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Conversations Around New Materials not yet on the Market: Design roadmaps to predict the adoption of innovative transparent composites

Eva Vanessa Bruno,* Doriana Dal Palù, and Beatrice Lerma

Transparent wood-based composites, realised by removing lignin from wood, have emerged as an innovative material in the last 15 years (Mariani & Malucelli, 2022). While the scientific community has proved this material's potential, its acceptance by stakeholders is still under analysis. Typically, adopting new materials takes about 20 years (Karana et al., 2015), making it crucial to establish a pathway for proper education and encouragement in its utilisation during this remaining period. The research conducted as part of the three-year Horizon Europe project AI-TranspWood aims to predict and facilitate the adoption of transparent wood-based composites in the coming years.

The workshop aims to facilitate university-stakeholder dialogue: using material-driven design as a methodological base (Karana et al., 2015), participants work on two different time planes, the present and the future. Indeed, they empirically analyse the state of the art of various woods and transparent materials (from different material families, from glass to plastics) through sensory testing (colour-finishing-material) and then, through speculative design actions, design new ways of adopting transparent wood-based composite through creative, and strategic techniques.

Sensory analysis involves examining material samples through handling, observation, and listening, following a specific procedure to ensure consistent results. Speculative design action involves using the worldbuilding method (Zaidi, 2019) or describing a world where transparent wood is the most widely

used material. Finally, it involves creating design roadmaps to define strategies for the adoption of transparent wood-based composites for two different time frames: the near future and the distant future.

The expected results are categorised into two levels: at the knowledge level, there are guidelines concerning adopting new innovative materials, with a specific focus on transparent wood-based composites but designed to be applicable to other material types; at the operational level, a practice framework for implementing the guidelines in the field of digital communication.

KEYWORDS: transparent wood, material adoption, speculative design, material properties, design roadmapping

RSD TOPIC(S): Mapping & Modelling, Methods & Methodology, Society & Culture

*As a researcher in design, I plan to test the described analysis and envisioning tools, collect participant feedback and then use them with the project's advisory board, which includes large industries, SMEs, research centres, and industrial associations.

Workshop description

At the start of the activity, the participants are split into working groups of four or five people and, at the beginning of activities, given samples of materials from different material families such as glasses, plastics, etc. (for transparent materials) and/or different types of wood. These materials are samples for commercial and research use sourced from the archives of MATto - the material library of the Politecnico di Torino[1]. The first activity involves an expressive-sensory description of the samples. The support tool used is a sensory vocabulary (Allione et al., 2012) that helps participants choose the most correct and specific adjectives for describing the material in order to provide a qualitative characterisation. Participants can enrich the vocabulary with new words to better describe the materials. In the first activity, participants qualitatively describe materials' tactile, auditory, and olfactory sensory characteristics in a "standardised" manner. They use sticky notes to write adjectives and then paste them on a board. After

[1] http://www.matto.design/en/home/

a certain amount of time, the facilitator shares the adjectives to create collective descriptions, which serve as the starting point for the second activity.

Following the completion of the analysis of the current state of the art of woods and transparent materials, the subsequent activities focus on the future, and its variations according to Henchey's theory on *futures cone* (Henchey, 1978), i.e. possible, plausible, projected, probable preferable, and the potential connections between the present and the future. The second activity, using pairs of working groups, employs a technique often used in creative writing to imagine *possible futures*: worldbuilding (Zaidi, 2019). Each pair creates a description of an imaginary planet, including its inhabitants, their habits, lifestyle, predominant values, exchange and trade, and the geography of the land. The catch is that the only known material on this planet is transparent wood-based composites. Indeed, after examining the "classic" transparent materials and/or woods, it is valuable to understand the participants' perception of transparent wood. This exercise is designed to help participants tap into deeper levels of imagination and generate innovative and creative concepts by exploring remote associations and latent elements that may not be immediately recognisable.

The final activity involves the creation of a preferable future (Henchey, 1978) using design roadmapping as a tool (Simonse, 2017). A roadmap is a flexible tool that requires a clear vision and should be divided into three-time horizons. In this workshop, the first time horizon, known as Horizon 1, is the present, and it mainly focuses on describing the state of the art. The second time horizon, or Horizon 2, is an intermediate horizon that presents more distant solutions and helps to develop opportunities (five years from now). Finally, the third time horizon is the most visionary, introducing more significant changes (ten years from now). The roadmap begins with a vision that serves as a guide, setting the tone for the strategic decisions that will be made. The vision, or the statement, is as follows: transparent wood is adopted by stakeholders, such as large industries, SMEs, research centres, and industrial associations, as a sustainable, functional material.

The strategy on the two horizons follows different levels. Generally, the number and type of levels in the roadmap depend on the project, but it is essential to include values, technologies, and products/services. In this workshop, three levels have been identified for this roadmap: stakeholder values, communication technology, and communication medium.

Topics covered

The workshop is designed to provide an interdisciplinary learning experience by incorporating interdisciplinary methods and tools, such as participatory design, creative writing, and planning techniques. It is supported by the material-driven design method (Karana et al., 2015), which is focused on creating material experiences and *Future Studies* (Poli, 2019) which provide insight into future trends and possibilities.

Objectives

The workshop has two objectives: on the one hand, to collect useful data provided by the participants, who, as designers and researchers in design, provide new strategies for the adoption of new materials, particularly transparent wood-based composites.

The workshop introduces participants to participatory and speculative design activities. These activities help them adopt a future-focused lens, enabling them to assume a demiurgic role and create and shape possible future scenarios. By engaging in these design practices, participants can explore potential futures and identify opportunities to facilitate the adoption of transparent wood-based composites as a sustainable, functional material.

There are two expected outcomes: The first is at the knowledge level, which includes guidelines to facilitate the adoption of new innovative materials. The second is at the operational level, which involves a multi-layer framework (the design roadmap) for implementing the guidelines.

Agenda

Part 1—Welcome

Welcome. 15-minute icebreaker activity. Audience and workshop introductions.

Part 2—Expressive-sensory description

This phase is set in groups and lasts approximately 20 minutes. Each group is provided with one or more different material samples under investigation. Participants are given a list of adjectives derived from sensory vocabulary. They can select the adjectives that best describe the sample based on a visual, tactile, and auditory perspective. The chosen adjectives are written on sticky notes and then attached to a poster board.

Part 3—Worldbuilding

Subsequently, participants describe the characteristics of an imaginary world where transparent wood-based composites are the only material available. This phase is set in groups and lasts approximately 20 minutes. This exercise helps participants develop their creative thinking skills, as they are required to imagine a world with unique physical properties and limitations. By envisioning such a world, individuals explore the potential applications of transparent wood as a sustainable, functional material and consider the potential challenges and opportunities that arise from such a scenario. A3 sheets containing graphics and directions are provided for this activity.

Part 4—Design roadmap

During the last part of the workshop, participants focus on planning and identifying guidelines and strategies that can help stakeholders adopt new materials through design roadmapping. Participants work on the near future (Horizon 2) and the distant future (Horizon 3). Horizon 1, the present, is provided to participants as the state of the art. This session is held for about 30 minutes and allows for open debate and discussion to gain more insights. On a panel in A1, the basis of the roadmap is drawn; participants complete it with sticky notes.

For each group session, participants share and present the results to the other participants (5 minutes per session).

About 16 participants are assumed to participate, to form 4 groups. The expected duration of the workshop is about one and a half hours, but it could be extended to two hours to facilitate discussion.

Facilitator/organiser profile

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Product designer, she is a PhD candidate in Management, Production and Design at the Department of Architecture and Design (DAD) of the Politecnico di Torino and Research Assistant at the MATto material library of the Politecnico di Torino.

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