



Lack of a plan limits Industry 4.0 development for many companies

Full report available at www.woodworkingnetwork.com/industry4-0

Industry 4.0 could help improve competitiveness of the U.S. woodworking industry. Digitization is increasing in both large and small wood products operations, but many companies lack a long-term plan or vision on how to integrate Industry 4.0 technology into their businesses.

Adoption of the principles of Industry 4.0, a term used to describe the ongoing digitization and rapid technological advancement in industry and society, will challenge the woodworking industry, due in part to the relatively small size and scale of many firms in the industry.

A study was conducted in late 2019 to assess the perceptions and experiences of secondary wood manufacturers concerning Industry 4.0, or more broadly the digitization/computerization of their manufacturing operations. The study was a joint effort by Virginia Tech, the USDA Forest Service, and Woodworking Network/FDMC.

Adoption of Industry 4.0

Respondents were asked if their company had increased the use of digitization/computerization in several manufacturing-related applications over the last three years. Designing products, machining, and communicating with customers to help them visualize product features were the most common applications.

Product engineering and optimiza-



Large firms increased the use of digitization/computerization more than small firms in nearly every application studied, and rated the real-time collection of manufacturing data higher.

tion of raw material processing also were mentioned relatively frequently. Facilitating robotics and finishing were the least-used applications. Only 13 percent of respondents indicated that they had not increased use.

There were some notable differences between small (1-19 employees) and large (20+ employees) firms, with product engineering, inventory tracking, manufacturing data collection, assembly, material handling, and shipping/distribution all being greater applications for large firms.

Several respondents also mentioned CNC/CAD-type applications, and ERP (Enterprise Resource Planning) or

related areas such as employee database access and paperless shop floors.

Respondents generally rated potential barriers to increasing digitization/computerization relatively low. Finding skilled labor and the needed capital for the investment were greatest barriers.

Just 19 percent of small firms indicated they had a strategic vision regarding digitization, while 52 percent of large firms reported having such a vision.

Impacts on employment

Respondents were asked their perceptions of the potential impacts of increased digitization and computerization on their firm's employment. A plurality

of respondents (40 percent) indicated there would be no change in their number of employees, and another 28 percent of respondents were uncertain of the potential impact on employment. Small firms were more likely to say there would be a gain in employment (20 percent) versus a loss in employment (8 percent) while large firms were less likely to say there would be a gain in employment (13 percent) versus a decrease (26 percent).

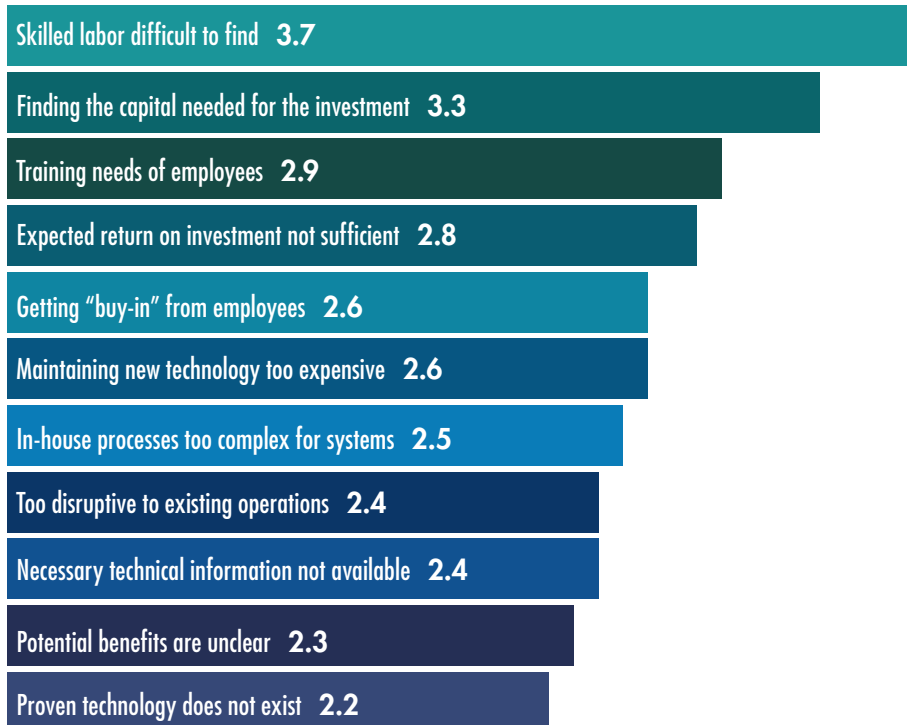
Industry 4.0 investments

Respondents were asked if their companies had made a “significant investment” in the digitization/computerization of their manufacturing operations in the past three years. Nearly 64 percent (n=88) indicated that they had made such an investment. The sub-sample was comprised of 47 percent small firms and 53 percent large firms, with all product types represented.

The most important potential benefits were improved productivity, improved product quality, improved consistency within manufacturing processes, and the enablement of increased customization of products. The least important potential benefits were enabling leaner manufacturing, improved raw material utilization, enabling the collection of real-time manufacturing data, and helping address labor shortages.

Improved information flow through the company and speed (manufacturing, speed to market, etc.) also surfaced as important benefits.

Respondents that had made a significant investment also were asked to qualitatively describe the most



Barriers to increasing digitization/computerization in respondents' manufacturing facilities.

1= Strongly Disagree to 5=Strongly Agree

unexpected problem encountered. Issues related to software and technology integration across platforms were mentioned most frequently, followed by managing the “learning curve.” Several respondents indicated no problems were encountered.

Training and maintenance

Respondents were then asked to indicate areas where formal training was sought for their manufacturing employees to implement digitization/computerization in their facilities. By a large margin, machine operation was the most common form of training sought, with several other training areas being mentioned in the 25 percent to 35 percent range.

Another topic addressed in the study related to the maintenance and repair of computerized manufacturing

equipment. Based on their experiences to date, for both general maintenance and repair, a majority of respondents (67 percent and 76 percent, respectively) viewed a combination of in-house expertise and outsourcing as the optimal way to receive service. However, respondents indicated they would prefer in-house service for general maintenance (30.7 percent) more than repair (14.7 percent).

Conclusions

Familiarity with the term Industry 4.0 was found to be somewhat low. However, this does not mean that secondary woodworking companies are not making decisions about, investing in, and implementing digitization and computerization in their manufacturing operations. Well over half of respondents

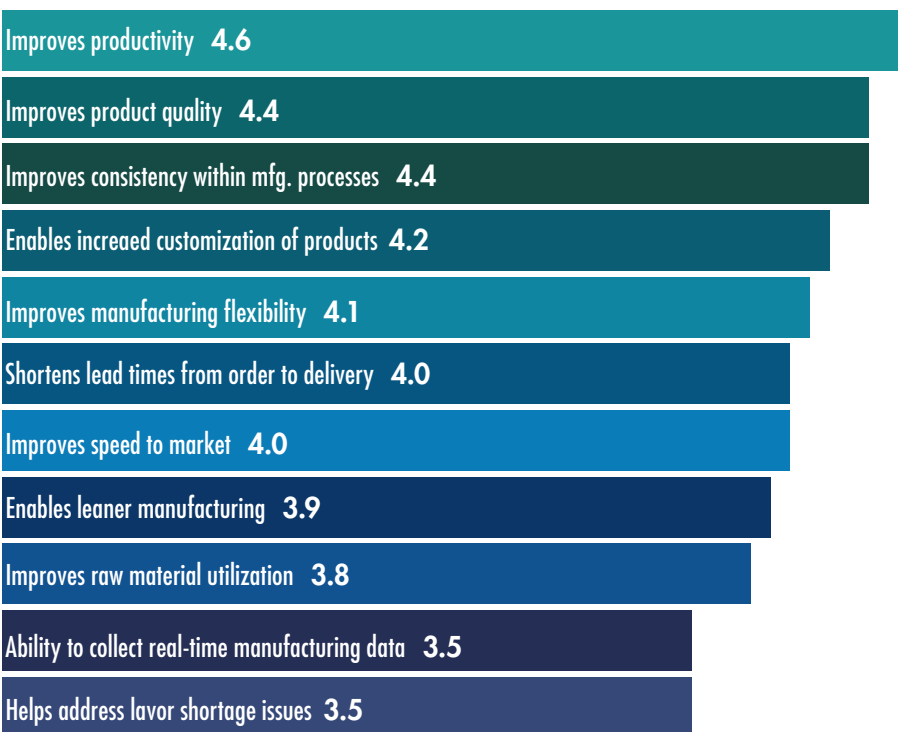
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INDUSTRY 4.0

(64 percent) indicated that their firms had made a significant investment in their manufacturing operations in such endeavors over the past three years. In fact, most of the potential barriers to Industry 4.0 investments in the study were rated as relatively unimportant. However, several respondents stated that software and technology integration was the most unexpected problem encountered.

A plurality of respondents indicated that Industry 4.0 investments would not result in a change to the number of employees at their firms, but small firms were more likely than large firms to say that employment would increase. Industry 4.0 investments led to more employee training requirements, but the kinds of training that were being sought were diverse in nature; only machine operation was indicated by a majority of respondents (63 percent). There were some notable differences between small and large firms. Large firms increased the use of digitization/computerization more than small firms in nearly every application studied. Large firms also rated the real-time collection of manufacturing data higher than did small firms as a potential benefit, and had sought more training in advanced programming.

Overall, responding firms tended to rate the success of their efforts to digitize/computerize operations as somewhat successful, and this was equally true for both small and large firms (even though more large firms than small had made significant investments). This suggests that an acceptable return on investment is achievable



Importance of potential benefits to the decision to digitize/computerize operations
 1= Not Important to 5=Very Important



About the study

The study was conducted in November/December of 2019 with invitations sent by Woodworking Network and FDMC to their subscribers in three separate emails. A total of 139 usable responses were received.

A plurality of responding firms (45 percent) were manufacturers of kitchen or bath cabinets, while 9 percent of responses were received from office/hospitality/contract furniture manufacturers. Another 9 and 7 percent were received by household furniture manufacturers and architectural fixture firms, respectively. Other replies were from manufacturers of moulding/flooring, windows or doors, store fixtures, closets, dimension or component products, and other products.

Nearly 80 percent of respondents represented companies with fewer than 50 employees. A majority of firms (55 percent) had fewer than 20 employees. Most firms had sales of \$10 million or less (87 percent). There were responses from 38 states, and there were 27 responses from Canada.

(regardless of firm size) if the necessary capital and employee skills can be obtained to facilitate the investments. However, just 19 percent of small firms indicated that their respective com-

panies had a strategic vision of how digitization might affect their business in the mid- to long-term, suggesting few are systematically thinking of the changes Industry 4.0 will bring. +