Wood Science & Engineering
Oregon State University

Innovation Evolution in the NA Structural Panel Industry

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***Description*:** An investigation of how innovation changes over an industry's life cycle

***Methods*:** Mail survey

***Data Source*:** 49 managers and top executives (one respondent per mill) from OSB and Plywood mills

***Key Findings*:**
1. OSB mills were more product innovative than plywood mills.
2. OSB mills used a more structured approach to developing new products
3. Plywood mills were more specialized in their product mix, thus less commodity product oriented

Introduction

Academic researchers have consistently concluded that innovation is critical to maintaining firm competitiveness and that innovation and firm performance are positively related. What is less understood is the evolution of innovation over an industry life cycle. Understanding the role of innovation at different stages of industry evolution can help managers make appropriate innovation-related investments aimed at maintaining competitiveness.

Industrial organization theory suggests that innovativeness differs across the industry life cycle. Utterback (1994) concludes that innovation is higher during early stages of the life cycle and declines as industries mature. In addition, he suggests that product innovation is generally higher in early stages while process innovation grows in importance in later stages (Figure 1). Utterback (1994) identified three distinct stages of innovation, a Fluid Phase, Transition Phase, and Specific Phase.

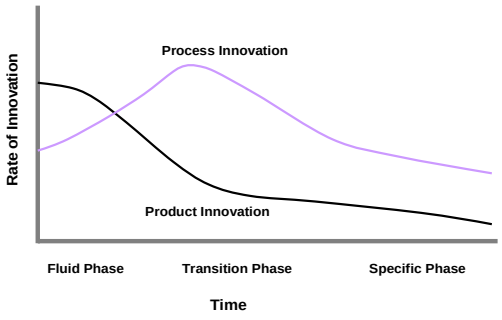

Figure 1: Evolution of Industry Innovation (Utterback 1994)

In the Fluid Phase there is significant experimentation with product design among competitors. Thus, the rate of product innovation is quite high while little concentration is placed on process innovation. It isn't until the general or "dominant" design is accepted in the marketplace that focus shifts to innovation in the production process (Transition Phase). In the final, or Specific Phase, industries are focused on costs, volume and capacity. In this phase both types of innovation occur in small incremental steps. This phase of evolution continues in the mature industry until some external shock occurs that brings a new wave of product innovation.

The North American Structural Panel Industry

Today, the structural panel market is dominated by two panel types, plywood and oriented strandboard (OSB). The products are in different stages of their product life cycles with OSB in its growth stage and plywood either in late maturity or decline (Figure 2).

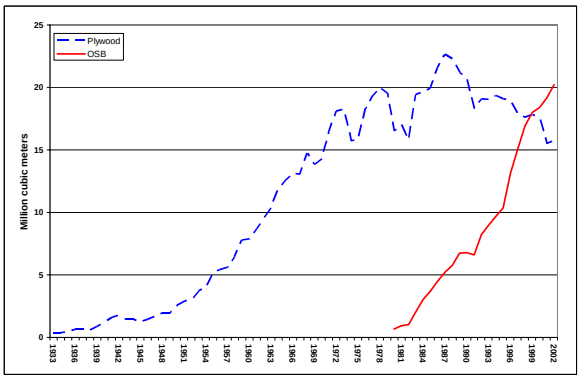

Figure 2: Production volumes of OSB and Plywood (APA)

Plywood production in the U.S. dropped by nearly 4.4 million cubic meters between 1985 and 2001 (APA 2002). A shift in product lines and target markets was a competitive necessity as the mills were often no longer capable of being cost competitive in traditional market sectors. This provides evidence that firms remaining in operation find a way to be more innovative than those that fail.

Innovative process technology has been recognized as key to competing in mature industrial markets. The forest industry has a longstanding image of being production oriented and focusing on process technology. This orientation, however, does not necessarily provide companies with the tools necessary to effectively deal with competition from new, substitute products. As is the case with structural panels, plywood was not necessarily well equipped to move to other markets even though companies may have been very good at process innovation.

Theory suggests that when a new product is introduced, the existing product undergoes significant innovation in response to the competitive threat. Upon introduction of OSB, plywood should have undergone significant product innovation to meet the competitive threat. As plywood producers see imperative for change, it is expected that

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they dedicate increased resources to new product development (NPD) and this also results in investment in new systems and structures for NPD.

Study Framework and Measures
Figure 3 outlines the framework used in the study. The discussion below summarizes how the concepts in the framework were measured.

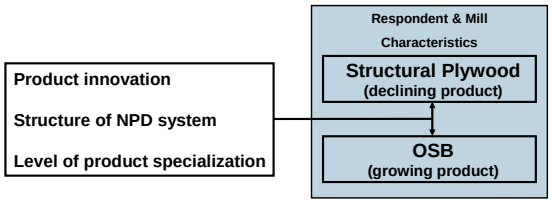

Figure 3: Study Framework

Product Innovation. Product innovation was measured by a self-report, Likert-type scale where 1=not at all innovative and 5=very innovative.

Structure of NPD System. The structure of the NPD process was operationalized based on 15 possible NPD steps ranging from idea generation to post launch evaluation

Level of Product specialization. This was measured by respondents allocating 100 points among the product types commodity, specialty, and custom-made. Commodity products were defined as products designed to meet an industry standard (product grades are the norm in this industry sector). Specialty products were defined as those products that are designed for a specific customer segment. Finally, custom-made products were defined as those designed for a specific, individual customer. A composite variable was constructed to represent a continuum ranging from a commodity orientation to a custom-made orientation. This was done by multiplying the value for commodities by one, specialty by two, and custom-made by three and summing the result. This provided a variable ranging from 100 (pure commodity) to 300 (pure custom-made).

Drivers of Innovation. Respondents allocated 100 points among several drivers of innovation. Examples include, retail customers, industrial customers, and competitors.

Sources of Innovative Ideas. Respondents allocated 100 points among several potential sources of innovative ideas. Examples include, customers, upper management, and R&D.

Results and Discussion
Overall, customers are the most important driver of innovation as well as the most important source of innovative ideas. With respect to differences between plywood and OSB, industrial customers are more significant drivers of innovation for plywood than for OSB. Customers are also a more significant source of innovative ideas for plywood respondents. Finally, R&D was a more significant source of innovative ideas for OSB than for plywood.

Results in this study are not consistent with expectations. Plywood mills manufacture a more specialized product line and, with respect to drivers of innovation and sources of innovative ideas, are more oriented to the customer base. This is consistent with the theory that the plywood sector should respond to the competitive threat presented by OSB, in this case by manufacturing more specialized products and avoiding competition in commodities. However, OSB mills were found to be more product-innovative and have a more structured NPD process. In addition, R&D was a significantly larger source of innovative ideas for OSB mills than for plywood.

A variety of factors may explain why findings do not follow expected patterns, though none are definitive. One possibility may be a consistent difference in the organizational structure of plywood and OSB operations. Generally OSB operations are larger and OSB comes from large, publicly owned corporations whereas small, independent plywood operations are common. These two factors might help explain the higher structure of NPD process in OSB mills since they are more likely to be tied to corporate standards of conduct and may have more resources dedicated to NPD.

Theory suggests that plywood mills should have substantially changed their product mix. Still, residential uses are a major market for plywood. It could be that as plywood mills left the industry, remaining mills found opportunities in filling gaps in existing markets that tended not to adopt OSB. For example, builders of high-end, large homes have tended not to adopt OSB. Since cost is not as large a driving factor for luxury homes, builders often stay with what is often perceived to be a higher-quality product. In cases where market segments do not make the shift to a new technology, the few remaining players in the older technology market may find sufficient opportunities. In the case of plywood, these remnant markets may have partially mediated the need for high levels of product innovation.

Though the results are mixed, industry practitioners can gain insight from the results of this study. The first critical point is acknowledgement of the stage in the life cycle of the overall product as well as elements of the product portfolio. Combined with recognition of potential competitive threats from substitute products, companies can best position themselves to remain competitive in the face of increased competition. Given the competitive setting of recent years, plywood manufacturers should be especially focused on their product lines, the markets they serve, and where they should change to stay viable in the marketplace. For example, if luxury home builders shift their sheathing purchases to OSB, this will be another hurdle for plywood manufacturers as they are forced to switch markets and/or products. As advocated by Utterback (1994), firms must embrace incremental innovation in products and processes while constantly preparing to bridge market and technology changes.

Literature Cited
Utterback, J.M. 1994. Mastering the Dynamics of Innovation, How Companies Can Seize Opportunities in the Face of Technological Change. Harvard Business School Press. Boston, MA. 253 pp.

Acknowledgements
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