



Deliverable 4.2:  
Set of ICT Tool for supporting the Virtual Atelier



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#### Glossary

Abbreviation	Meaning
AB	Advisory Board
ABAROMA	Academy of Fine Arts of Rome
CA	Consortium Agreement
CM Team	Content Management Team
Co	Confidential
EC	European Commission
GA	Grant Agreement
LMA	Art Academy of Latvia
M	Month (e.g. M1, M18)

MKE	Hungarian University of Fine Arts
PMM	Project Management Manual
Pu	Public
R	Report
RP	Reporting Period
SC	Steering Committee
WP	Work Package

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## 1 - Introduction

The concept for a knowledge management system called 'Kobi, organized to become a digital space to share knowledge produced within the community of our Art Academies is described in this document. This knowledge, produced either online or in the classroom, in a synchronous or asynchronous way, will be processed and become an integrated ecosystem. The digital space was designed with the goal of effectively expanding the social, cognitive, ideational and cultural dimensions of the learners.

Section 2 summarizes some basic issues on and approaches to Art Education, while Section 3 deals with the creative dimension. Section 4 and 5 describe the fundamentals, functions and expected results of 'Kobi, the knowledge-oriented application which we have conceived and designed to fulfill Work Package 4 Activity 4.2. – *Virtual Atelier and indexing*. Section 6 is a complete User Manual of the 'Kobi App.

## 2 - Sketches on Art Education

In this section, the fundamental features of the educational activity in art courses that underpin the development of the °°Kobi project are summarized. As we shall see, given the complexity and depth of the issues addressed, °°Kobi is oriented towards the development of only some aspects of the art education process, nominally the conceptual and cultural aspects.

However, it is necessary in this first section to address the problem as far as possible in its entirety, in order to define a framework allowing to place the results of the project in an organic manner and to provide the cues for further developments.

The following contents have been reworked from (Addison et. Al. 2010), a work of great methodological relevance that fully embodies the point of view of art educators.

### 2.1 Art Education

Art Education is an expansive yet socially engaged, heuristic and embodied activity. We use the term "expansive" to describe how art and design can encompass the entire history of cultural production. It also broadens students' knowledge of the diversity of human practices, the ways environments have been, are and might be constructed, what people wish to represent about their culture, and how they might reproduce and sustain it. By socially engaged, we mean a set of activities that have implications for the way students live their lives, that the things they perform in class have real-world consequences in their immediate social situation.

The idea of a heuristic activity suggests a process of discovery, of not knowing the outcomes of an activity even though participants may have clear aims and goals; in other words, heurism is a process of finding out and coming to know, not being told. The idea of embodiment encapsulates the idea that works of art, craft and design are produced through the reciprocal action of mind and body working with matter (whether substantial, clay or ephemeral, light) so that the art object/event is an inextricable combination of idea and substance: in this sense, the artwork is analogous to the human being who is indivisibly body/mind.

Art is a discipline in which the mind and body work reciprocally, it foregrounds and, to a certain extent, valorizes practical and embodied forms of knowledge.

## 2.2 Mastering Traditions

Art and design do work within or in relation to traditions, and some of these traditions are technically demanding, requiring diligence, determination, immersion and an acculturation to and within valued conventions. It is therefore inevitable that art education underpins creative work by teaching technical procedures and by providing opportunities for students to imitate, rehearse and consolidate practice through repetition and limited variation; creative work does not mean that technical competence can be ignored or overruled in the name of 'freedom', as is sometimes supposed. In this sense, not all work in art and design is, or needs to be, creative.

However, if creativity is the goal, then you will need to encourage students to consider extending the potential uses of, for example, a material by questioning a rule or assumption, or by making connections between or across traditions and representational conventions in ways that set up new possibilities.

## 2.3 Creativity

Mihaly Csikszentmihalyi argues that it is possible to know what constitutes creativity and, in his collected testimony of the thoughts of creative individuals, constructs a theory of 'flow' based on psychological principles and an acceptance of established domains of practice. From the point of view of teaching young people, however, he too proves a sceptic: 'Children can show enormous talent, but they cannot be creative because creativity involves changing a way of doing things, or a way of thinking, and that in turn requires having mastered the old way of thinking. No matter how precocious a child is, this he or she cannot do.'<sup>1</sup>

However, there needs to be a balance: mastery of conventions provides satisfaction, confidence and self-esteem, and confidence is a prerequisite for risk-taking; conventions and rules need to be understood before they can be questioned, tested or broken, and within the western tradition, such a pushing at boundaries is a prerequisite for creativity. Alternatively, as some artists are happy to work within tradition and may well be content with the physical resources and their conventional patterns of use, it is also important to consider the way that it can be a regime of representation, rather than its material expression, that forms the locus of creative questioning.

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<sup>1</sup> Csikszentmihalyi, M. (1996), *Creativity: Flow and the psychology of discovery and invention*, New York: Harper Perennial, page 155.

## 2.4 Imagination - Learning to see

Seeing is not just a matter of transmission (like a camera), but a cognitive and creative process through which people come to learn to see – that is, to interpret sensory data in relation to their social, cultural and historical specificity. The phenomenological philosopher Merleau-Ponty puts it thus: “perception is ‘subtended by an “intentional arc” which projects round about us our past, our future, our human setting, our physical, ideological or moral situation, or rather which results in our being situated in all these respects.”<sup>2</sup>

In the context of education, the US philosopher John Dewey, prefiguring Merleau-Ponty, claimed that: “experience is a matter of the interactions of organism with its environment that is human as well as physical, that includes the material of tradition and institutions, as well as local surroundings”. Education should therefore engage fully, productively and reflexively in the whole fabric of society, including its cultural resources. In this way: “instruction in the arts of life is something other than conveying information about them. It is a matter of communication and participation in the values of ordinary life by means of the imagination, and works of art are the most intimate and energetic means of aiding individuals to share in the arts of living.”<sup>3</sup>

## 2.5 Learning

Learning is creative in and of itself and, in terms of teaching, you can build on this ordinary process to develop affective and purposeful pedagogic experiences in which students work in relation to given, emerging and potential traditions (Burgess 2007). In order to take on board new knowledge (not information, but ways of thinking and doing), you need to design a learning environment that both provides opportunities and encourages students to think and behave differently to the ways they have done before.

Therefore, learning and other forms of creative action require imagination, a term that includes visualization (thinking and ‘shaping’ through images); ingenuity, invention and the world of possibility; ordering or synthesizing and syncretizing (seeing as totalities), as well as acknowledging difference and thinking other, a process that leads to empathy.

(Greene 1970) eloquently proposes this idea of imaginative possibility as the basis for education: In a sense, a student stands against a world of possibilities, a world of possible forms. In a sense it is imagination that puts him in relationship to these possibilities, just as it is imagination which enables him to order the indeterminate situations in which his inquiries begin. As in the case of works of art, possibilities signify richer and richer orders, more and more complex relationships. And this means, perhaps paradoxically, that a proper regard for imagination may intensify the sense of reality. It is therefore through the imagination that people are able to intensify habitual ways of perceiving the world to transcend the limitations of their current situation.

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<sup>2</sup> Merleau-Ponty, M. (2013), *Phenomenology of perception*, New York: Routledge, page 136.

<sup>3</sup> Dewey, J. (1980 [1934]), *Art as Experience*, New York: Perigree Books, page 336.

## 2.6 Sensory experience and embodiment

Schools can extend students' knowledge and experience of art, craft and design towards both an expansive and focused understanding of aesthetic practices by engaging motivated exploration, through the combination of the intentional and arbitrary activities of balancing, hearing, seeing, smelling, tasting and touching. This dialogue with materials is the primary ground out of which all making practices emerge, practices that take shape in relation to the cultural forms within which the maker is immersed. In this sense, the dialogue is profoundly intertextual, and it conjoins historical practices with the phenomenological event (the maker's actions) to inform future uses – utilitarian, discursive, symbolic.

Most art forms require time as a principle mode not only for their production but also for their immediate reception. A dance, a novel, a film, a song, all require viewers to attend to their changing forms within a period defined by the work itself as a linear, unfolding sequence of events. Works of art, craft and design may likewise use temporal elements – they may incorporate video, performance, depend on the movement of a viewer through a succession of spaces, the prolonged use of tools through a series of applications and so on – but they may also depend on simultaneity.

In other words, the richness and complexity of a vessel, chair, painting or sculpture, with their spatial relationships and formal and semantic possibilities, can be perceived in a comparatively short time. This provides such works with an extraordinary immediacy and potency, which only subsequently invites viewers to attend to particularities.

This is not to suggest that time should not be spent in savoring, exploring and investigating them; but immediate aesthetic appreciation can be almost instantaneous as the mind takes in and is able to understand an artifact's organizational principles. This means that when a person looks at an artwork, they can oscillate between aesthetic contemplation or reverie and a more deliberate reflective investigation, analysis or evaluation.

For temporal works, particularly those performed in real-time, sustained reflection is always mid-or post-event because such reflection tends to interrupt their continuity. School students, like anyone, come to artworks with expectations, assumptions and some prior knowledge of the field. It is in a work's resistance to these expectations and norms that the possibility for the transformation of ideas and values lies. Such a concern to retrace the making process, to understand a work's finality as a resolution of almost infinite possibilities, allows makers to investigate artworks as a map of material and formal decisions.

As such, craft knowledge, knowledge of materials and their use within tradition, is a necessary ground for all embodied expressions. In dance, drama, music and other performances, embodiment is more obviously rooted in the body itself as a resource for expression. In traditional types of art, craft and design, the body is less obviously but no less significantly present in the way that it is inscribed in the object through the traces of its actions as the maker transforms materials into some concretization or crystallization of an idea. But this is not to suggest that the idea necessarily precedes the reformation of materials; indeed, ideas may emerge and converge within the act of making itself.

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## 3 - The creative dimensions

In the previous section, we drew some sketches about art education from the point of view of art educators. In this section we will discuss how creativity is interwoven in art education by pointing out the general dimensions where creativity emerges. In particular we will investigate the creative process, general descriptions like divergent thinking and the cognitive dimensions.

Although these different perspectives are sometimes seemingly conflicting, they nevertheless contribute to forming a framework that is extremely important for the aims of the "Kobi project, as they make it possible to delineate the functional target, i. e. the set of cognitive functions and cultural structures, that the system will have to support.

Again, the contents of this section are based on a guiding text (Kaufman 2010) that is a well-established reference in the field.

### 3.1 The creative process

(Locher 2010) emphasizes that the process of creating art is dynamically interactive, with feedback loops between the various stages of development, in which new ideas or visions can arise in equal measure either through a logical-conceptual process or from the emergence of a provisional imaginary-signal structure resulting from the generative interaction (the sketch) with the expressive medium. The artist initially engages in various activities that trigger a series of expressive dynamics that can lead to enucleating the foundation of his creative process.

Once a particular idea or sign element imposes itself strongly enough, it is developed both conceptually and physically in a complex set of interactive and reflexive processes (Schon 1987) that involve structuring, extending, restructuring and evaluating the form and content of the composition. An essential aspect of this stage of development for most artists is the creation of preliminary drawings or sketches, which give the work an initial and provisional structure.

Sketches serve as external memories of ideas for later analysis and provide visual cues 'on the fly' for the association of structural and functional problems associated with the developing artefact. Sketching, when effective, is a cyclical and dialectical process that results in the continuous emergence of new knowledge and reinterpretation.

It is often considered as 'visual thinking'. Downstream of the initial exploration and conception begins the maturation of the content and form of the artwork, which is articulated in the same set of processes used during the conception phase, but on a more consolidated semantic-perceptual level.

### 3.2 Experiential learning

The profoundly experiential nature of the creative process is reflected pedagogically in the study of the forms of apprenticeship. In apprenticeship, the learner is directly in contact with the realities studied and the moment of learning is co-articulated with the moment of doing.

This contrasts with the learner who reads, hears, talks or writes about realities with which he never comes into contact during the learning process. Experiential learning models (Kolb & Kolb 2017) suggest the idea that learning is by nature a process full of tension and conflict.

New knowledge, skills or attitudes are achieved through the confrontation between four different types of skills:

- concrete experience skills (CE),
- reflective observation skills (RO),
- abstract conceptualisation skills (AC)
- active experimentation skills (AE).

In other words, learners must be able to involve themselves fully, openly and without prejudice in new experiences (CE). They must be able to reflect and observe their experiences from many perspectives (RO). They must be able to create concepts that integrate their observations into logically valid theories (AC), and they must be able to use these theories to make decisions and solve problems (AE).

Experiential learning thus requires skills that are polar opposites. More specifically, there are two primary dimensions to the learning process:

- The first dimension represents concrete experience of events at one extreme and abstract conceptualisation at the other.
- The other dimension has active experimentation at one extreme and reflective observation at the other.

Thus, in the learning process, one moves in various degrees from actor to observer, and from specific involvement to general analytical detachment. Furthermore, the way in which conflicts between dialectically opposed modes of adaptation are resolved determines the resulting level of learning. If conflicts are resolved by the suppression of one mode and/or the domination of another, learning tends to be specialised around the dominant mode and limited in the areas controlled by the dominated mode (Morris 2020).

### 3.3 Convergent and Divergent Thinking

Divergent thinking is a thought process or method used to generate creative ideas by exploring many possible solutions. It typically occurs in a spontaneous, free-flowing, 'non-linear' manner, so that many ideas are generated in an emergent cognitive way. Many possible solutions are explored in a short period of time, and unexpected connections are drawn. Following divergent thinking, ideas and information are organized and structured using convergent thinking, which follows a particular set of logical steps to arrive at a solution, which in some cases is a 'correct' solution.

Divergent thinking, often referred to as lateral thinking, is the process of creating multiple and unique ideas or solutions to a problem one is trying to solve. Through spontaneous and free thinking, divergent thinking requires the creation of many different answers or paths.

Convergent thinking, on the other hand, occurs when cognition is used to identify a correct or conventional answer. Divergent and convergent thinking can both be involved in creative endeavors, which allows the generation of ideas that are both original and effective.

### 3.4 The role of the Associations

(Mednick 1962) developed a cognitive theory of the associative processes underlying creative intuitions. Mednick describes how ideas are concatenated together, one after the other, and how remote associations tend to be original.

Associations between ideas can be formed for various reasons, for example, being functionally or even acoustically linked. Apparently, some individuals tend to move quickly from obvious to remote associations.

In this view, more creative individuals tend to have flatter hierarchies of associations than less creative individuals; in other words, more creative individuals have many more relatively strong associations for a given concept, rather than just a few, which is thought to provide a greater possibility of simultaneous activation of remote representations.

### 3.5 Creative Cognition

From a cognitive point of view (Ward & Kolomyts 2010), the creative process is an activity in which mind and body work reciprocally, an activity that foregrounds and, to a certain extent, valorizes practical and embodied forms of knowledge. The cognitive approach to the study of creativity explicitly rejects the idea that the extraordinary forms of creative thought are the product of minds operating according to principles fundamentally different from those associated with normative cognition.

Thus, the cognitive approach to the study of creativity has largely addressed the fundamental processes, such as abstraction, conceptual combination and analogy, that can operate to produce creative results from the most mundane to the most extraordinary across a wide range of domains.

A general and sufficiently descriptive model for creative thinking is the Geneplore model (Finke et al., 1992), which characterizes the development of new and useful ideas as the result of an interaction of generative processes that produce candidate ideas of varying degrees of creative potential and exploratory processes that expand on that potential.

Rather than focusing on the creative process as a singular entity, the model identifies a group of basic cognitive processes that combine in a variety of ways to influence the likelihood of a creative outcome.

Therefore, it is not necessarily inappropriate to use divergent thinking scores as indicators of creative ability. Indeed, there is at least some evidence that divergent thinking scores pre-dictate creativity in the real world. However, from a cognitive perspective, the most precise characterization of creativity requires a detailed consideration of the primary processes used in generating the items that lead to that score.

By extension, it is essential to understand the basic processes that lead to all forms of creativity. Creative thinking can thus be characterized in terms of a set of specific processes and their combination.

### 3.6 The cultural dimension

In recent decades (Lubart 2010), a line of research has developed on the influence of exposure to different cultures on creative processes. Multicultural experiences can include time spent abroad, interactions with people of different nationalities and ethnic groups, exposure to foreign languages, immigration experiences and exposure to other cultures through educational experiences. In general, the basic assumption is that exposure to multiple cultures and/or multiple languages is beneficial for creativity. This exposure enhances knowledge and provides contrasts with typical ways of thinking and acting that help people overcome their cultural habits.

Multicultural experiences can foster openness to new ideas. Multicultural experience can provide exposure to and knowledge of different ideas, allow multiple interpretations of the same object, 'destabilise' routine knowledge structures, promote the tendency to seek information from unfamiliar sources, and foster syntheses of different ideas. Some recent studies have focused directly on multicultural exposure. A series of studies indicates that exposure to multiple cultures can be beneficial for creativity (Leung 2008).

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## 4 - The °°Kobi approach

On the basis of the analyses conducted in the previous sections, we can finally qualify the general objectives of the °°Kobi system, as outlined in Work Package 4 – The creative eco-system, as a set of functionalities well-grounded in the current scientific cultural context.

In WP4 °°Kobi was initially figured out as a knowledge-based system for supporting creativity in the educational process of art academies, with the aim of realizing an eco-system for creative learning. From the analysis of the previous sections two main cognitive targets, i.e. reflective and associative thinking, and the cultural dimension were selected as target processes to be supported in creative education, and the following functional requirements for the °°Kobi system were defined:

1. Supporting of reflective thinking by developing a system that can be an integral part of learning moments, fostering the creation of new critical and interpretative structures through abstract conceptualization and reflective observation as well as reformulation and reinterpretation of contents.
2. Supporting of associative thinking by implementing large knowledge domains, possibly arranged as flat hierarchies, nevertheless providing the richness possible set of contents.
3. Implementing a cultural dimension by enabling the integration of multidisciplinary content and the creation and use of disciplinary well-defined semantic and linguistic domains.

On that basis, °°Kobi was developed as a web environment by selecting in the pool of current methodologies and available technologies what maximizes usability and dissemination in learner communities.

### 4.1 Summary

°°Kobi is a knowledge-oriented application that extends the MIRO platform by introducing the possibility of sharing boards between users.

The main purpose of °°Kobi is the elicitation of knowledge produced in the preparation phase of the teaching material and its sharing among teachers belonging to the same community.

°°Kobi inherits from MIRO the fundamental structure of the concept map (boards in MIRO terms).

Boards are used in the preparation phase of the didactic material, as a tool for authoring the contents that are the ground materials of the teaching activity.

Boards can also be used, in a complementary way, during the teaching phase, using pedagogical approaches typical of such tools like flipped classroom, problem posing, etc.

## 4.2 Reflective thinking

From a methodological point of view, the °°Kobi project chose to reinterpret the Knowledge Mapping paradigm already widely used in the world of Knowledge Management (Wexler 2001). This is because °°Kobi shares with the world of Knowledge Management the objective of capitalizing on the knowledge produced in the educational cycle, and more specifically the rich conceptualizations underlying the production of teaching materials by teachers, so that they can be reused in a flexible manner to support creative thinking during learning processes.

On the other hand, the tools used in knowledge mapping as well as the tools used in mind mapping are based on interface types that foster self-reflection on content (Davis 2011). Mind maps have in fact been developed in such a way as to allow the spatial representation of the structure underlying concepts or information complexes on a medium that enables their observation, manipulation and subsequent critical reflection.

Therefore, in °°Kobi it was decided to adopt a user interface that would flexibly allow the graphic representation of knowledge structures in order to best support the critical-reflective observation that underlies the cognitive dynamics of creative thinking.

## 4.3 Associative thinking

On the other hand, knowledge structures reflected on the plane of spatial representation already explicitly present their relation structures, which are themselves part of semantic association processes. Moreover, the visual organization and linguistic component of the knowledge structures represented in this way offer further possibilities for creating semantic association structures.

On the linguistic level, one obviously has the great functional availability offered by the latest techniques of computational linguistics (Mitkov 2004). This makes it possible to use very flexible terminological searches by expanding the semantic field of terms, even possibly using specific corpora (Speer et. al. 2017).

The visual organization of content, which is naturally observed during authoring processes, offers a third type of association, if we want to call it *gestalt-like* in nature, in which spatially proximate elements of knowledge tend to be considered more semantically relevant than elements that are distant from each other.

This aspect, which in the following we will call the proximity principle, emerges naturally in the knowledge mapping process and is used in °°Kobi as a further principle of semantic association of knowledge map contents.

## 4.4 The cultural component - the knowledge ecosystem

Finally, the cultural component of creative thinking is supported in °°Kobi through technologies for collaborative work. These technologies enable the creation of communities of users, whether teachers or learners, who share information, documents or media material, and have the ability to interact and communicate with varying degrees of flexibility.

Using the ability to create associations on a semantic level, °°Kobi extends this functionality by creating what is commonly called a knowledge ecosystem. In °°Kobi, individual content production is semantically related according to the techniques discussed above, thus generating a universe of knowledge. Such a universe has multiple educational significance.

First of all, each knowledge map naturally generates a linguistic domain or semantic field (Lyons, 1977) using terminology and associations specific to the subject matter in question. The proposition of syntactic associations between terms belonging to different linguistic fields i.e. different semantic fields tends to generate a polysemous or sometimes metaphorical shift that is extremely significant for creative thinking (Mednick 1962).

On the iconographic level, the proximity association of terms and images on different semantic fields creates very rich contexts for the creative interpretation of visual and/or conceptual suggestions. Finally, °°Kobi makes it possible to navigate the associated fabric thus created, generating interpretative paths that may diverge (Runco 2012) while remaining within a set of well delineated and relevant semantic contexts.

This places °°Kobi in clear complementarity with, for example, traditional search engines that do not allow searching by semantic relevance. In fact, °°Kobi allows one to use one's own linguistic scopes, generated during associative navigation, to generate search keys for use in traditional search engines.

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## 5 - The °°Kobi Architecture

°°Kobi is a web-based application, and therefore consists of a front-end that implements the user interface and a back-end that implements the business logic services and knowledge-based functions (Figure 1).

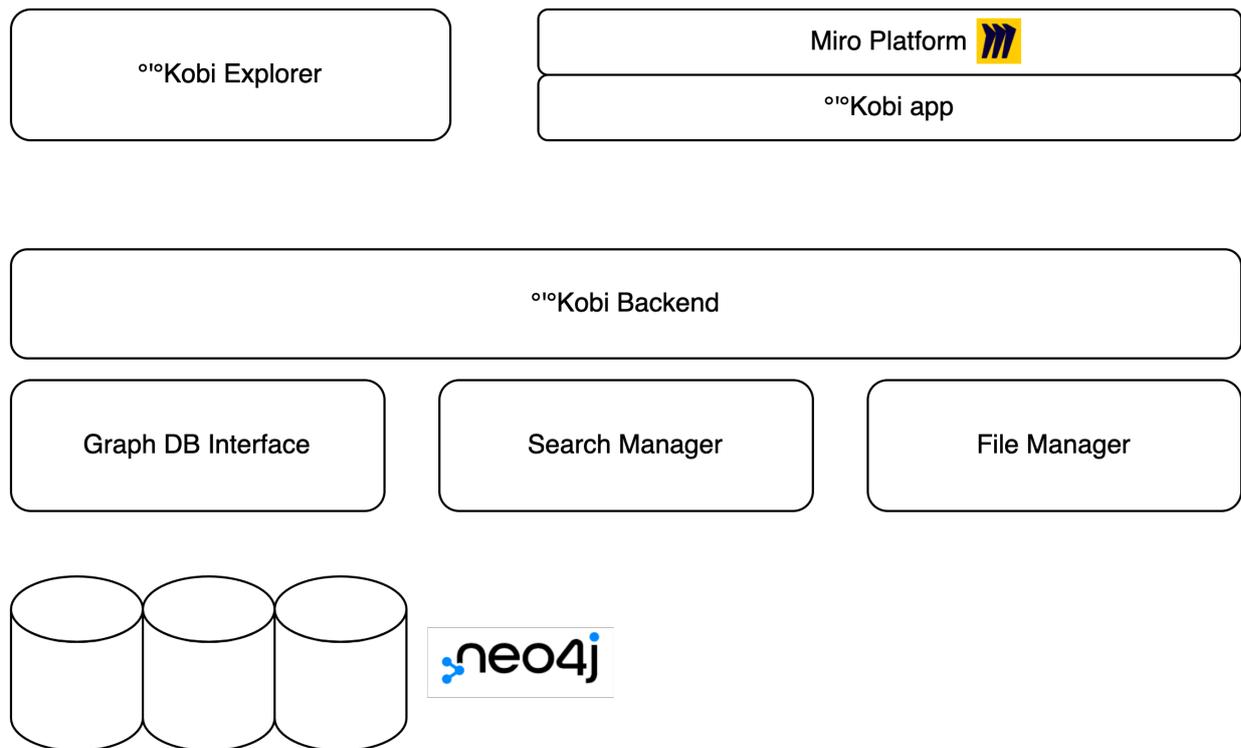


Figure 1 - The °°Kobi functional architecture

### 5.1. The °°Kobi Front-end

From the point of view of the technology mix, it was decided to work from well-established user interfaces (GUI) from the point of view of quality and usability. The development of GUIs was in fact considered to be outside the scope and economic possibilities of the project. Therefore, it was decided to use the MIRO platform, which offers state-of-the-art usability, flexibility and support for collaborative work.

The MIRO platform is also open for the development of custom applications and, with some limitations, totally free for academic and educational purposes.

A large part of Kobi's front-end has thus been developed as a custom application of MIRO, while leaving some functionalities (i.e. the explorer) totally autonomous. Hence Kobi uses the MIRO boards as its main knowledge authoring tool, while the Kobi explorer, provides autonomous navigation in the Kobi knowledge and a link to the web.

Figure 2 show a fully featured picture of the Kobi app as it appears embedded in the MIRO Platform.

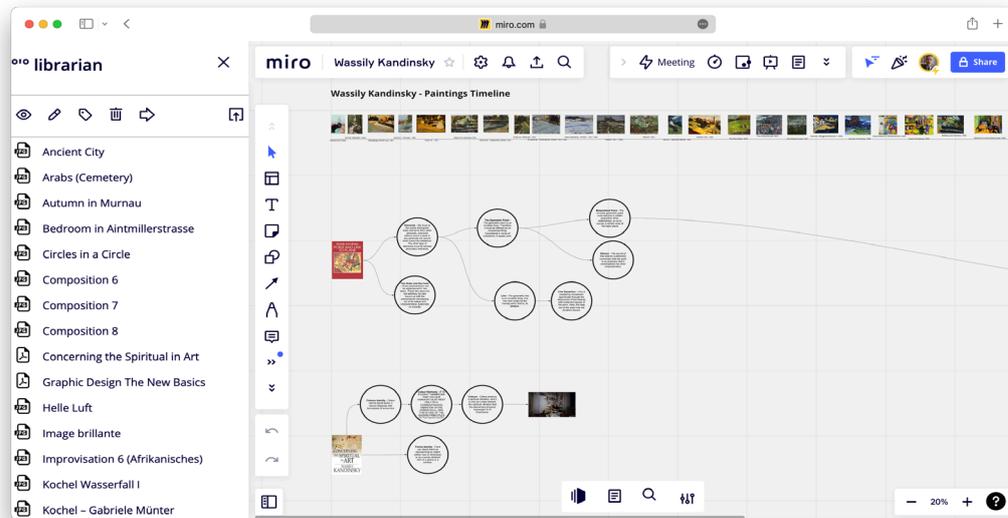


Figure 2 - The Kobi app in the Miro platform

Figure 3 shows the Kobi explorer web app interface. On the right panel the knowledge universe, on the left the selection tab.

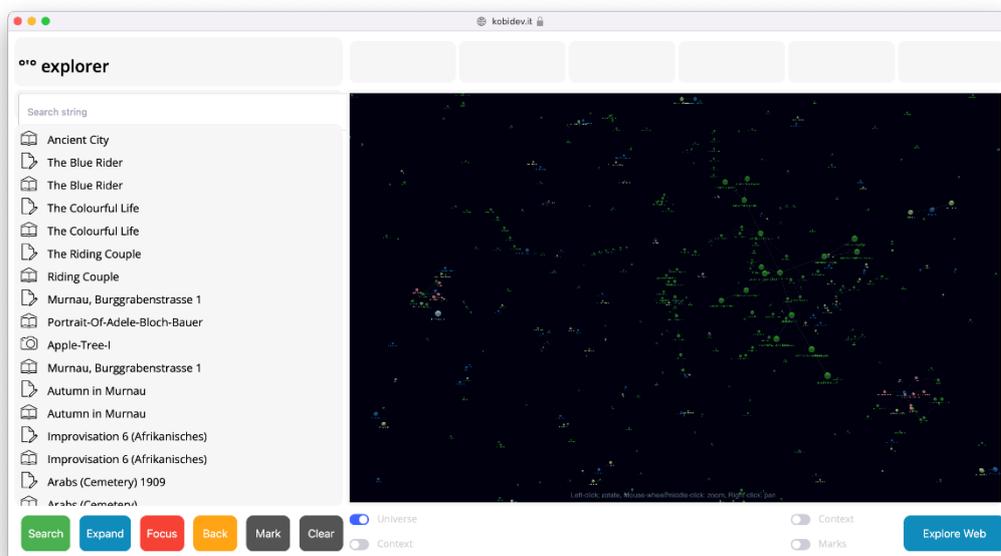


Figure 3 - The Kobi explorer

Figure 4 shows the <sup>oo</sup>Kobi explorer in context view perspective. The details of the <sup>oo</sup>Kobi GUI are outlined in section 5.

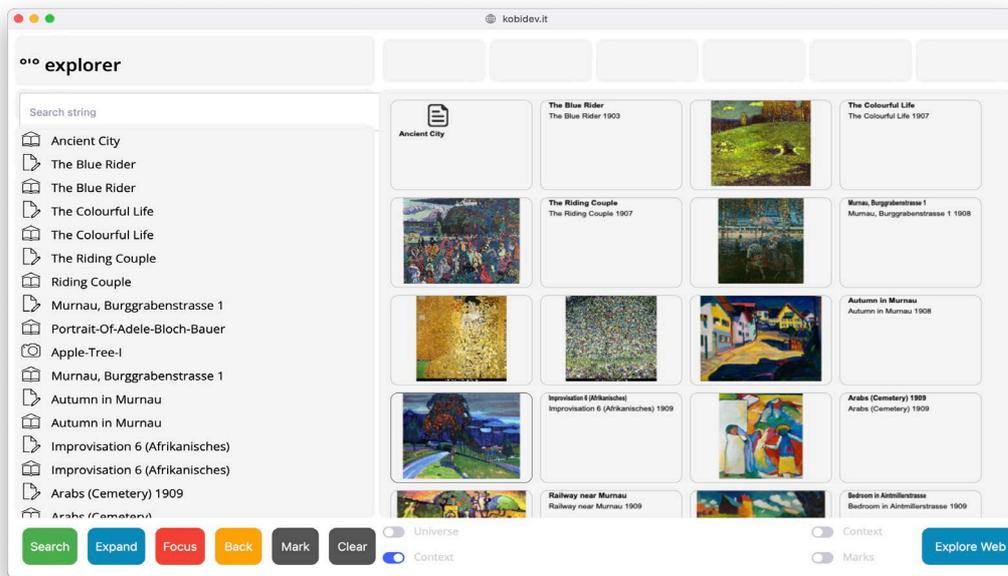


Figure 4 - The <sup>oo</sup>Kobi explorer in context view perspective

## 5.2. The <sup>oo</sup>KOBI Back end

The back end has been implemented in Node.js. The database uses a graph DB technology, by means of the open source Neo4j application, which maps very well with the knowledge representation requirements of the <sup>oo</sup>Kobi application. Figure 5 shows a screenshot of the neo4j manager of the <sup>oo</sup>Kobi Knowledge Base.

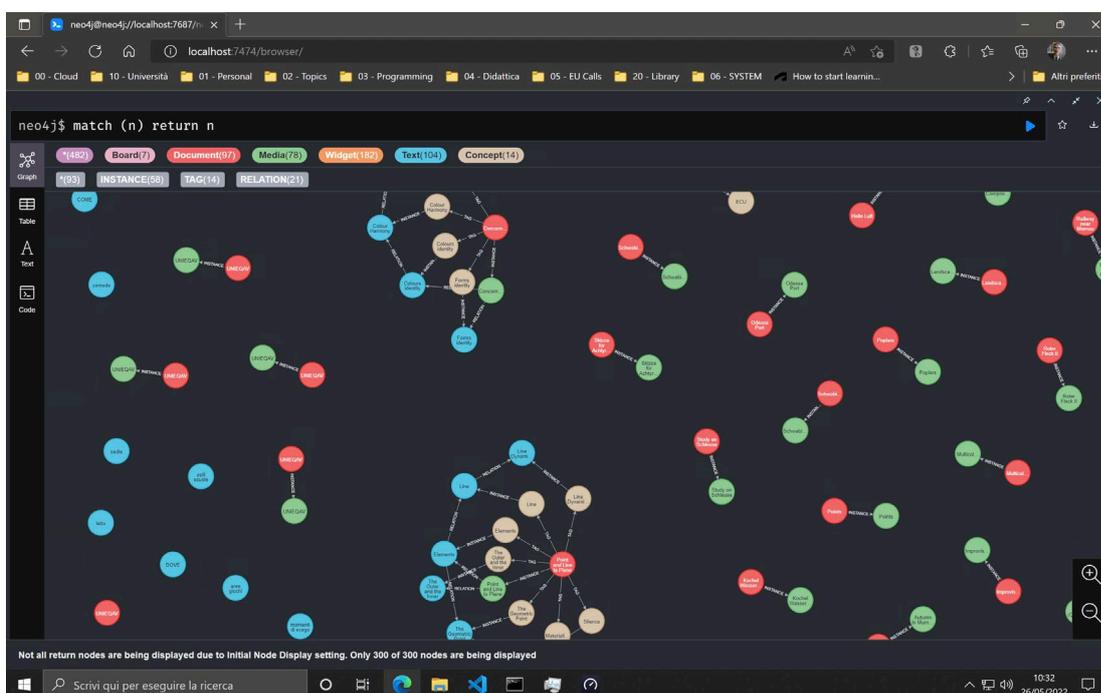


Figure 5 - A screenshot of the neo4j manager of the <sup>oo</sup>Kobi Knowledge Base

### 5.3. Hardware and hosting

The °Kobi application runs on servers hosted at the Digital Construction Capability Centre (DC3) of the Marche Polytechnic University connected to the Italian GARR research network via a gigabit link. In order to guarantee reliability, a dual hardware architecture based on a deployment and a back-up server, as well as a data mirroring protocol was arranged. Both servers are configured with dual Xeon processors for a total of 32 cores, 128Gb of central memory and 32TB of mass storage.

This configuration was deemed adequate for conducting the experimentation within the project. Further developments should include scalability on cloud architectures.

## 6 - °°Kobi User Manual

What follows is a complete user manual, covering all °°Kobi functions.

### 6.1 Authorization of the °°Kobi App

The °°Kobi app belongs to the MIRO environment. Therefore, its installation in each of the teams that you have in MIRO is done through an activation code that is sent upon request.

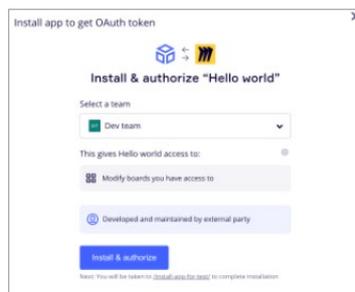


Figure 6 - The activation panel

The activation code opens a panel that allows you to choose which team to install the °°Kobi app on.

### 6.2 The °°Kobi App

If the installation is successful, the °°Kobi app can be started through the °°Kobi button.

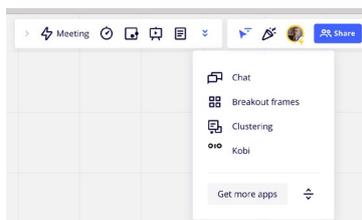


Figure 7- The °°Kobi app button

The °Kobi button opens the °Kobi bottom bar. Through this bar the main °Kobi activities can be accessed. The bottom bar consists of four buttons.

From right to left we find the boards manager, the librarian, the explorer, and a control panel accessible only to the administrator.



Figure 8 - The °Kobi bottom bar

### 6.3 The Boards Manager

The boards manager allows you to manage the publication of MIRO boards on the °Kobi system.

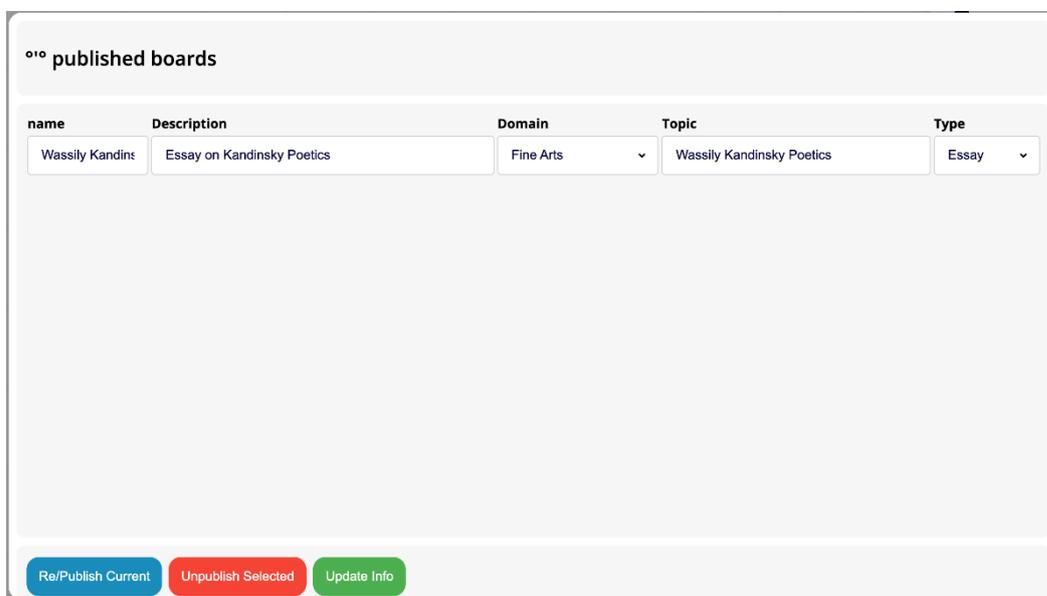


Figure 9 - The °Kobi boards manager

The central table contains the list of published boards. Each line contains the information of a board. The rows of the table are selectable. The left button allows you to publish the current board. If the current board has already been published, it is overwritten. The middle button unpublished the board from the °Kobi system, but it does not delete the board from MIRO. Therefore, a previous board previously unpublished in °Kobi can be re-published again. The right button updates the metadata (outline information displayed in each row) of the board without publishing the board.

## 6.4 The Librarian

One of the major limitations of the MIRO environment for <sup>oo</sup>Kobi purposes is the handling of multimedia files. Image files, some video files (from YouTube as an example) and pdf documents can be embedded in MIRO boards. However, they cannot be used by extension apps. Therefore <sup>oo</sup>Kobi provides its own librarian that allows a media file management more suitable for the purposes of the application. The <sup>oo</sup>Kobi librarian manages image files (jpg, png, etc.), video files downloaded from YouTube or uploaded from the desktop, audio files and pdf documents.

The librarian is activated by the bottom bar button



Figure 8- The <sup>oo</sup>Kobi button bar

and appears as a sidebar on the left.

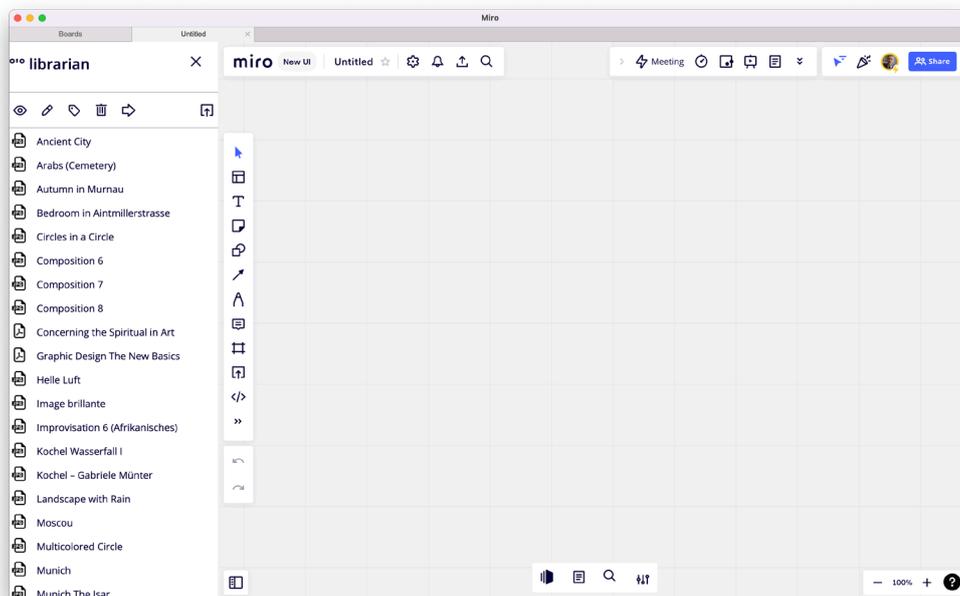


Figure 10 - The <sup>oo</sup>Kobi librarian

The librarian has a very simple structure. It consists of a list of uploaded media files (bottom) and a panel of management buttons (top). The buttons perform the following functions (left to right): viewing, editing metadata, tagging, deleting, inserting. The button furthest to the right opens the upload panel.

### 6.4.1. The Media viewer

The viewer opens a viewing panel whose functionality depends on the media file type. The following picture show an image media viewer.

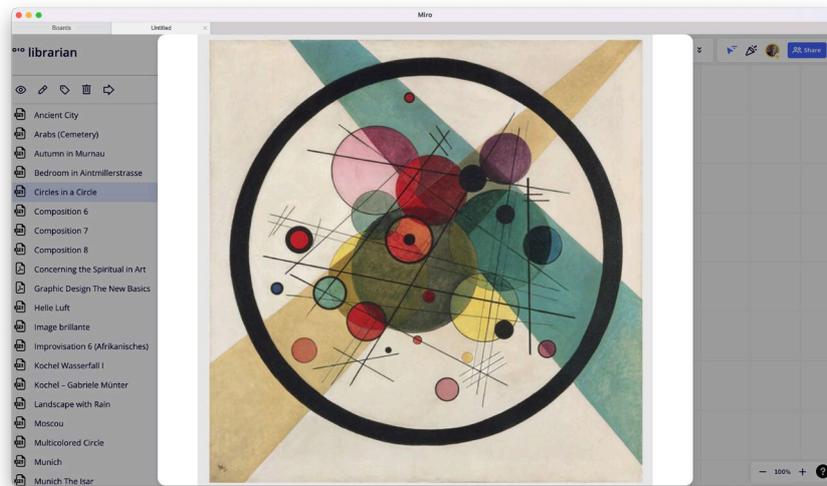


Figure 11 - The °°Kobi media viewer

The viewer is a modal window (does not allow the use of other functions) and can be closed simply by clicking out of its area.

### 6.4.2. The Metadata Editor

The metadata editor allows the contour information of the media file to be updated. The following image shows its simple structure.

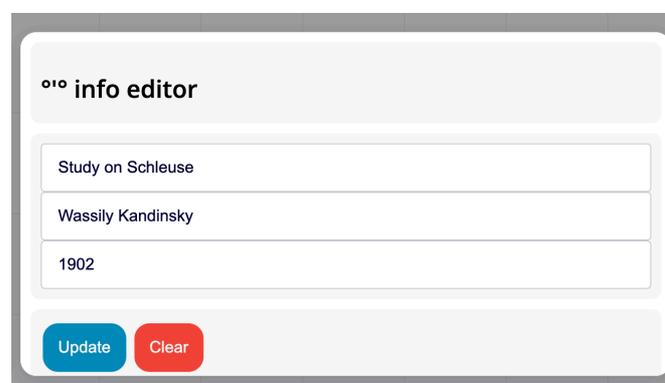


Figure 12 - The °°Kobi info editor

### 6.4.3 The Media tagger

One of the peculiarities of °°Kobi's media management is the possibility of using bookmarks to mark particularly relevant content and highlight the main concepts associated with it. This operation is called tagging and can be performed on any type of media using the tagging panel of the librarian.

The tagging panel has an identical structure for each type of media, although obviously the selection operation depends on the particular nature of the content. The following figure shows the tagging panel for a pdf document.

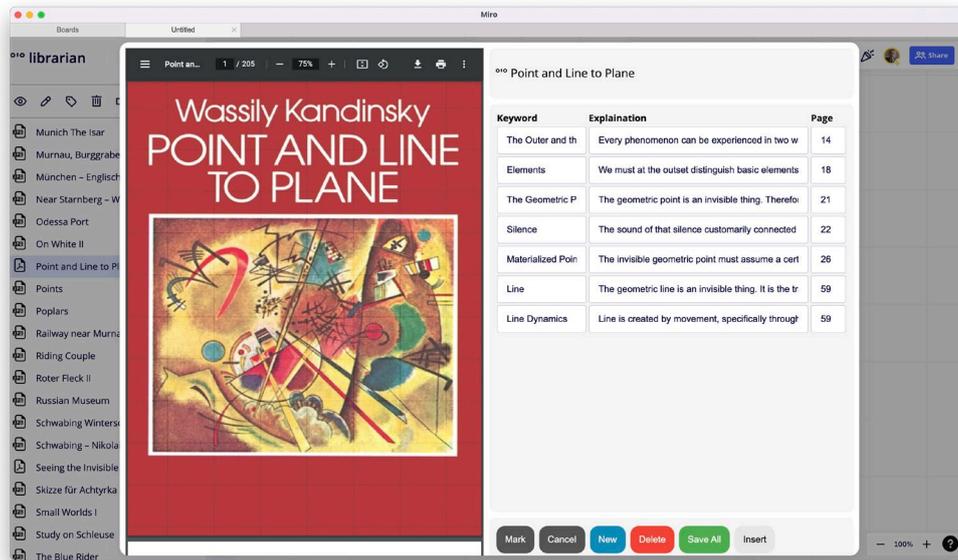


Figure 13 - The °°Kobi media tagger for a pdf document

The left-hand side contains the document viewer. In this case a pdf viewer. On the right-hand side is the tag table. Each tag consists of three fields: the keywords outlining the concepts it expresses, a more extensive description of these concepts and a positional mark (in the case of a pdf document, the page number).

The buttons at the bottom allow the following functions:

**New:** inserts an empty tag (row) in the table

**Delete:** deletes the selected tag from the table

**Save all:** publishes the list of tags in °°Kobi

**Mark:** inserts the positional mark in the selected tag

**Cancel:** deletes the selection (applies to some media types)

**Insert:** inserts the tag in the current board, the tag will appear as a text widget.

The action of bookmarking differs according to the type of media material. For documents a mark, as we have seen, is simply the page number. For an image it is a specific area of the reproduced bitmap. This area can be defined through a click and drag action.

The following figure shows the result of placing a mark on an image.

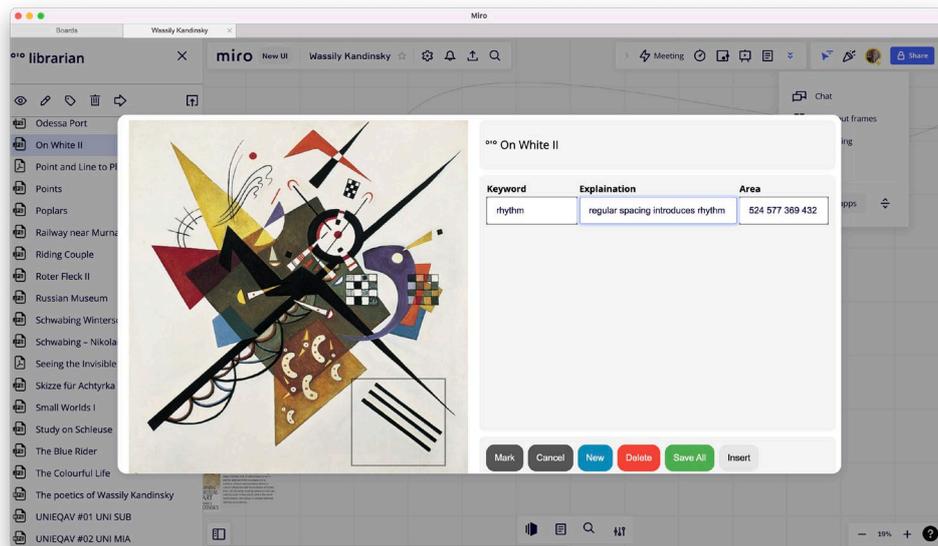


Figure 14 - The “Kobi media tagger for an image

Video and audio material is tagged by specifying a time interval. To this end, the **mark** button must be pressed at the beginning of the interval and again at the end. The **cancel** button deletes the selection. It is easy to operate by first placing the cursor of the player at the desired time and then pressing the **mark** button.

#### 6.4.4 Inserting documents and tags in MIRO boards

The “Kobi librarian allows references to both entire media and media tags to be inserted via the respective buttons in the librarian's tool bar and media tag panel. The action of inserting a document creates a reference in the board that allows further tags to be generated in the document. Inserting a tag in a board allows the reference in the document to be accessed.

The generated reference is in effect a MIRO widget. If the reference is selected, the MIRO pop-up panel contains the  “Kobi button which allows access to the reference.

## 6.4.5 The °°Kobi Media Gate

The °°Kobi Media Gate (Figure 15) allows files to be loaded into the library. Media files can come from a variety of sources. The files may reside on your personal computer. In this case, a Drag&Drop action in the panel area is sufficient to generate references for the upload.

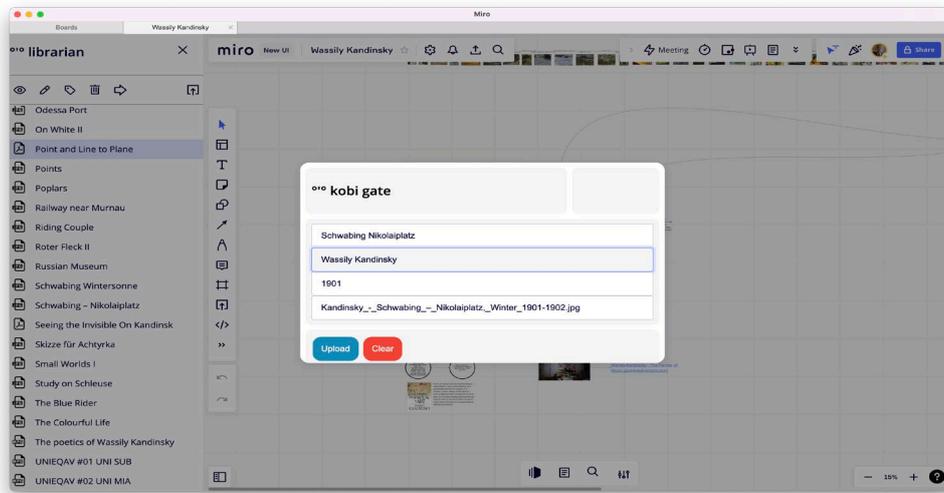


Figure 15 - The °°Kobi Media Gate

It is necessary for a correct display in the library to pay attention to attributing well intelligible and coherent names to both the media file and the author. The date is optional, but it is in any case advisable to affix a time mark to the media file.

In the case of a file accessible through the Internet, you can copy the address (URL) of the file into the bottom file... field. Sometimes it may happen that the file cannot be loaded correctly from the Internet. This is due to inconsistencies that sometimes occur on internet sites.

The °°Kobi librarian also allows files to be uploaded from YouTube. This can be done by copying the reference provided by YouTube into the file field (Figure 16). Uploading YouTube files can take some time. You must wait for the process to be completed. Be patient.

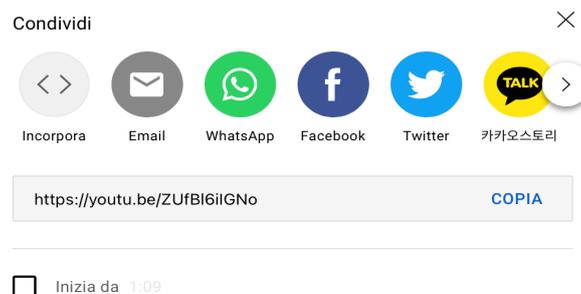


Figure 16 - The Youtube reference to be copied in the file field of the media gate.

## 6.5 Working with MIRO widgets

Uploading media files in the librarian, inserting tags and document references and editing MIRO widgets are the main authoring activities to build the °°Kobi knowledge base. In this section we will deal with how MIRO's traditional widgets participate in °°Kobi's knowledge base.

°°Kobi interprets MIRO's widgets from a semantic point of view, i.e. leaving out their graphical quality. It does, however, retain the information of their position on the board. Widgets with textual content (text, shape, sticker) are considered as text and are fully managed by °°Kobi.

Widgets that have media content (images, audio and video, as well as documents) are treated as media files. Such files, as mentioned, can be inserted from °°Kobi's library. In this case, references to such files are handled directly by the °°Kobi librarian. Alternatively, media files can be inserted directly into the MIRO board via drag and drop.

In this case the MIRO application does not provide references to such files. These files are therefore completely transparent to °°Kobi. In other words, they are part of the MIRO board but do not generate any references in °°Kobi's knowledge base.

A third situation arises from the possibility offered by MIRO to copy image addresses or media files from the web and insert them into the boards (Figure 17). In this case the reference remains in the inserted widget and °°Kobi uses it as an external reference in its knowledge base. Therefore, widgets generated in the MIRO boards from external references by copying or drag-and-drop operations from browsers are managed by °°Kobi.

Finally, relations play an important role in the construction of knowledge bases in °°Kobi. As we have said, °°Kobi interprets a MIRO relation as a semantic relevance between its endpoints, on a par with spatial proximity. The text of relations, in this release, is not considered.

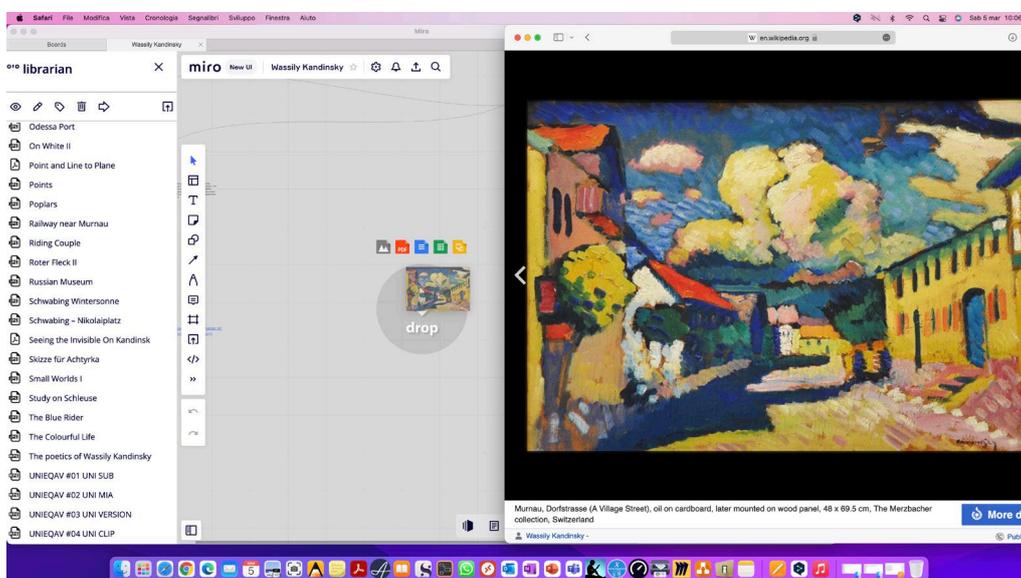


Figure 17 - Drag&Drop of a Kandinsky painting picture for Wikipedia into a Miro Board.

## 6.6 The Node Expander

The navigation of Kobi's knowledge use can be conducted by means of two tools, the node **expander** and the **explorer**. The functionalities of these tools are very similar although their purpose is different. The node expander is activated from a specific widget of a board and allows to exclusively browse the Kobi knowledge base and insert knowledge items as a new widget of the board.

The node expander is accessed through the button  of the context menu that pops up when a widget is selected (Figure 18).

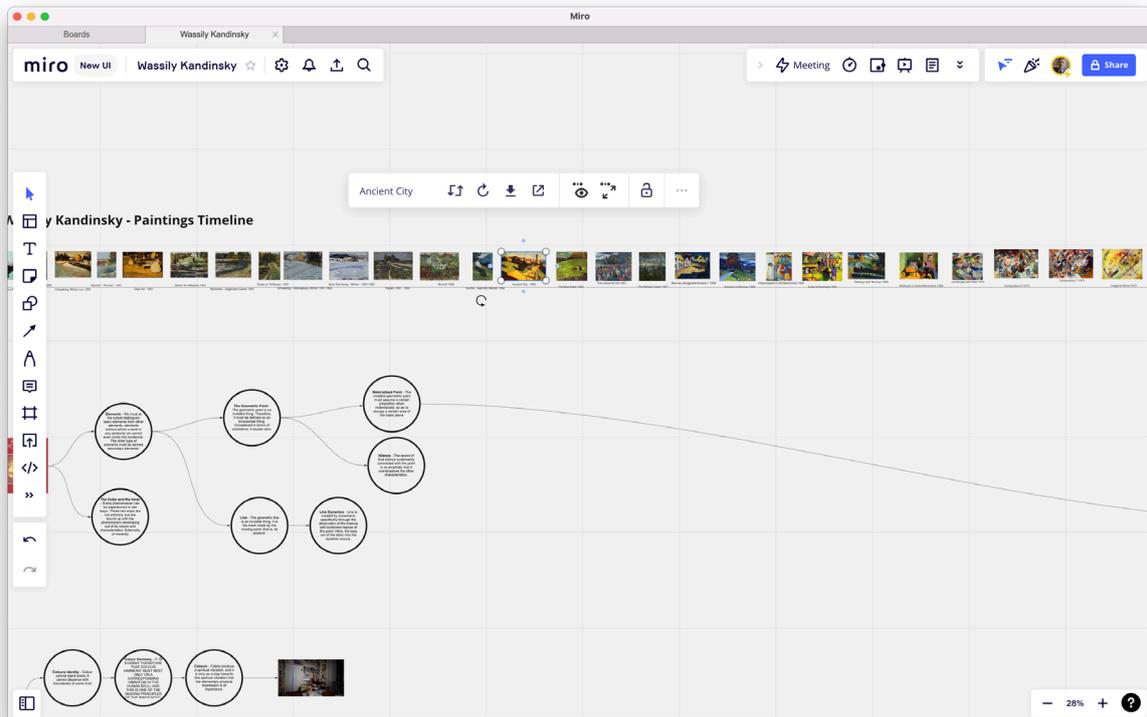


Figure 18 - The context menu after a widget selection.

Figure 19 shows the modal window of the node expander. On the left side of the expander panel, from top to bottom we find the text entry field, the list of nodes and the navigation buttons. The text entry field is filled by “Kobi with the text of the node to be expanded. However, it can be filled with any other text entered manually. The list of node is filled with the results of search, expansion or focus actions. Row can be selected and the related content shown in the right panel. The right side of the expander panel contains, from top to bottom, the mark zone, the display area and the insert button.

The mark zone is an area where nodes of interest encountered during navigation can be temporarily noted. The **mark** button copies the selected node to a free area together with its context. The **clear** button clears the list of marks. When an area of the mark zone is clicked on the stored node becomes the current node and its context becomes the current context.

The display area can show either a single node or the whole set of nodes (called **context**). View modes can be selected by means of the **context** switch just on the right of the navigation buttons. The **insert** button is placed on the bottom right. It creates a copy of the selected node on the current widget.

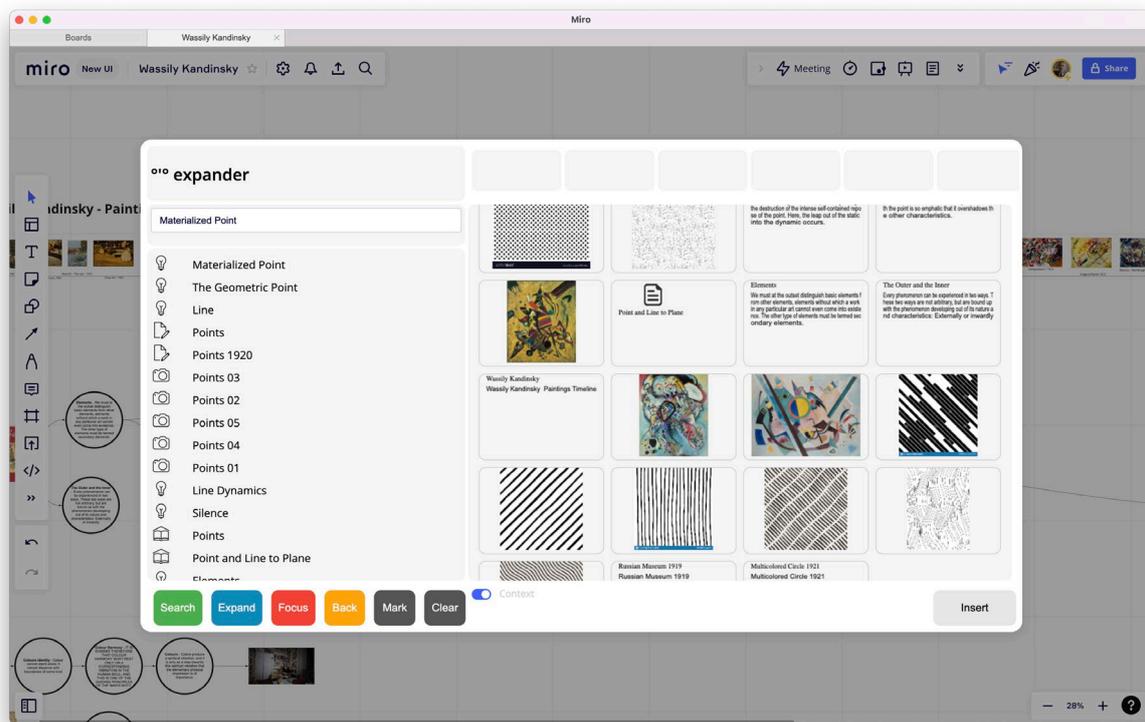


Figure 19 - The “Kobi expander modal window.

## 6.7 Browsing the °Kobi Knowledge base

The navigation of the °Kobi knowledge base needs some further investigation.

Navigation is through the buttons: **search**, **expand**, **focus** in the lower left area (Figure 19). Each search generates a result shown in the list of nodes that is called context. The search button performs a simple textual search in the °Kobi knowledge base. The expand button enlarges the context of the textual search by inserting nodes that are semantically relevant. The focus button narrows the context generated by an expansion by selecting only those nodes that are semantically closest to the expanded node. Search and expansion actions can follow one another, generating a series of contexts. The back button allows you to retrace your steps by regenerating previously explored contexts.

## 6.8 The Explorer

The explorer is activated via the bottom bar button .

Figures 20 and 21 shows the explorer window. The explorer functions in much the same way as the expander. We will discuss the aspects that differentiate its use later. First of all, the explorer is a stand-alone window, so it can remain open to the side of MIRO's board window.



Figure 20 - The °Kobi explorer showing the universe.

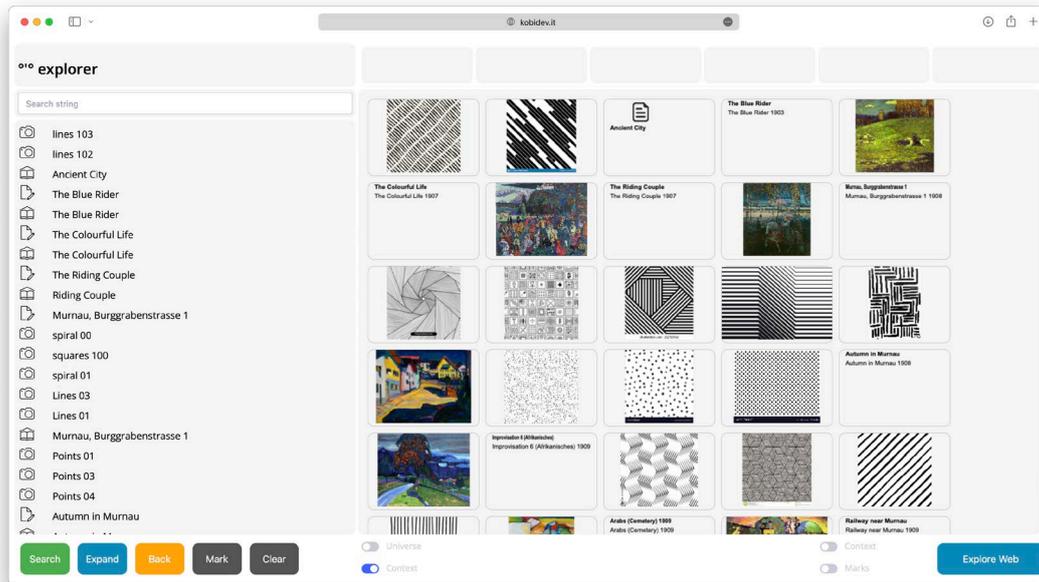


Figure 21 - The <sup>oo</sup>Kobi explorer showing the context.

As soon as it is activated, the explorer shows the universe, i.e. <sup>oo</sup>Kobi's entire knowledge base represented as a three-dimensional set of nodes connected by semantic relations. The two switches below the display area allow to alternate between the two display modes.

Navigation in the explorer is substantially analogous to what has already been described for the expander. However, the explorer replaces the possibility of inserting nodes into the board with the possibility of using the semantic context or stored tags as a basis for generating search keys on the web. The button in the bottom right-hand corner together with the two switches perform this task.

The explore web button opens a pop-up window (Figure 22) that contains the list of n-grams generated by <sup>oo</sup>Kobi related to the context. The n-grams can then be selected to compose the search key that can be performed through the search button (bottom right). This will open a dedicated web browser and perform the corresponding search.

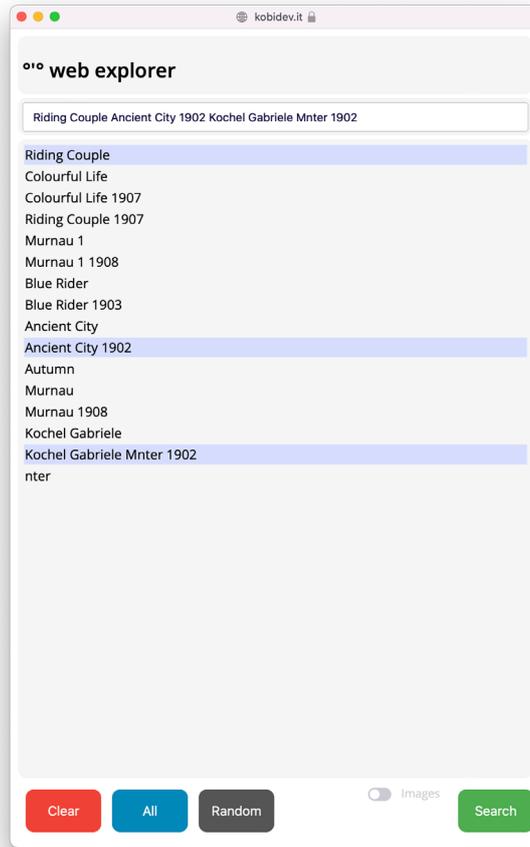


Figure 22 - The web explorer window.