



# DWoC 2013-2018

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# The DWoC in a nutshell

Design Driven Value Chains in the World of Cellulose (DWoC) was a multi-disciplinary research project funded by **Tekes**, the Finnish Funding Agency for Innovation (now **Business Finland**), which focused on finding new, innovative applications for cellulosic materials. The DWoC project combined design thinking and design-driven prototyping with strong competence in technology development. The goal has been to make Finland a source of value-added cellulosic products and business concepts.

The project partners were: **VTT** Technical Research Centre of Finland, **Aalto University**, **Tampere University of Technology** and the **University of Vaasa**.

The project consisted of two phases: Phase I, 2013-2015; and Phase II, 2015-2018. The report of the first phase can be found at: <http://www.vtt.fi/Documents/DWoC1.pdf>

The total budget of the project was 11 M€.

About 110 people participated the research work over the years, and 54 manmonths of international researcher exchange was also realized. The research work in the project produced 40 scientific publications, 12 theses, 19 notifications of invention, 10 patent applications, and over 50 technology, product or business concepts. Three of the technologies were upscaled, and one start-up began operations already in January 2015.

Six seminars and 11 exhibitions were held; the exhibitions were attended by an overwhelming 70 000 people.

More information:

[www.CelluloseFromFinland.fi](http://www.CelluloseFromFinland.fi)



# The vision

Refresh the image of  
cellulose to a trendy raw  
material

Support design entrepreneurs to  
use new biomaterials in new  
applications

Promote Finnish cellulose  
knowledge internationally

A dynamic ecosystem of businesses  
capitalizing on  
numerous applications of cellulose

Develop technologies  
and machinery for  
production of new  
material structures  
from fibrous  
cellulosic materials

Develop new cellulosic product  
concepts by combining design-  
driven prototyping and  
hypothesis-driven technology  
development

Prototype product concepts  
for architecture and  
building, personal assistive  
products and textile  
materials.

# The journey



## The transformation requires

- 1 Amalgamation of designers, material scientists, engineers and business professionals. Creation of a common language and understanding.
- 2 Engaging the designer community. Showing the potential of cellulose materials to support design entrepreneurs as promoters of new materials.
- 3 Coherent development of technology into business concepts. Continuous dialogue within the business ecosystem. Advocacy of start-ups.

## In figures

| Science                                                                                                                      | Business                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|  Scientific presentations 45                |  Technology, product, business concepts > 50              |
|  Scientific publications 37                 |  Notifications of inventions 19<br>Patent applications 12 |
|  Theses 10                                  |  Technology scale-up 3                                    |
|  International exchange<br>52 person months |  Start-ups 2                                              |
| Outreach                                                                                                                     | Management and financing                                                                                                                     |
|  Media hits 19                            |  Duration 4.75 y                                        |
|  Exhibitions 10                           |  Funding 11.3 M€                                        |
|  Public seminars 6                        |  Resources 85 persons                                   |
|  Audience > 70 000                        |  Industrial advisors 15                                 |

## Some examples from final demos



*Figure. Concept bike with load-bearing nanocellulose tubes (white structures). Bike was produced by Tiina Härkäsalmi and Kim Antin /Aalto, and Tuomas Pärnänen TUT. Testing of the mechanical strength of the CNF tubes has been done by Mauno Kemppainen and Steve Spoljaric (Aalto). Photo by Eeva Suorlahti.*

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*Figure. Two layered demo panels (40cm x 40 cm) for décor and sound absorbance purposes by Jani Lehmonen, VTT (material and process) and by Heidi Turunen, Aalto university (design). Base material is pure pulp. The panels are produced by foam forming and pressed to desired density profile. In the bottom panel the pulp was dyed before foam forming. The top panel (white) is water cut to beautiful shapes. Photo by Eeva Suorlahti.*



## Some examples from final demos



*Figure. Shoe demonstration. Upper material is strong, cellulose based nonwoven textile. The brown texture is made by 3D printing cellulosic paste on cellulose non-woven. Saara Kinnunen HAMK, Jukka Ketoja, Atsushi Tanaka and Kirsi Kataja, VTT. Photo by Saara Kinnunen.*

