the fall season brings changing leaves and cooler, crisp temperatures. Football season and fall harvests fill the weekends. Warm apple cider in a thermos watching the local high school football team on Friday nights turns into raking leaves on Saturday and pumpkin patches on Sunday. And speaking of pumpkin, it’s in everything now from coffee to beer.

Do you know what else happens every fall? NAEP begins its membership renewal process. In a few weeks, your institution will be asked to renew membership in NAEP for the 2016 calendar year. You will be able to renew securely online. Don’t let your membership lapse and lose out on valuable resources for you and your staff team. NAEP is here for you to do your job effectively and to help your procurement department become a strategic player within your administration. Renew your membership in NAEP for 2016!

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**Nominations Open for Board of Directors: November 1, 2015 Deadline**
The call for nominations for our 2016 Board of Directors is now open. NAEP is accepting nominations for the 2nd Vice President Board seat along with Board of Director representatives from District II and District V. CLICK HERE to read the criteria for nominating a candidate.

The Board of Directors is seeking candidates who are strategic thinkers and visionaries. Self-nominations are encouraged. Here is an opportunity to advance the purchasing profession and your own career. If you are interested in serving—or if there are any NAEP Member colleagues you would like to recommend—please contact Cory Harms, NAEP Immediate Past President for 2nd Vice President nominations and your current regional or district leadership for district nominations.

Nominations are due by November 1, 2015.

Anything New on the Street?

Heard on the Street columnist Greg Macway is hard at work in his next video forum! Here’s the latest hot topics video culled from recent topics in the NAEP National Forum. This video covers cost per copies and request for architecture design firms. Remember to sign into the website first.

Can You Craft Clear Concise Contracts

Clear contract drafting is a skill that must be learned. The ability to draft procurement-related documents (contracts, policy, procedures, etc.) clearly is essential to lowering risks and increasing compliance. Whether you are an attorney, a contract officer, a purchasing officer, or a business officer, this class will introduce you to the skills needed to draft clear documents, policies, and procedures.

Watch this 30-minute video to catch a sneak preview of this intensive event.

This in-person institute is filling quickly but there are still plenty of seats available for you. Join us in Las Vegas, NV on December 6-8. The Luxor Hotel has a room rate of $35 (plus $15 resort fee).

2016 Procurement Academy: Tiers I, II, & III

January 31 - February 2, Phoenix

Discount for Back-to-Back Courses in Phoenix. NOTE: A discount is offered for attending both the Procurement Academy and either the RFP Process Institute or the Federal Procurement Institute, which both immediately follow the Procurement Academy in Phoenix.

Details and Registration

Career development does not happen by chance. It takes thoughtful planning and active management to understand and learn the right skill sets, job knowledge, and abilities to succeed at your current position and advance into your next role. The NAEP Procurement Academy offers three Tiers, each tailored to the specific needs of the individual’s current career position and experience.

- Tier I: FOUNDATION course schedule
  If you are newer to higher education procurement, this tier is for you. Join others in your cohort group as you discover best practices across a broad range of procurement topics including the legal aspects of procurement.

- Tier II: PROFESSIONAL course schedule
  Ideal for the more seasoned veteran, learn from subject matter experts who will share best practices on leadership development, ethics and diversity, contract development, management and administration, as well as special legal issues in procurement.

- Tier III: PROFESSIONAL PLUS course schedule
  Are you ready to manage people? Do you understand Emotional Intelligence and conflict resolution? This tier will teach the specific skill sets needed to become an effective leader on your procurement team and at your institution.
**Women's Leadership Institute**  
*Program dates: December 6–9, 2015,  
Location: Ritz-Carlton, Amelia Island, Florida*  

Designed for women of all ages who aspire to new leadership positions on campus, the Women’s Leadership Institute features a curriculum with an overall focus on building the next generation of leaders in higher education administration. The Institute is co-produced by members of the Council for Higher Education Management Associations.

**Core Competencies:** Communications, Fiscal Management, Human Resource Development, Intercultural Proficiency, Leadership, Management, Planning

**Learning Outcomes**
- A stronger community of practice among women in the college and university environment  
- Personal and professional growth through reflection and both general and concurrent sessions  
- Team-building and leadership development  
- Empowerment for women to pursue higher-level positions in their respective fields

For more information and registration contact the Association of College Unions International (ACUI) at [www.acui.org/wli](http://www.acui.org/wli).

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**Quote of the Month**

“If you really look closely, most overnight successes took a long time.”

— Steve Jobs

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