datemats

Knowledge & Technology Transfer of Emerging Materials & Technologies through a Design-Driven Approach

3.4 EM&T transfer toolkits version 1

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EXECUTIVE SUMMARY

This document reports the creation of the initial version of the EM&T transfer toolkits. P2 – Materially, in constant collaboration with P4 – FAD, identified several physical samples of emerging materials, suitable to represent the four EM&Ts areas addressed in the project. The collection comprises at least five material samples for each of the four EM&Ts areas, thus presenting a total of 20 material samples.

The aim of these material kits is to be used as a tool to facilitate the understanding and application potentials of emerging materials and technologies.
After testing this initial version of the material toolkits in the knowledge transfer activities, targeted both to the students participating in the project mobility [T5.3] and to the companies involved in the knowledge transfer labs [T4.3], an improved version will be created at the end of the project in WP5 [T5.4].

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1 INTRODUCTION

Aim of the EM&Ts transfer toolkit is to provide a tool to facilitate the understanding and application potentials of emerging materials and technologies.

The draft kits reported in this deliverable are going to be proposed to students and companies in dedicated knowledge transfer activities [T4.3 & T5.3], as a flexible tool to experience, understand and interpret each of the selected materials, by providing data and tangible examples of the EM&Ts to transfer.

The final version of the Datemats EM&Ts toolkits will be defined according to different criteria resulting from: the literature review [T 2.2], the surveys among companies [T 2.3], knowledge sharing among HEIs [T 2.5], the pre-mobility contents [T 3.2] and the knowledge transfer labs with companies [T 4.3]. In WP5 [T5.3] the draft version of the toolkits will be analysed after testing in the above-mentioned activities, and then optimised and finalised into a final version [T 5.4].

2 BRIEFING

To start task 3.5 coordinated between partners and set the expectation, a general brief (see Annex 01) was defined indicating goal and contents of the toolkits, constraints and requests regarding the shape, and suggestions for possible solutions. In addition, as indicated in the project description, the EM&Ts transfer toolkits are part of the unique design teaching method (DTM) developed within WP3 and are based on the insights gained by the partners through discussion and creation of the e-Book [D2.4].

3 MATERIALS

The EM&Ts toolkits are basically a collection of tangible samples showcasing emerging materials and technologies. A toolkit for each of the four EM&Ts area addressed in the Datemats project is created, containing at least five samples in each kit. This means that a total of 20 physical material samples are made available facilitating the unique design teaching method developed in the project.

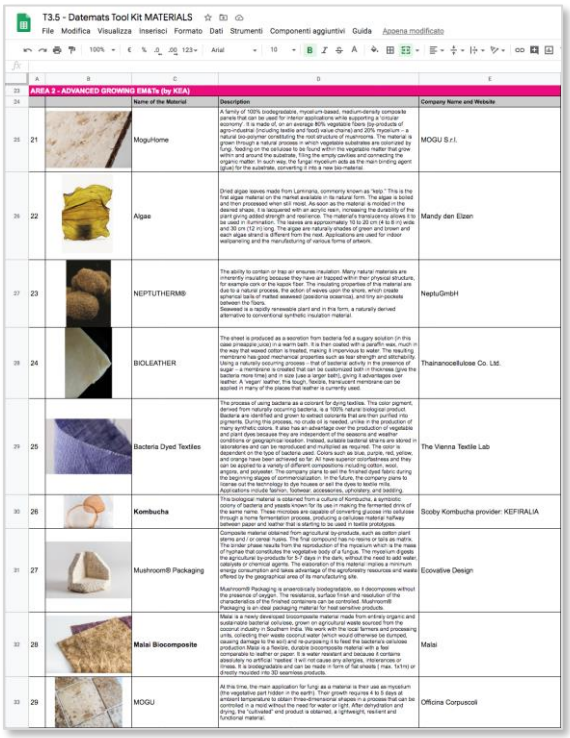
3.1 MATERIAL SCOUTING

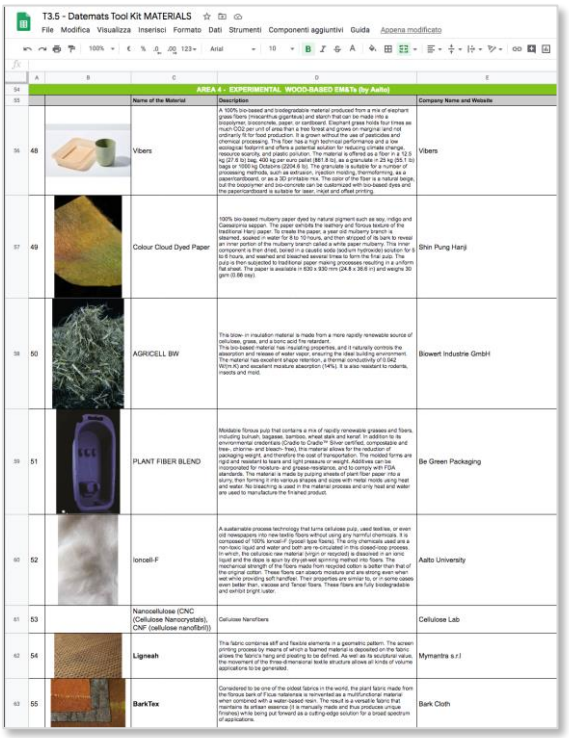
Task leader Materially (P2) in collaboration with FAD (P4) executed an in-depth scouting activity exploiting their in-house material database and established contacts with material suppliers, identifying more than 60 possible materials suitable for the Datemats EM&Ts toolkit.

In order to facilitate collaboration and exchange of information between the partners involved in task 3.5, a shared spreadsheet has been set up, categorising the scouted materials based on their characteristics responding to one of the four Datemats EM&Ts areas:

1) Advanced growing EM&Ts
2) Experimental wood-based EM&Ts
3) Interactive Connected Smart (ICS): wearable EM&Ts
4) Nanomaterial EM&Ts

The data collected in the spreadsheet include basic information such as product picture, commercial name, short material description, manufacturer, online references (supplier website), etc.





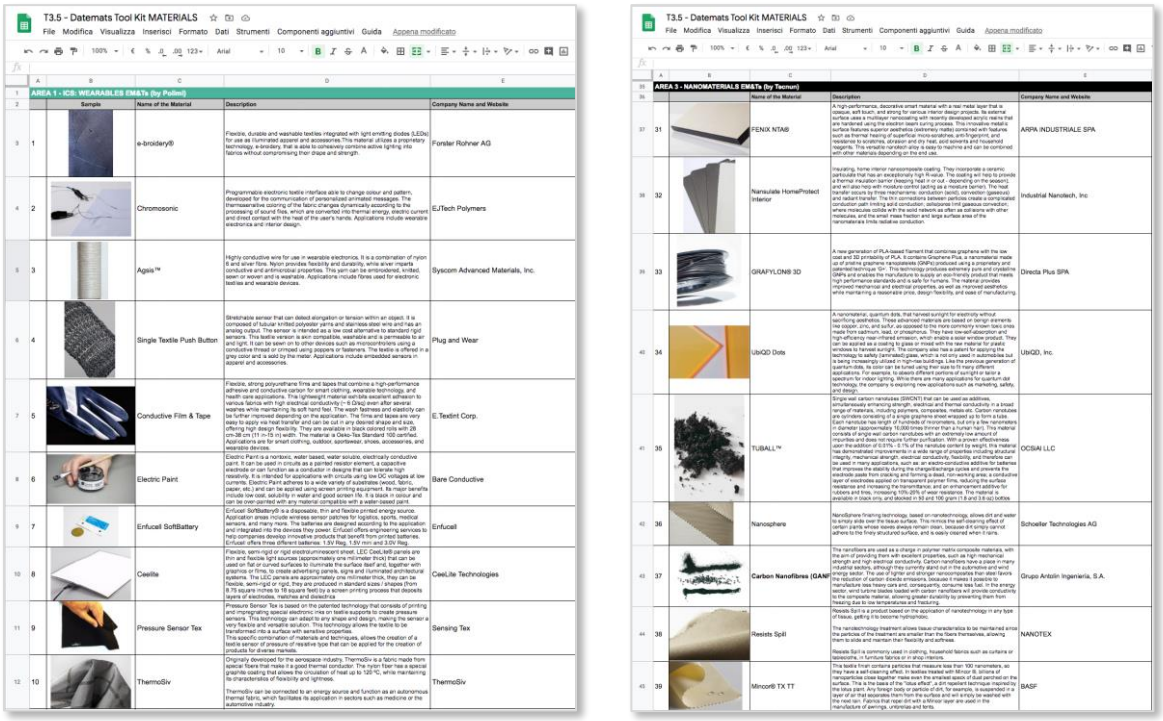


Fig. 1: Over 60 materials scouted for the 4 EM&Ts areas, complete list available as Annex 02.

3.2 MATERIAL SELECTION

Being executing in the first semester of 2019, the material selection was influenced by the current COVID-19 restrictions, which led the task leader to privilege material samples already available at FAD's and Materially's premises. The materials identified and pre-selected by FAD and Materially were presented to the experts of the four HEIs involved in the project – KEA (P7) for Advanced Growing EM&Ts, AALTO (P9) for Experimental wood-based EM&Ts, POLIMI (P1) for ICS Wearable EM&Ts and TECNUN (P5) for Nanomaterial EM&Ts - which indicated their preferences and confirmed the final selection of at least five materials for each EM&Ts area.

The previously collected data of the selected materials was subsequently integrated with additional description in order to provide information according to the DTM guidelines that identified the following three aspects as crucial to design with EM&Ts:

- *Understanding* - describing the EM&T with physical and senso-aesthetic parameters
- *Shaping* - describing the EM&T specific transformation processes and techniques
- *Applying* - describing the EM&T application potentials with a real case example

For each of these aspects, online freely available digital content related to the specific material was scouted, able to facilitate the knowledge transfer.

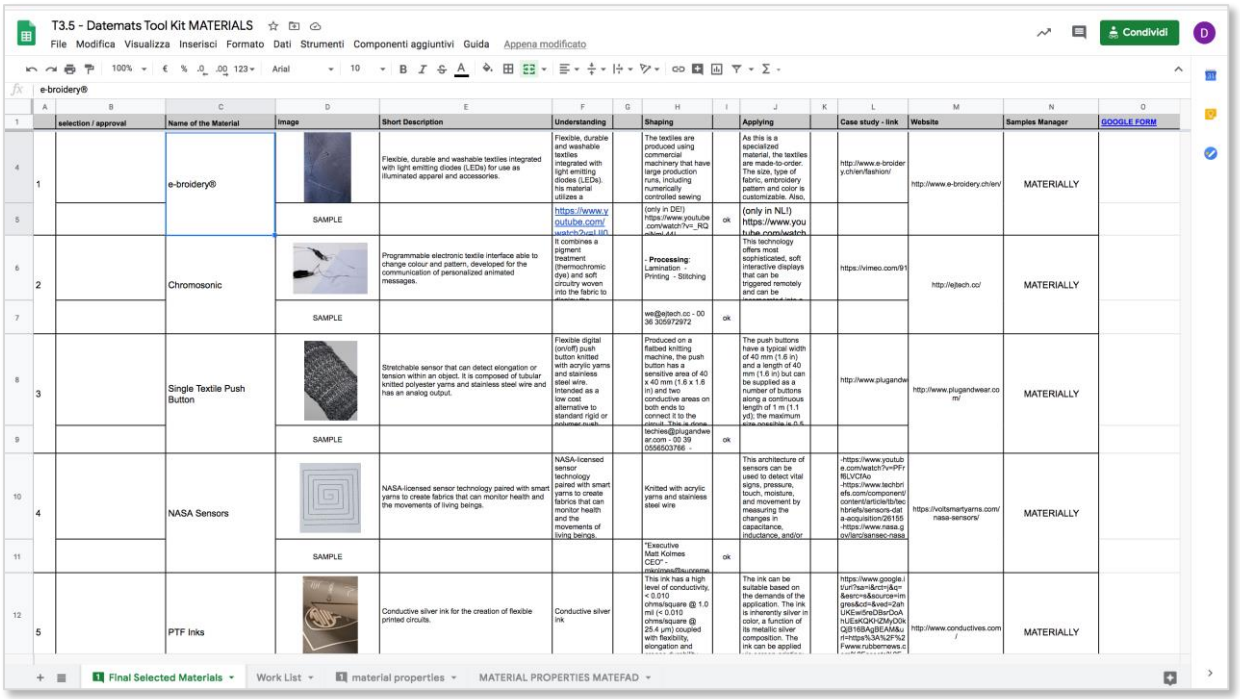


Fig. 2: Extract of list of selected EM&T materials (Annex 03).

4 DATASHEET

The collected information about each EM&T material is included in the toolkit on three separated datasheets, addressing the three aspects of the DTM guidelines - Understanding, Shaping, Applying - and accompanying the showcased physical sample. Several tools were created by P2 and P4 to gather the needed data about the materials. These tools are shared with the consortium in order to be exploited and adapted for the creation of the final toolkit foreseen in task 5.3 and led by P4 – FAD.

4.1 ONLINE FORM

To facilitate filling in the datasheet for all the selected materials, an online form was created; a simple tool to uniform data collection and provide a standardised format useful for future additions during Datemats project execution. In addition, using Google Form enables to collect the answers in one excel file, thus creating a dedicate Datemats EM&Ts materials database.

The online form (Annex 04), divided into five sections, collects the following data:

1. EM&Ts AREA

2. UNDERSTANDING

2.1 Material name (include ™ or ® if applicable)
2.2 Website (if available in EN)
2.3 Material producer
2.4 Base material - the material belongs to the following material family:
2.5 Main features - describe the material in one sentence

2.6 Composition - components of the material
2.7 Technology Readiness Level (TRL)
2.8 Sensorial qualities
2.9 Performance properties
2.10 Sustainability properties
2.11 Smart properties
2.12 Variations - are there variations in colour, finishing, texture, pattern, etc. available?
2.13 Testing - following testing results and standards are available for this material
2.14 The material has the following certifications

3. SHAPING
3.1 Manufacturing process - how is the material made?
3.2 Supply - the material is provided as
3.3 Shape - the material is provided as
3.4 Transformation processes - how can the material be shaped?
3.5 Options - are there possibilities to customize the material?
3.6 The material is compatible with
3.7 The material system can be enhanced via

4. APPLYING
4.1 Current application field
4.2 Potential application fields
4.3 Case study - commercial product applying the material (share a link)
4.4 Concept applying the material (share a link)
4.5 The material is comparable to
4.6 The material is inspired by
4.7 The material is better than similar commercially available materials because

5. CONTACT DETAILS

To extract the gathered information easily from the online form (database) into the dedicated material datasheet, the architecture of the datasheet was defined via an excel file (see Annex 05).

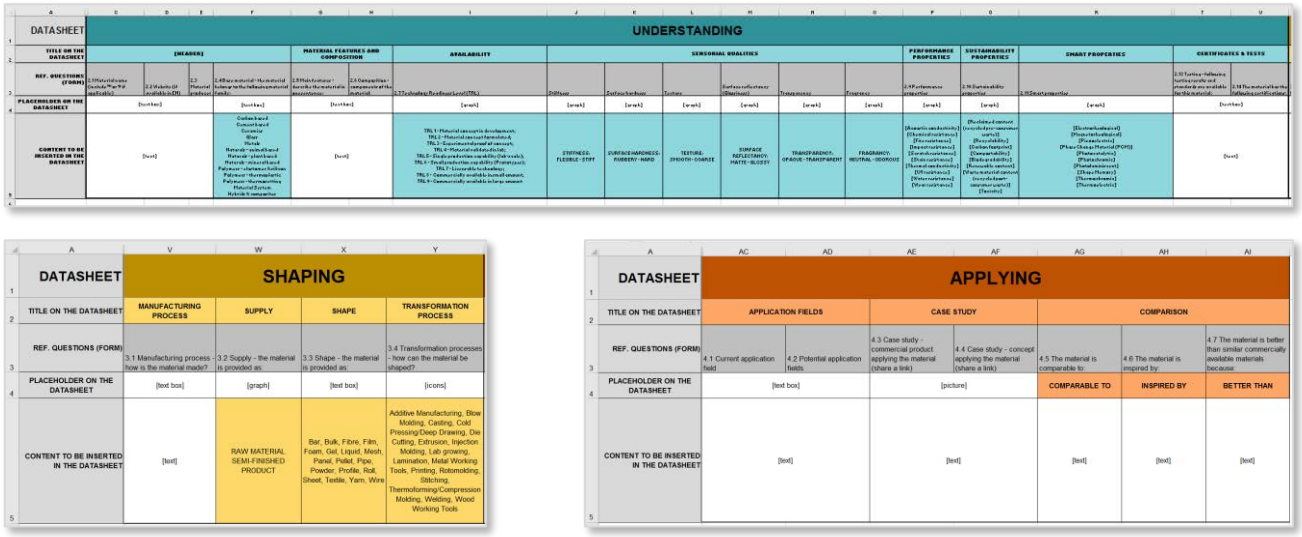


Fig. 3: Datasheet architecture linking database contents to datasheet layout

4.2 GRAPHIC LAYOUT

The graphic layout of the datasheets is designed based on the project's visual identity and includes several infographics to convey the data in an effective and immediate manner, enhancing the user experience while exploring the materials. Format of the datasheet is conformed to international standards (A5 DIN) in order to foster large scale fruition and dissemination. The following figures showcase the three datasheets (front and back page) of the product "Fenix NTM", selected for the Nanomaterial EM&Ts area (Annex 06).

Fig. 4: Datasheet UNDERSTANDING front

Fig. 5: Datasheet UNDERSTANDING back

Fig. 6: Datasheet SHAPING front

Fig. 7: Datasheet SHAPING back

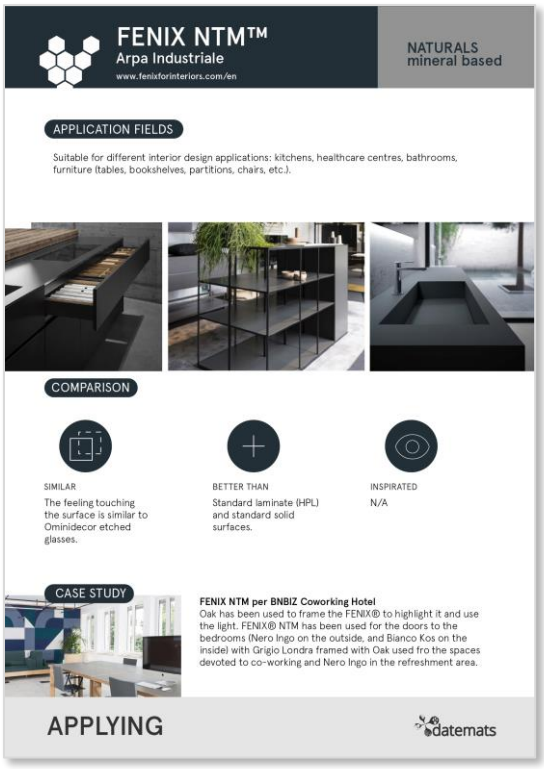


Fig. 8: Datasheet APPLYING front

Fig. 9: Datasheet APPLYING back

5 EM&TS TRANSFER TOOLKIT

Materially, in collaboration with FAD, has drafted a transfer kit presenting material samples of each EM&Ts area, as a tool to facilitate the knowledge transfer activities with companies and students. Goal of the task 3.5 was to create at least 4 toolkits, one for each EM&Ts area, containing at least 5 EM&Ts samples. The task leader executed a series of activities – including desk research and benchmark on similar tools - to design the toolkit in an appropriate manner, involving whenever possible all consortium partners. After presenting to the consortium three solutions for voting, a draft version was prototyped and made available for the upcoming knowledge transfer activities with students and companies.

5.1 CONCEPTS

Based on the general brief, the task leader ideated two concepts: the "book" and the "box".

Fig. 10: Inspirational images for concept "book"

Fig. 11: Inspirational images for concept "box"

After the presentation to the partners, a third version – the "folder" – was developed considering the inputs and suggestions collected from the consortium partners. Finally,

the partners took a vote on three options before putting into production the final version. Concept descriptions presented to the partners are available in Annex 07.

5.1.1 CONCEPT A

Concept A, identified as the "book", is focusing on an analytical approach, focusing on material observation, presenting one single material packed in its dedicated container, providing detailed information via the three datasheets. The physical sample cannot be manipulated (touched) but only observed, datasheets are not detachable. In this way, integrity of the samples and good conservation of the datasheet is guaranteed. Several "books" (at least 5) complete one EM&Ts area compendium.

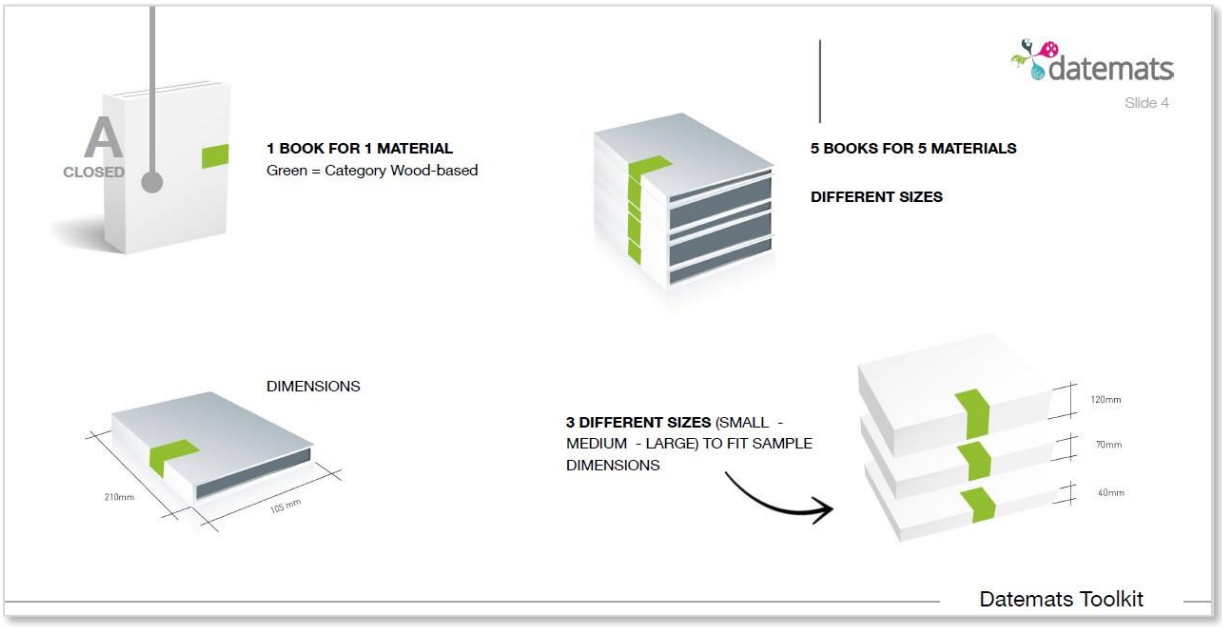


Fig. 12: Concept A - the "book"

5.1.2 CONCEPT B

In alternative to the previous one, concept B, named the "box", gives priority to interaction. A container is proposed, collecting all samples related to the specific EM&Ts area. Each material sample is equipped with its datasheets. This solution favours an explorative approach, facilitating material manipulation and experimentation.

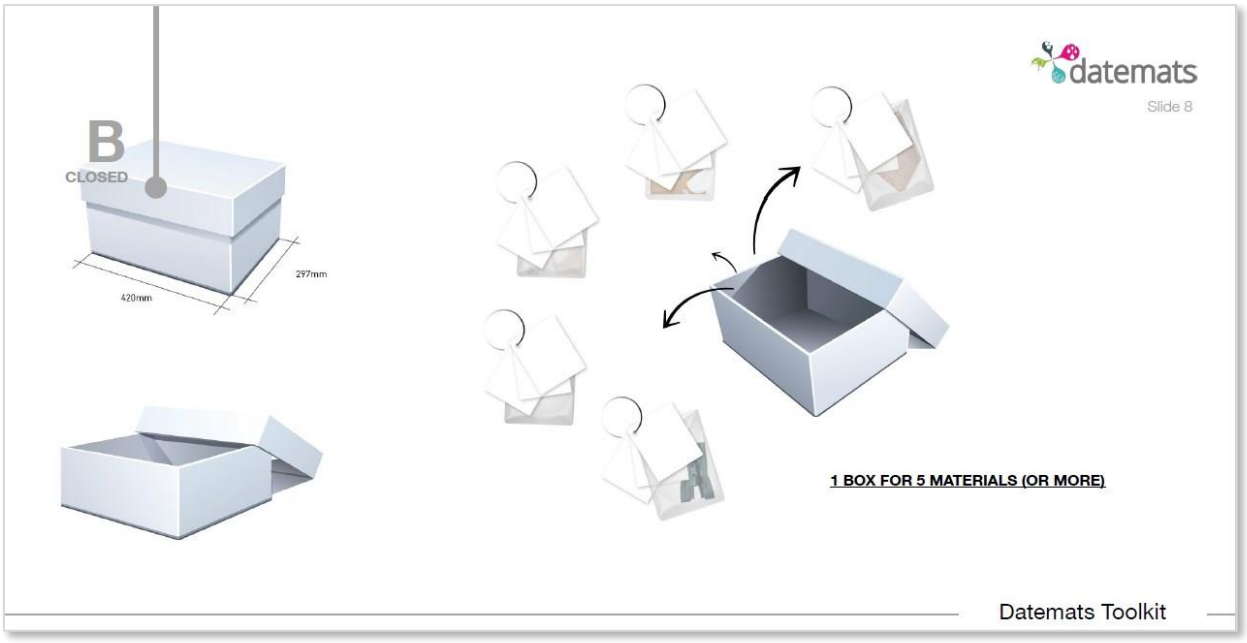


Fig. 13: Concept B - the "box"

5.1.3 CONCEPT C - FINAL PROPOSAL

After the presentation during the 3rd consortium meeting (M16, executed online due to COVID-19) of the two initial concepts, the feedback and suggestions collected were integrated into a third proposal, optimising the advantages of the two previous ones in this final proposal. The Concept C, called the "folder", provides a single container for each material, but the sample and datasheets are removable offering the possibility to organise the knowledge transfer activities in an explorative manner. This guided interaction enhances material exploration, where manipulating the samples is appropriate, while assuring integrity and good conservation of the samples.

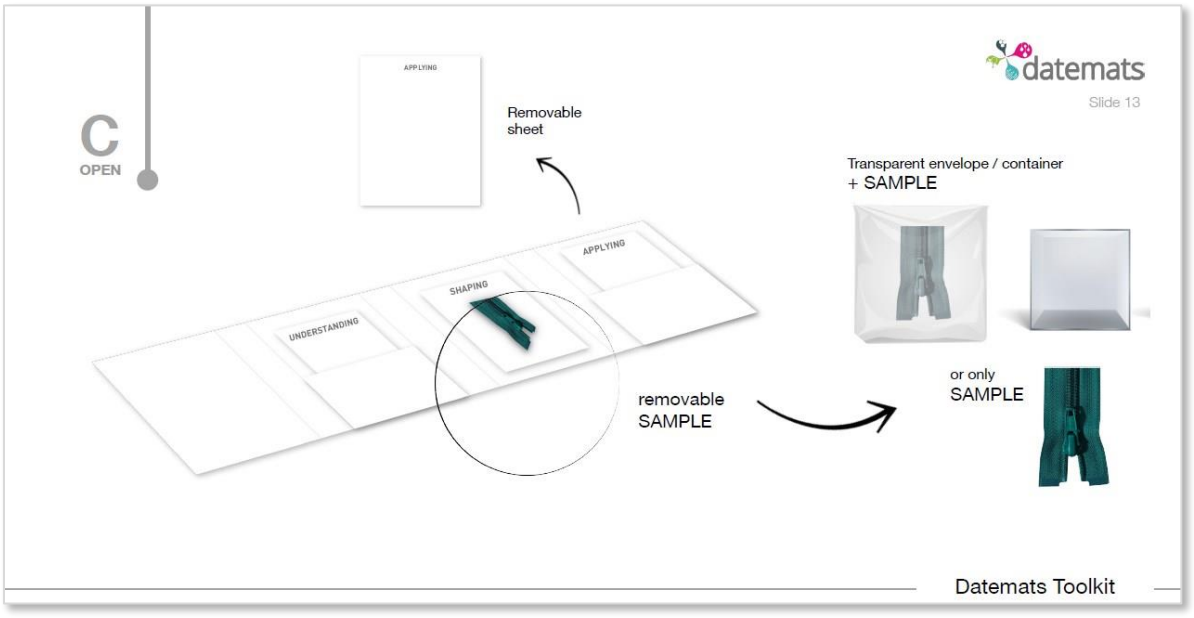


Fig. 14: Concept C - the "folder"

5.1.4 VOTING

Despite optimising the initial proposals into a third one, the task leader decided to put to vote all three concepts fostering the perceived interest and the excellent spirit of collaboration of the project consortium. To facilitate voting, an explanatory video and an online form were provided.

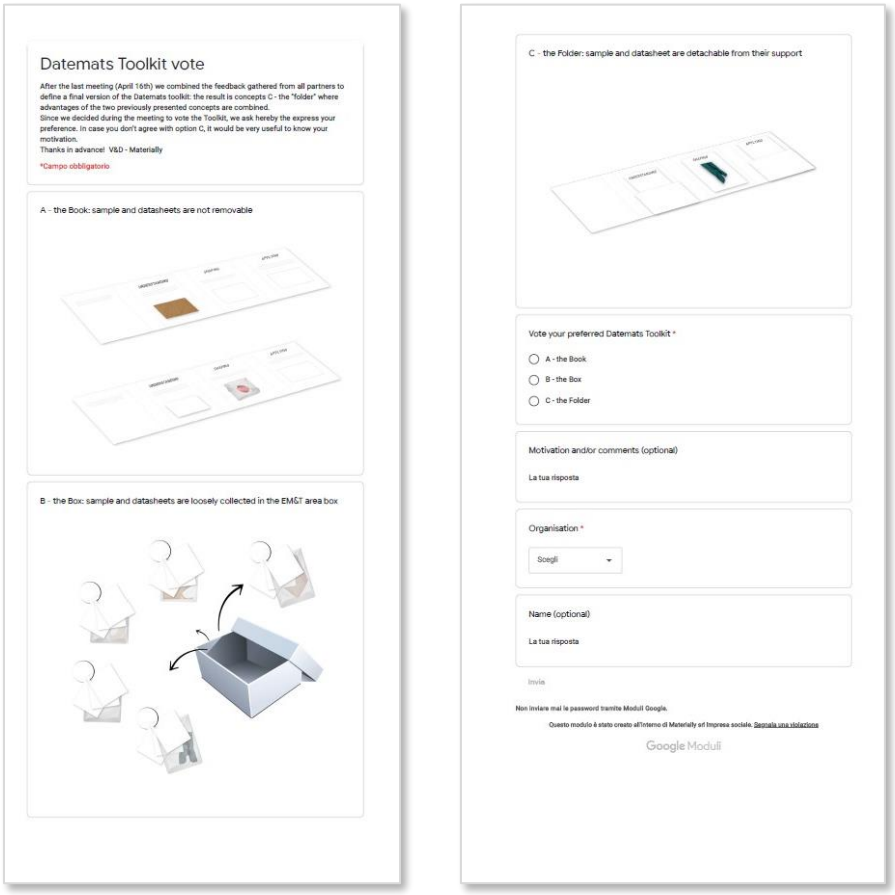


Fig. 15: Online form to vote the 3 EM&Ts transfer toolkit concepts (https://forms.gle/b1PWVJpNb6gf85Uw5)

Concept C gained 8 votes out of 10 (concept A: 1; concept B: 1) being chosen by the large majority of the consortium partners. Voting questionnaire available as Annex 08, results available as Annex 09.

5.2 PRODUCTION

Before contacting different manufacturers for producing the toolkit, Materially (P2), again in collaboration with FAD (P4), scouted different materials suitable for both, the draft and the final version of the Datemats toolkit. Finding a converter using these identified materials available to provide a small production - only 20 containers are needed for this draft version - was not feasible, in particular due to the COVID-19 pandemic that caused most of the local, national and European manufacturers to suspend their activities.

5.2.1 MOCK-UP

Eventually, the task leader was able to identify a local typography able to produce the 20 containers using laminated cardboard and foam board to compose the toolkit, applying die cutting and digital printing to trim and customise each EM&T material's container. A mock-up was created in order to verify dimensions, functionality and define the graphic layout.

Fig. 16: Toolkit mock-up front

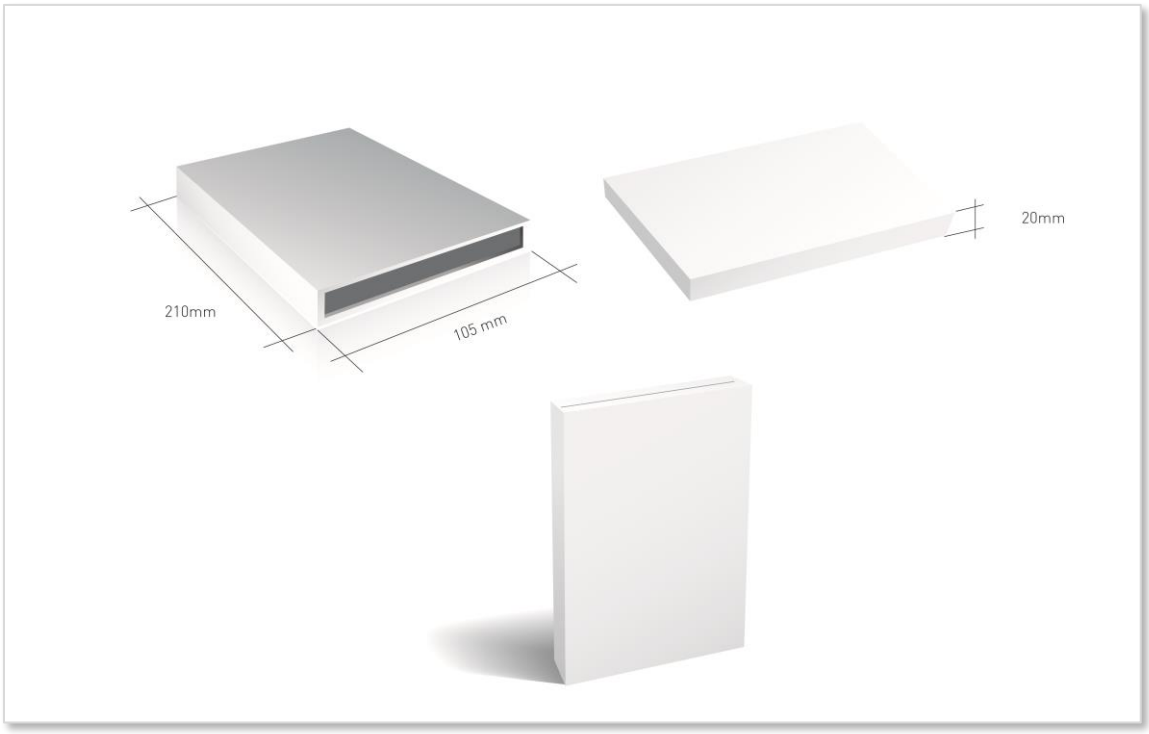
Fig. 17: Toolkit mock-up inside

Fig. 18: Toolkit mock-up inside view with sample placeholder

Fig. 19: Toolkit mock-up back

5.2.2 DIMENSIONS

Task leader decided to optimise the dimensions of the single material container to be complying with international standard format DIN A5, in this way the toolkits are handy and easy adjustable for the final version.



5.2.3 GRAPHIC LAYOUT

Again, the material sample container's graphic layout was created based on the project's visual identity. References include general information about the project's goals, focus points - the four EM&Ts areas - involved partners and project funding references.

Fig. 20: Toolkit graphic layout, outside - available as Annex 10.

Fig. 21: Toolkit graphic layout, inside - available as Annex 10.

Special attention was adopted to create coherence with the visual impact of the datasheets.

Fig. 22: Datasheets to be included in the Toolkit

5.2.4 DIE CUT TEMPLATE

The Toolkit producer provided the die cut template in order to adjust the graphics and verify dimensions.

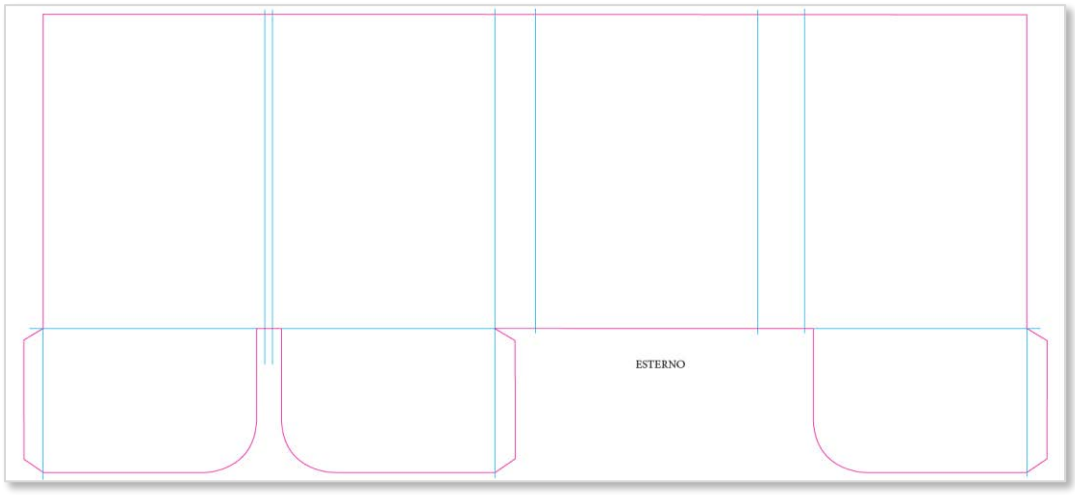


Fig. 23: Die cut template, outside – available as Annex 11.

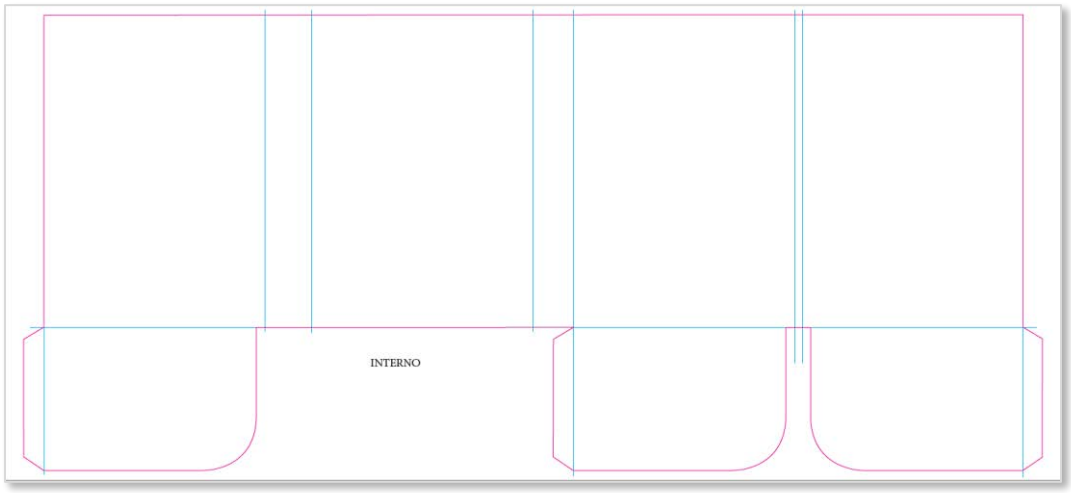


Fig. 24: Die cut template, inside – available as Annex 11.

6 CONCLUSIONS

The task leader P2 (Materially) created this first version of the Datemats EM&Ts transfer Toolkit in tight collaborations with P4 (FAD), both hosting a material library, based on their experience of managing and using physical samples for knowledge transfer and consulting activities.

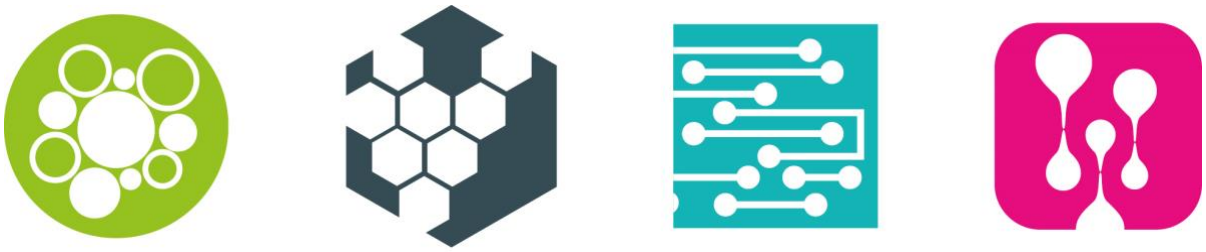
The consortium partners, especially the four involved HEIs, are the main users of the Toolkit in support of the ad hoc developed Design Teaching Method (DTM). Valuable feedback to improve the "EM&Ts transfer toolkits version 1" will be gathered during the upcoming knowledge transfer activities where the Datemats DTM and its tools will be validated. Subsequently, the following aspects will be assessed and, if needed, optimised in the final version:

- MATERIALS - physical samples have been selected based on the needs and suggestions provided by the responsible partners of the four EM&Ts areas and their availability; some materials might be substituted or added for the final version in order to effectively communicate the essence of the Datemats EM&Ts.

- DATASHEETS - the content of the EM&Ts material datasheets are based on the DTM guidelines describing each material from three different point of view and providing information to enhance *understanding*, *shaping* and *applying* of the materials; information provided on the datasheets might be substituted or extended in the final version in order to effectively communicate the Datemats EM&Ts properties and potentials.

- FORMAT - the proposed format aims at providing an efficient and easy manageable tool with a strong attention to material exploration while facilitating interactive and module-based knowledge transfer activities; shape, dimension and material of the container might be modified in the final version in order to adjust the flaws and integrate insights gained during the project execution.

Finally, the execution of task 3.5 provided a great opportunity to the involved partners' staff to assess and extend their expertise on emerging materials and knowledge transfer tools.



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