

Efficient production and assembly of customer-specific multi-storey houses from space modules with architectural freedom

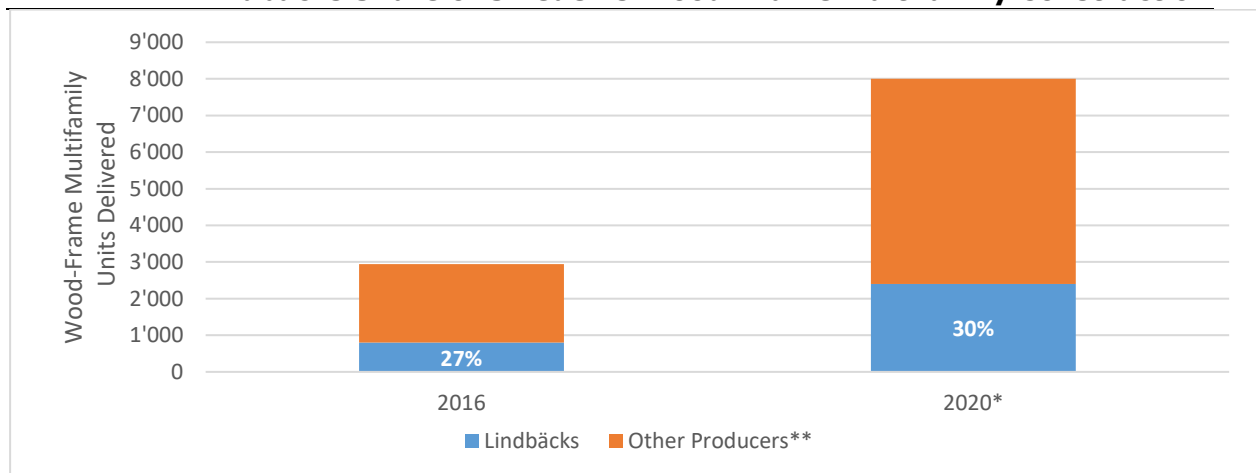
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Lindbäck specializes in 2-8 story wood-frame residential construction, produced through industrialized methods. They leverage the efficiencies of factory production to construct finished volumes, with everything from ceiling, floor, and wall blocks to furnishings with doors, windows, kitchens, tiled bathrooms, heating, and water as well as electrical installations and painting completed. These modules are then transported and assembled on the construction site. Lindbäck currently produces 800 apartments annually – or about a quarter of the Swedish wood-frame multifamily market – with a second “next gen” factory opening in December 2017 that will expand capacity by 200 percent. Their strong market share is attributable to several creative approaches to overcoming industry barriers and a principled business model described below.

Lindbäck's Share of Sweden's Wood-Frame Multifamily Construction



Source: TMF Swedish Wood and Furniture Companies Trade Organization

*2020 total wood-frame multifamily construction forecast estimated by TMF.

**Other producers category includes multifamily produced by both off-site and conventional construction methods.



Lindbäck's current factory in Öjebyn

Though pre-fabrication has a long history in Sweden, no other company in the country has achieved such scaled industrialized multifamily production; the keys to Lindbäck's success is company rather than country specific.

1. Overcoming Barriers to Industrialized Construction

There are several identified impediments to scaling industrialized construction, and Lindbäck has employed creative solutions addressing many of these shared challenges in their work. A few examples most pertinent to the United States context are highlighted below:

- **Technical Challenge:** Off-site construction offers less flexibility in the timing and type of adjustments that can be made to unit design.
- **Lindbäck's Approach:** Industrialization implies a greater level of standardization than that needed by on-site construction. Lindbäck has found that striking an appropriate balance between customization and standardization is key: too much customization can sink the business model, but not enough can also compromise the success of a project. Lindbäck has consequently learned the value of saying no to potential projects that may require over-customization (something that many

in the construction industry are not accustomed to doing). Instead, they pursue an 80 percent standardization/20 percent customization mix, enabling both the benefits of efficiency along with a level of creativity necessary for successful projects. To achieve this in practice, they work with external architects but choose to engage very early on in the design process, as soon as the first architect's sketch. This, along with creating a comprehensive architect manual on industrialized construction, ensures all team members are on the same page at the outset and limits costly design adjustments later on in the project.

- **Operational Challenge:** The off-site construction business model struggles with high fixed costs amidst a cyclical and sometimes unpredictable real estate market.
 - **Lindbäcks Approach:** Lindbäcks' business model operates with a 9-12 month pipeline of confirmed projects, ensuring constant production. A fixed production schedule uniquely enables precise forward-looking planning and its large customer base moderates uncertainty. They also ensure they are producing a diversity of product types – including rental apartments, condominiums, student housing, elderly housing, and even hospitality – which provide a range of both cyclical and counter-cyclical business, contributing to pipeline stability. The Lindbäcks company also directly develops housing, accounting for 30 percent of factory production and providing further confidence in a continuous pipeline.
- **Coordination Challenge:** A lack of familiarity on the part of general and sub-contractors, among others, can present challenges in efficient coordination.
 - **Lindbäcks Approach:** Lindbäcks operates as its own general contractor and assembles modules on-site with their own employees. This reduces coordination issues and guarantees informed oversight of each stage of the construction process. They are also able to serve as a one-stop shop for customers, increasing efficiency and assuaging some uncertainty on the part of the purchaser.

2. Lindbäcks Keys to Success

In addition to the thoughtful business model approaches above, Lindbäcks upholds a number of key guiding principles that are foundational to their company's success:

- **Focus on Human Capital and Culture:** Lindbäcks recognizes that their success is rooted in an ability to attract and retain top talent. Especially given the company's remote location (~500 miles north of Stockholm), this is facilitated through a dynamic and inclusive culture. They place special emphasis on attitude and cultural fit in recruitment, with training for technical skills viewed as the easy part. Experienced factory employees all receive the same salary, fostering a sense that each team member is a valued contributor. Daily morning "huddles" – where factory groups meet to review the previous day, plan for the upcoming day, and discuss issues – creates a forum for open communication, enables responsive problem troubleshooting, and ensures team members are on the same page. This empowering and supportive culture has allowed Lindbäcks to attract a diverse team of top talent, including a relatively high proportion of women, who are traditionally under-represented in the construction fields.
- **Optimization of Man and Machine:** Lindbäcks views the relationship between human capital and machine as synergistic: people are crucial for making swift and subtle judgement calls throughout the production process and the machine is optimized to deliver product with reliable speed and precision; together, human and machine achieve much more than either can achieve on their own.
- **Pursuit of Innovation:** Despite significant strides in industrialized production techniques, an ingrained forward-thinking culture continues to propel Lindbäcks toward further innovation. They closely partner with the nearby Luleå University of Technology, investing three percent of annual revenue toward research and development.