Current situation and issues of practical use of digital information in wood supply chain

木材サプライチェーンにおけるデジタル情報活用の実態と課題

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Research background

Bar codes, two-dimensional codes (QR codes) and IC tags (RFID), which are called data carriers, are generally used as means for adding digital information to products. Use of this information is effective for streamlining the wood supply chain and due diligence. Currently,Wood-related industries are introducing production management methods using digital information. And are committed to establishing a supply chain directly connected to production, processing and distribution.. But because the scope of application is still not large, and the application methods are not yet mature, there are still some problems to be solved in the actual production and application process.

Purpose of research

① To discribe the use of digital information in the wood supply chain
② To discuss the issues of digital information utilization in wood supply chain

Results

➢ **What is digital information**[1],[2],[3],[4]

Type	IC tags (RFID)	Bar codes	Two-dimensional codes
Maximum information volume	Several kilobytes	Dozens of bytes	Several kilobytes
Update / add information	Possible	Impossible	Impossible
Communication when shielding	Possible	Impossible	Impossible
Simultaneous reading	Easily possible	Possible depending on conditions	Possible depending on conditions
Counterfeit	Difficult	Easy	Easy
Size	Large	Small	Extremely small
Positioning for scanning	Unnecessary	Necessary	Necessary
Toughness	High	Low	Low
Price	High	Low	Low
Reading speed	Fast	Slow	Slow
Range	< 10m	< 1m	< 1m

RFID:**R**adio **F**requency **ID**entification

画像：Wikipedia、TOPPAN FORMSホームページ

➢ **Purpose of introducing digital information**

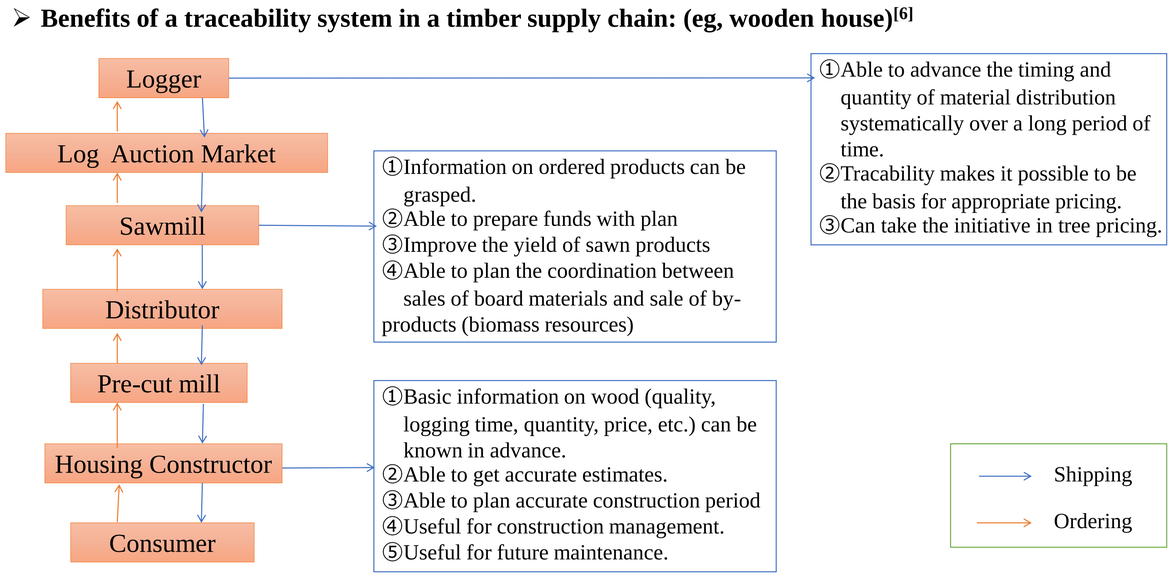
① Reduces Bullwhip Effect
② Improve traceability
③ Improve supply chain efficiency etc.

➢ **Bullwhip effect causes well-known problems:**[5]

- the accumulation of excess inventories at certain times, followed by serious inventory shortages;
- poor customer service at other times;
- excess or insufficient capacity, depending on the case;
- unstable production and inefficient production planning and scheduling, leading to higher costs resulting from the corrective actions that have to be taken

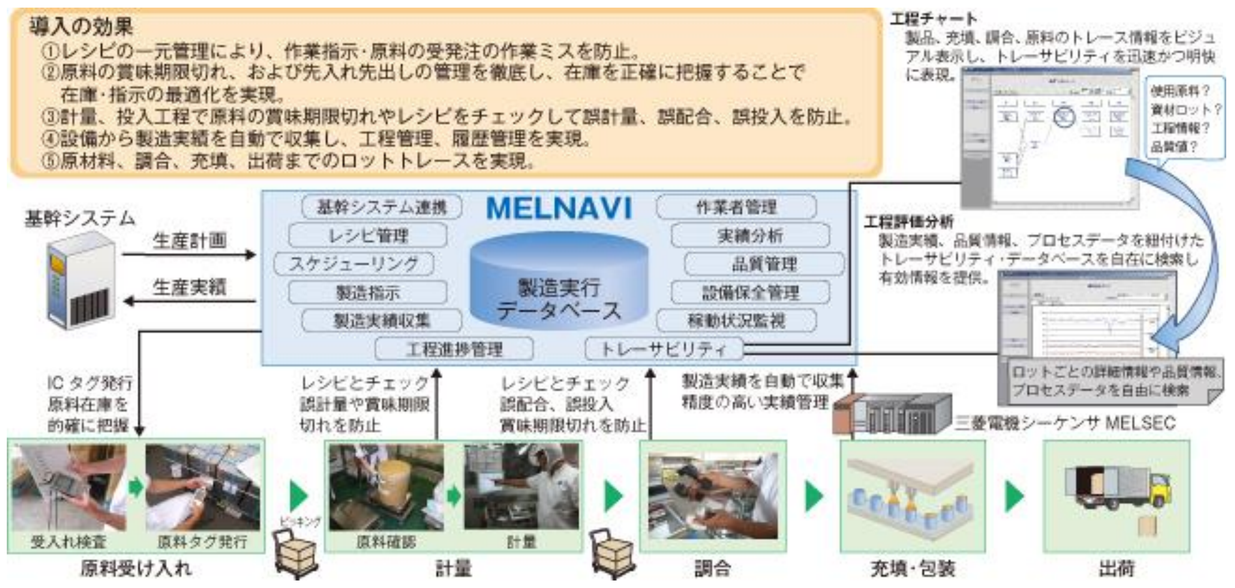
According to a study by Machuca et al. In Spain, the introduction of digital information significantly reduced the average cost of net inventory at each node in the supply chain. The average value of the average order placed, which is more important in the supply chain, has also dropped slightly.
These results show that **the application of digital information leads to a reduction in the bullwhip effect.**
However, the supply chain used in this experiment was a fictitious one built by a computer simulator, and may not match the results in the actual supply chain.

➢ **Benefits of a traceability system in a timber supply chain: (eg, wooden house)**[6]



Results

➢ **Effects of introducing digital information**



資料提供：凸版印刷

➢ **Digital Information Usage in Production Sites**[7]

In previous studies, electronic tags (IC tags) were attached at the stage of standing trees, information such as ID was written and managed on the tags, and when logs were manufactured, electronic tags were attached to each log. Or a two-dimensional barcode (QR code) was attached and another ID was given. At the time of processing, such as in sawmills and pre-cut mills, they were removed as needed, replaced, and pasted with information such as QR codes when passing on to the final consumer.

From the viewpoint of reducing the amount of work and ensuring reliability, a data carrier that can be used consistently from upstream to downstream of the distribution is desired, and it has been clarified that a label-like electronic tag is useful.

By adopting a method of starting material tracking from a log market or an intermediate land, or by managing lots, it is possible to minimize the work of attaching tags, etc., and load necessary data on the material.

Wood products also include pulp wood and wood used as fuel for biomass energy. For these wood products, the only information required for shipment is weight. These woods do not require a data carrier for advanced management. The wood should be sorted before installation to avoid wasting data carriers and work. In order to select the wood to be tracked, it is necessary to consider the time of installing the data carrier according to the distribution form, which varies depending on the location, quality, etc. of the wood used.

資料提供：協和木材, https://www.ishihara-group.co.jp/bu_ishimamki.html

Discussion and Future Research Agenda

By making the IC tag a small size made of paper without thickness, the data carrier does not interfere with the work in each work process except for pre-cut, and there is a risk of **mechanical damage** in the lumbering process during installation. Using an adhesive instead of a tacker would improve work efficiency in that the data carrier would not need to be replaced during the verification in Takayama City, Gifu.[8]

In the 2013 test, when only the label was used for adhesion, there was a problem in adhesion. For example, it does not adhere to the edges of wet wood or fall off during drying. Therefore, it is necessary to confirm that there is no peeling or the like during the drying process.[9]

In the traceability system of wood , it is necessary to accumulate the information required for distribution of wood. Items required in the timber distribution include those generally required in each distribution process and those that differ depending on the region and distribution form. It is necessary to define the minimum required data items so that meaningful information can be accumulated and shared as timber traceability information.[8]

When creating a database of wood information by introducing a traceability system, it is necessary to consider what kind of information is needed, such as by conducting interviews.

Therefore, the actual situation and issues of utilization in the industry related to wood processing and distribution are summarized. efforts to add product information using bar codes or QR codes are being carried out by some entities, but the content varies depending on the entity, and the necessary information is often not provided at each stage of the supply chain. IC tags are not yet widely used due to cost and other issues. In order to promote the use of digital information, it is important to show the merits quantitatively and unify the information items to be provided throughout the industry.

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