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Training Modules

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TRAINING MODULES

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Author(s)	Centro Consorzi
Contributors	University of Rijeka - Faculty of Maritime Studies, MARSERVIS Ltd
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1. Project Overview

TOFOLA project intends to launch sustainable (economically, environmentally and socially) tourist products based on the historiography of shipbuilding during the Serenissima Republic of Venice, in order to diversify the current tourist offer in the Northern Adriatic area and promote underexploited destinations.

The challenge the project aimed to address to is represented by the diversification of touristic flows aimed at ensuring equal access to tourist destinations and cultural heritage (for persons with disability, elderly people and retired, unemployed and low-income population, younger generation).

Also, the delocalization of flows will be pursued to increase the environmental sustainability and to produce a positive impact on the local communities. To face this challenge, TOFOLA project starts from the belief that the area represented by the coastal provinces of the Veneto Region, the Friuli Venezia Giulia and Istria Regions has a strong history, characterized by the supremacy of the Serenissima Republic of Venice that determines a very culturally rich environment to be exploited or tourism purposes.

Indeed, the project intends to contribute to the development of the cross-border area starting from what represent the 'intangible' and shared foundations: the historical memory and local traditions of the above-mentioned regions. These, however, are not intended as mere evidence of the past or museum material, but as a means to bring people back, in an active and aware manner, to those waterways that have given so much fortune to the area and that are now largely underused, starting from the historical forests (of the plain in Veneto region, Cansiglio in Friuli Venezia Giulia region and Montona in Istria region) and their timber, which, today as then, provide for the construction of historical and traditional boats that will be used for tourism purposes. TOFOLA intends to achieve this objective by bringing together local citizens and workers around a project that allows the recovery of the past by connecting it to the present and the future, with creativity and innovation.

The project would in fact launch tourism products, to be defined trough a business composed by itineraries (of various types, not only historical/cultural/landscape-related but also sporting for example) and related services, which geographically follow the routes of the wood used for the production of boats (but not only) in the historical period of the Serenissima, from the mountains to the sea, linking two traditionally competing or



antithetical tourist destinations in the current tourist offer. These itineraries are: from the Carnia and/or Cansiglio forests to the Marano lagoon (IT); from the Montona forest to the Istrian coasts (HR); from lowland wood to Caorle Lagoon (IT); from lowland woods to Delta del Po area (IT).

The main results of the project consist in:

- the "traceability" of wood used for reconstruction of traditional boats by the mean of a dedicated QR code to be positioned on the boats;
- ICT tools for reverse engineering of wooden boats so that the process can be easily broken down and understood by other operators and boatyards;
- engineering and technical solutions to make wooden boats as accessible and usable as possible for people with reduced mobility and disabilities (motor, visual or cognitive);
- engineering solutions to equip boats with propulsion systems that have minimal environmental impact;
- easily usable business models for the definition of tourism products related to the project's pilot areas.



2. Document Overview

This report aims to present a comprehensive overview of the training activities developed within the TOFOLA project. Chapter 1 explores the methodological aspects behind the design of the training modules, highlighting the pedagogical approach and the rationale used in structuring the learning path. Chapter 2 presents the specific contents and materials created for the three training modules implemented within the project, illustrating how each one contributes to the project's objectives. Finally, Chapter 3 concludes the report with a proposal for a more structured training format in the form of a one-week intensive program, designed to further consolidate and expand the skills and knowledge addressed throughout the project.

The document intends to provide a clear and coherent understanding of the developed training framework, as well as its potential for future use or adaptation.



2. Methodological aspects - Cross-border training curriculum

The curriculum is content of what is taught in a particular course or subject, including methodologies and tools used to achieve favorable teaching outcomes. Curriculum therefore refers to an interactive teaching and learning system with specific objectives, content, strategies, measurements, and resources. The desired outcome of a curriculum is the successful teaching and/or development of knowledge, skills, and attitudes.

Training curriculum is, therefore, an overall set of learning activities designed to achieve the goals of the educational program. In a competency-based system, the goal or desired purpose for trainees is to acquire the specific knowledge and skills (competencies) they need to do their jobs. There are three main components that must be examined when evaluating a training curriculum.

These are:

- the content or information to be taught,
- the organization of the curriculum: the structure, format and sequence,
- the training methods used.

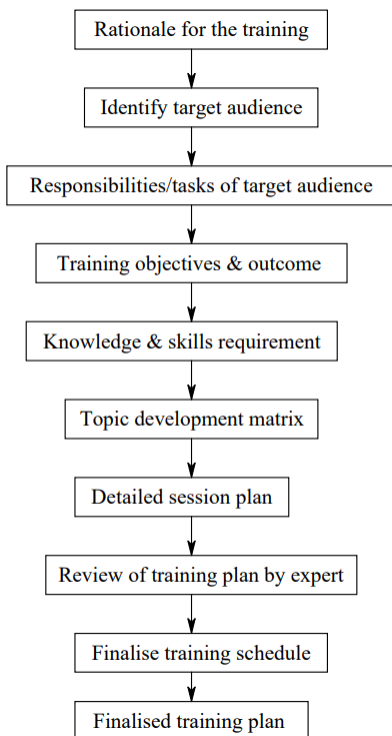
Training curriculum means an established set of course topics for instruction in an accredited training program for a particular discipline designed to provide specialized knowledge and skills.

In a participant-centered training programme, the needs of the participants are in the focus of the entire training. The main goal is to develop participants' skills, with an emphasis on improving them along with the knowledge. Once there is clarity on the reason for offering the training programme, the driving force in developing the curriculum is to identify the appropriate target audience and then address the details of their responsibilities and tasks. This forms the basis for the curriculum's development. Goals and outcomes provide greater direction to the educational programme. Unlike educational institutions where specific subjects are taught, in this context, subjects are integrated, and the training content includes several topics related to their responsibilities and tasks. The subjects to be taught are identified using a two-page matrix table, with the responsibilities in the first column and the objectives of the course in the first row. Based on this, the detailed content is determined, so unlike a typical classroom, practical and theoretical content is integrated. The course



duration must be determined, considering when participants may be absent from work and other obligations. Whatever is to be taught must fit within this period. Prioritizing the content will ensure that the focus is on the areas where participants require more in-depth input. The following flowchart (Diagram 1.) shows the various stages of curriculum development.

Diagram 1. Process flow for developing a training curriculum



3.1 Training content

Content includes the specific information, facts, attitudes, and skills to be taught through the training program. In a competency-based system, these are formalized in the competency statements. The following principles relate to the training content:

- the scope and depth of the content of any curriculum are determined by the competencies that the curriculum is designed to teach
- content should provide a theoretical framework and conceptual rationale for the training
- content should reflect the best standards of practice
- content should communicate a value orientation
- in a continuous training program, the content must be applicable in direct practice
- the content of a curriculum must be congruent and complementary both within and between sections.

3.2 Structure and format

This refers to the structure of the individual sections and the organization of the parts of the curriculum into an integrated educational unit. This includes the design of the individual sections to achieve the objectives, the sequencing of sections and activities, the establishment of time frames, and the design of connections between various sections.

1. The sequencing of activities within each section and the curriculum should be consistent with the natural learning process.
2. Knowledge and skills conceptually related or performed together in the workplace should be taught together.
3. A broad overview of the content at the beginning of the sequence provides a conceptual framework into which the participants can place the individual parts.
4. The principles of sequencing are from the simple to the complex, from the general to the extraordinary, and from the basic to the refined.



5. Repetition of the key concepts in different contexts facilitates understanding. Linking sections within a curriculum helps to make logical connections between previous and current training content and to identify different situations in which similar knowledge and skills are applied, further promoting retention and generalization.
6. Allowing sufficient time to cover the content in the desired depth. Compressing the content into an unrealistic amount of time limits the effectiveness of the training. It cannot be done faster than the natural course of education process dictates.

3.3 Training methods

Training methods are the strategies used to deliver content and promote learning and knowledge retention. In the in-service training curriculum, training methods must be appropriate for use with adult learners in an applied setting. The method best suited to achieve the objective of the section should be selected. The usual course of action is the following:

1. Use a presentation to quickly convey information.
2. Use discussion to reinforce information and promote understanding.
3. Ask trainees questions or use exercises that feed information back to the trainer to determine how well trainees understand the content.
4. Use experiential (experience-based) exercises and examples to promote self-awareness.
5. If participants have prior knowledge or preconceived notions about the content, use the activity that challenges the mindset and motivates participants to rethink their own beliefs.
6. Use exercises and simulations to encourage application of the content to work tasks and develop trainees' skills.
7. Use activities that identify solutions to potential workplace or logistics process obstacles
8. Present the same concepts with a variety of learning strategies to ensure that trainees with different learning styles can absorb the knowledge. Listening, viewing, modeling, and then practicing the training content reinforces learning for individual trainees.



3.4 Framing the learning outcomes of each module

Learning outcomes are statements of the knowledge, skills, and abilities that individual participants should possess and can demonstrate upon completion of the learning experience or sequence of learning experiences.

They help the participants:

- understand why this new knowledge and these skills will be useful to them
- focus on the context and possible applications of knowledge and skills
- connect learning in different contexts
- guide assessment and evaluation

Good learning outcomes emphasize the application and integration of knowledge. Rather than focusing on covering the material, learning outcomes articulate how participants will be able to apply the material, both in the context of the class and more broadly.

Within the didactic concept, the teaching methods in this course program will include theoretical lectures, seminars and tutorials, individual practice work, extracurricular lectures by guest lecturers and key figures identified by the responsible project partners, active participation in debates and knowledge sharing. The course needs to provide participants with a favourable and diverse quality study environment to achieve specific knowledge and competences in areas of novel technologies applied to traditional boats and their implementation in order to have a successful knowledge transfer in the real market scenario or even further lateral advancement and transfer to other business and practical areas for implementation of innovative digital technologies. In order to identify satisfaction with the learning outcomes of the modules, a comprehensive collaborative environment with all the parties will be created and thus ensure that all members participate in their own evaluation and quality improvement processes, by means of open discussion with project partners where syllabi, learning outcomes, assessment forms, assessment results as well as overall performance of the courses are discussed. It is important to identify how much they have met their goals and objectives for the respective course in relation to the teaching process, how much they have done individual research and practical work, and how satisfied they are



with the courses offered for their overall professional development and improvement of the knowledge of traditional boats implementation in tourism in their area of work.

The learning outcomes for the courses are formulated based on the approach adopted by the partners in charge, which includes transferring knowledge, skills as well as broader competencies. Learning outcomes reflect the indicators aligned with the application form, as they provide the provision of practical and theoretical knowledge, the development of participant skills for independent research work within the field of traditional boats, collection and interpretation of relevant data to come up with judgments as well as apply their knowledge to problem solving within the implementation of the traditional boats in tourism. In accordance with the identified requirements in addition to providing participants with the basis for progress in further areas, the courses are outlined so to provide them also with possibility to apply new knowledge in other business and academic areas.

3.5 Framing the objectives and outcomes of the course

The objectives would make it possible to determine the focus of the course. The objectives should be based on the knowledge and skills that the candidate is expected to acquire through participation in the training. The outcome decision would determine the exact impact of the training on the participants.

Every course needs to be adjusted with the general mission (objective) outlined in the TOFOLA application form. The course objective needs to be in compliance with the overall mission statement of the project. The design of the course was preceded by a comprehensive process of consultation and review with the involved project partners and builds upon professional experience of the responsible project partner in dealing with the stakeholders in the area of usage of traditional boats. This process was carried out in accordance with the goals set out in the application form.

Therefore, the knowledge transfer within course execution is done as an intra-team effort, where higher instances of the project partners already having adequate levels of knowledge transfer it to lower instances, end-user participants and involved stakeholders.



3.6 Creation of the training plan

Similar content should be grouped together, and the logical flow or sequence determined, keeping in mind that some topics must be taught before others, in a logical order of sequence. The duration should be determined, considering the person's availability and individual focus capabilities. The content and training plan created so far must be fitted into the available time period. This is where weighing several topics helps in deciding how to allocate time.

3.7 Direct measures for evaluation

Direct measures of assessment of learning require participants to demonstrate their knowledge and skills. They provide tangible, visible, and self-explanatory evidence of what participants have and have not learned as a result of a course, program, or activity. Examples of direct measures include:

- objective tests (written, oral, or using LMS – Learning Management Systems)
- essays
- presentations
- in-class assignments
- portfolios

The organization of the cross-border training curriculum on use of the traditional boats in tourism will provide interesting results to enhance management efficiency and effectiveness in many areas of the supply chain.

It is a commonly accepted fact acknowledged by numerous research work conclusions that digitalization rests on the shoulder of people that used it. The issue of human capital is, consequently, crucial for successful adoption of the traditional boats in the tourist market context. Two crucial questions to which the cross-border training curriculum need to shed light on is:

1) how to attract and retain talent; and



2) how to use software resources for better recruitment, development, and training processes.



4. Contents and Materials of TOFOLA Training Modules

4.1 MODULE 1 – Dedicated to young people/students

Navigare necesse est, vivere non est necesse

This famous saying, attributed by history to the Roman general and politician Gnaeus Pompey (106 – 48 BC), strongly reflects the spirit of the time when sailing was more than a choice – it was a matter of survival. The sea was the basis of life for many peoples who searched the coast for food, security, trade and the spread of influence. In this context, navigation was not only used for transport, but also for fishing, exploring new areas, trade and conquering and defending territories.

Maritime peoples perceived the sea as a natural source of their prosperity, as a symbol of power and reputation, but also as the foundation of their own culture and identity. With the development of shipbuilding and advances in the knowledge of navigation, new opportunities opened up for the expansion of state power and influence, with the sea becoming a bridge between different countries and peoples.

The concept of globalization, which today is often associated with modern times, actually had its roots in the distant past, when people, goods and ideas began to spread first through rivers and lakes, and then through seas. Until the discovery of the New World at the end of the 15th century, the Mediterranean Sea, including the Adriatic Sea, played a key role as one of the most important centers of the world. Throughout history, the Mediterranean has been a place where different civilizations, customs and cultures have met and intertwined, making the sea not only a geographical border, but also a link between nations.

4.1.1 Traditional boats on the Adriatic and in Venice

The most common types of traditional boats on the Adriatic

On the Croatian Adriatic coast, especially in the Kvarner area, a rich range of traditional boats has been developed, which testify to the centuries-old connection of the local population with the sea. These boats, adapted to the specifics of the climate and the way of life, reflect the excellence of traditional shipbuilding, with pronounced differences in hull lines, construction, general plans and sailing.



The simplest form of a boat is represented by monoxils, hollowed out of a single piece of wood, known as ladva, chupa or zoppolo, which were used for short voyages and fishing along the coast.

Among the more complex types, the lađa stands out, especially the Rab lađa or laja, recognizable by its elegant hull lines and solid construction. A similar type is the guc, whose variants such as the Kvarner guc and the Opatija guc are especially appreciated for their characteristic hull lines and balanced design. The Opatijski guc is also known for its precise longitudinal construction and the shape of the sail that allows easy maneuvering during coastal navigation.

Pasara is another widespread type of boat, ideal for everyday tasks at sea. Her hull lines are simple and functional, and there are detailed master plans, longitudinal cross-sections of the structure and sailboat plans. Particularly noteworthy is the Lošinj regatta pasara, which is used in regattas and has refined hull lines and a developed sail system.

Gajeta, an example of which is the Krk gajeta, has a traditional shape and numerous variations. It has a clear master plan, functional sailboats and optimal hull lines. Among them is the Lovran guc, also known as the Lovran gajeta, which has its own general plan, a precise longitudinal cross-section of the structure, defined hull lines and a traditional sailboat.

For larger naval ventures, the leut, a robust ship with powerful hull lines, a rich general plan, detailed construction and complex sailing, was used. Similar qualities have bracera, the design of which is adapted to freight traffic. The Bracera has defined hull lines, an elaborate general plan, a longitudinal section of the structure and an efficient sailboat. A variation of this type is the Istrian bracera.

One of the most recognizable types of Kvarner shipbuilding is the batana, a flat-bottomed boat. The Rovinj batana, for example, is known for its hull lines, general plan, longitudinal cross-section of the structure and specific design, side plan and plan of the sailboat. There are also other variations such as the Savudrija batana, the batana with two looms, the batana with a V bottom, the batana with a semicircular stern, the batana of transverse construction, the batana with a keel, the Kvarner batana, and a larger version – the large batana or batelon.

Among the smaller boats there is the batelina, while the batiel stands out for its specific hull lines and cross-section of the structure, and finally, we should mention the bragoc, an imposing sailing ship often used for longer voyages and larger cargoes.



All these boats represent a living heritage of the maritime tradition of Kvarner and the Croatian Adriatic coast, not only as means of transport but also as symbols of the identity and mastery of local shipbuilders.

Traditional boats – Venetian lagoon

On the Italian side of the northern Adriatic, especially in the area of the Venetian Lagoon, a rich tradition of building wooden boats has developed, which are perfectly adapted to sailing the shallow and calm waters of the lagoon, canals and coast. These traditional Italian boats represent a combination of functionality, elegance and craftsmanship that has been passed down through generations.

One of the most famous lagoon boats is the sandolo – a slender, light and extremely agile boat that was used for personal transport, fishing and even rowing races. Similar, but even smaller and more discreet, is the s'ciopon, designed primarily for bird hunting, often equipped with a small cannon – which is what gives it its name.

In contrast, the mascareta is an elegant rowing boat that was often used by women in the past. Low, narrow and simple in construction, it is ideal for steering in the narrow canals of Venice.

The Cofano is a lesser-known but very useful workboat, often used to transport goods or tools, while the sanpieroata, a more robust and multipurpose boat, is named after the Venetian patron saint Saint Peter. Its sturdy construction makes it suitable for calmer open seas.

The Caorlina is larger in size, symmetrical and recognizable by its striking shape, ideal for carrying loads and participating in traditional rowing regattas. On the other hand, the topo venessian is a simple, working boat typical of everyday chores in the lagoon, appreciated for its stability.

Batelo a pisso is another functional type of boat, designed to perform various tasks such as fishing, transportation, or even as a support boat for larger vessels.

Among the traditional fishing boats, the bragagna stands out, characterized by a flat bottom and a practical superstructure that allows work and protection during fishing.



Larger and more impressive is the bragozzo, a traditional fishing sailing ship with a richly painted bow and sails, which once dominated the northern Adriatic as a symbol of fishing power and lagoon aesthetics.

A smaller variant of the bragozzo is the bragozzetto, adapted for smaller crews and shorter voyages, but with the characteristics of the larger version preserved.

All these boats testify to the ingenuity and adaptability of Venetian and Adriatic shipbuilders, and are an indispensable part of the cultural and maritime heritage of Italy.

Transport of cargo and people by traditional vessels

In the period before modern means of transport, traditional vessels were crucial for transporting cargo and people along the Croatian Adriatic coast. Their adaptability and functionality made it possible to perform a variety of tasks, from supplying coastal settlements to transporting agricultural products, timber and working animals.

For the transport of cargo, the bracara, a sturdy and spacious merchant vessel capable of carrying large quantities of goods, stood out. Her wide deck and deep bowels made her ideal for long journeys between ports. For the same purpose, a trabakul was used, a slightly heavier ship with a larger draught, which regularly transported firewood, timber, and even barrels of wine, which was a common sight on the decks of trabaccoli moored to the breakwater of the port of Rijeka.

In the Dead Channel, a historic mooring in Rijeka, the ships were tied tightly to each other, forming a network of life and exchange. From here, they headed for smaller ports and islands, often using access roads – puntija, to enable easy embarkation and disembarkation of passengers and goods.

It is interesting that on the gajeta, one of the most common smaller coastal boats, not only cargo was transported, but also working animals, especially on the islands where they were used for agricultural work and transport. Gajeta was a multipurpose vessel that successfully connected the islands to the mainland.

A smaller logger, originally used to transport goods, was sometimes converted into a sandblaster, a specialized vessel for transporting sand, and would sail towards the port of landing, supplying construction sites and the coast with building materials.



In recent times, traditional vessels have also been given a new function. Today, for example, the transport of tourists is organized on the "Opatijski guc", which combines cultural heritage with the tourist offer and enables an authentic experience of sailing through Kvarner.

In all this, traditional vessels were not only means of transport – they were the lifeblood of Adriatic everyday life, guardians of connections between land and islands, people and nature, past and future.

Sea fishing

Fishing in the Adriatic has always been more than just an economic activity – it was a way of life, knowledge that has been passed down through generations, a skill and a relationship with the sea. Traditional fishing techniques and tools have been developed in accordance with natural conditions, fish species and the possibilities of local communities, creating a rich and diverse fishing heritage.

One of the oldest techniques was fishing with barbs, with the help of barbs, three-toothed or multi-toothed fish used to catch fish from the shore or boat, often at night, with the help of a lantern or an iron device for lighting – grille. This method required patience, good eyesight and a steady hand.

Different tools were used for fishing with a hook: kančenica (also known as kanjavača) and cast (or rope, or tuna) were simple tools for fishing from a boat or from the shore. Billboards, towing hooks, were often used during navigation. The solitary was a special type of panula with one hook. For a larger catch, a longline was used, a long thread with a series of hooks. Before descending into the sea, it was necessary to put the bait on hooks – hooking, and the longlines were stacked in a wooden basket or crate (crate).

Fishing with traps was extremely widespread. Shrub traps were the first form of traps, while later wire traps, specialized in catching shrimp, came into use. Net fishing was developed through numerous forms of gillnets – from single to triple, which caught fish by tangling methods. Fishermen lowered and raised the nets daily, often by hand, and later dried the cotton nets in the sun.

Special nets such as the migavec were lowered into the sea (kalevala) and then hoisted onto the boat, while larger seines were pulled and pulled ashore, often with the help of the entire village. Tools such as scarves, dradzi, kogol and spreaders (tavulaci) were also used in hunting.



One of the most complex techniques was the technology of bottom trawling with a single boat, also known as trawling, where the net (sack) was lowered, pulled with sails, and the catch was lifted with a winch with a reel. The fish was lifted from the sea, sorted (sorted) on the deck, then loaded into crates – incashetting, and unloaded on the waterfront, where it would be sold on the fish market (placa).

Fishermen also used techniques such as riddlefishing, frožat and ludra, often at night. There were also purse seiners, who, in cooperation with two spark plugs, carried out the phases of active purse seine fishing: the beginning of lowering the net, raising the net over the Puretić block, manually clamping the net bag (saka), lifting the fish on the deck, stacking the end of the net after fishing, and then unloading the net from the boat and rearranging the net (picking).

At the end of each fishing day, repairing the nets (patching) was an unavoidable job. Whether on a boat or on the waterfront – as was often the case in Crikvenica, fishermen carefully renewed their gear, preparing for a new day at sea.

This rich world of traditional fishing, with a multitude of techniques and tools, testifies to the deep understanding of the sea, fish and the rhythm of nature, which has shaped the lives of Adriatic fishermen through the centuries.

Development of shipbuilding and navigation in the Adriatic Sea

Before the Middle Ages, the Adriatic was most often sailed by Romans, Liburnians, and occasionally Greeks, leaving a strong mark on the development of seafaring and shipbuilding in this area. Learning from each other, they acquired knowledge about shipbuilding and navigation techniques. An example of such an exchange is the warship Liburna, whose construction was taken over and perfected by the Romans in the 1st century BC, adapting it to their military needs.

In order to make the best use of the natural marine resources, the local population began to develop traditional vessels – simple but efficient boats designed primarily for fishing, cargo and passenger transport. Knowledge of their construction was based on local traditions, passed down from generation to generation within coastal communities.

Shipbuilding skills could be divided into two levels: basic knowledge, which included woodworking, and more demanding knowledge, which included building, shaping the hull and adapting the vessel to the specific conditions of the area.



Vessels intended for coastal navigation were smaller and lighter, mostly powered by oars, but often also by sail. In shallow waters, flat-bottomed vessels prevailed, while the more open seas required larger, more robust vessels, whose construction allowed safe navigation and was primarily based on sails.

This early shipbuilding knowledge laid the foundations of a rich maritime tradition that developed over the centuries on the eastern coast of the Adriatic.

Traditional shipbuilding and navigation on the Adriatic developed primarily out of practical needs – first for fishing, and then for trade and transport of people and goods. An important factor was also the dietary custom of the Italic population, based on seafood, which encouraged a significant fish trade between the Adriatic coast and the Apennine Peninsula. Numerous Venetian fishermen, especially the *Ćozoti*, who regularly came to fish along the eastern Adriatic coast, also participated in this trade and fishing.

The development of the merchant ship began as early as the 12th and 13th centuries, often with a dual function – both commercial and defensive. However, the roots of shipbuilding go even deeper. The first challenge for a man was to cross a water obstacle – a river, a bay, or reach a nearby island. Initially, dry logs were used, and then joined logs, which made the vessel more stable and useful, allowing more people, goods or fishing to be transported. Propulsion was carried out with a pole, oar or using animal skin as a sail. By hollowing out thick logs, monoxils – *ladve* – were formed, and a great progress was the transition to formwork construction.

One of the earliest examples of such construction was the *nađa* (Rabska *laja*), in which ribs would be installed on the basic hull – the conditional keel – to which the plates (formwork) would be fixed. A similar construction was used by the Liburnians, who developed two types of ships: *trabikes* for trade and *serials* for war campaigns. Both had a longitudinal keel, ribbed structure, and plating, and some had a deck. The joints were fixed with wooden nails, and "sewn" formwork was also used in *trabics*.

The largest center of shipbuilding in the northern Adriatic was Venice, while from the east coast Senj stood out, known for the production of wooden oars that were exported along the entire Adriatic. In Istria, shipbuilding of smaller vessels was extremely developed, especially in Rovinj, which produced typical fishing vessels. The abundance of forests and favorable coastal conditions enabled the growth of the Istrian merchant navy. During the



15th century, shipbuilding developed more strongly in Rijeka, where ship equipment was first produced.

In some parts of the east coast under Venetian rule, shipbuilding stagnated, due to the monopoly of Venice or bans aimed at preserving wood for the needs of the Venetian fleet. Despite this, in the 18th century, seafaring on the east coast was revived, and shipyards were established in Rijeka, Kraljevica, Bakar, Volosko, Ika, Lošinj, Senj, but also in the central and southern Adriatic. Senj also became famous for its rope and sail factory.

With the Industrial Revolution and the discovery of the steam engine at the beginning of the 19th century, sailing ships slowly went out of use, and the first steamships appeared. At that time, shipbuilding activities were also growing stronger in Koper, Izola, Portorož, Piran, Rovinj, Novigrad, Fažana and Pula. In 1883, the last long-distance sailing ship was built in Rijeka – "Capricorno".

In the second half of the 19th century, Rijeka became a place of revolutionary invention. Giovanni Luppis from Rijeka devises a way to attack enemy ships using a guided boat filled with explosives, which was the forerunner of the torpedo. It was technically perfected by the Englishman John Whitehead, which made Rijeka the cradle of the first torpedo in the world, an invention that forever changed naval warfare.

The method of building traditional boats has not changed much for centuries. Although new tools and machines were gradually developed, the basic principles remained the same. With the advent of the engine, the hull lines of the boats begin to change. Boats powered by oars were narrow and long, while sailing ships had wider sides to better withstand tilting under the action of the wind. With the introduction of internal engines, pasares are increasingly used, with solid lines at the stern that provide greater lift and stability.

In the Adriatic, two main wind systems prevail – north and south, and in summer the mistral. Sea currents flow counterclockwise, but they are not particularly strong. In winter, especially in the northern Adriatic, navigation is difficult due to strong winds, high waves and fog. However, the eastern coast of the Adriatic offers more opportunities for shelter and orientation during sailing.

In the era of the Venetian Republic, galleys regularly sailed to the Black Sea, Alexandria, ports of the western Mediterranean, and even to the shores of the Atlantic, passing through the Strait of Gibraltar. Venice established trade colonies in these areas, and pilgrims to the Holy



Land were transported by galleys. Interestingly, many testified that the Kvarner Bay was the most dangerous part of the entire trip, due to its specific meteorological and navigation conditions.

4.1.2 Career Opportunities in Traditional Boat Restoration

Drafting (photogrammetry method)

Photogrammetry is an optical measurement method that determines the spatial coordinates of the points of the observed object based on photographs taken with a camera. The basis of this method is the principle of triangulation, which makes it possible to accurately determine the position of each point in space from multiple perspectives.

After an object – for example, a vessel – is recorded from different angles, computer digitization follows using specialized photogrammetric software. This software analyzes the captured photos and reconstructs a digital 3D model of the real object based on them.

Once a 3D model of a vessel's hull is created, it can be used for a variety of purposes. In addition to technical documentation and analysis, the model can be integrated into virtual reality to enable a realistic and interactive experience of the vessel – whether for educational, exhibition, design or promotional purposes.

Today, the digitization of traditional boats using the photogrammetry method is an important way of documenting, preserving and displaying them in virtual space. This method allows for the creation of precise drawings and 3D models, which are used for analysis, restoration, education or the creation of virtual representations of boats.

The process begins with the calibration of the digital camera, which checks and adjusts the optical accuracy of the device. This is followed by the marking of the real model, i.e. the boat, where the markings from the calibration sheet are placed on the surface of the object. These tags serve as reference points for later processing in the software.

After marking, the model is photographed from multiple angles, which ensures a sufficient number of overlapping shots needed for 3D reconstruction. The captured photos are then entered into a computer program, where points on the photos are marked and referenced. This means that certain points on the surface of an object are recognized and connected through multiple images, allowing for precise measurements in space.



This is followed by an iterative data processing process, in which the model is corrected and adjusted until satisfactory accuracy is achieved. Once this process is complete, the resulting 3D model – which includes important technical elements such as hull lines – can be exported to external 3D/CAD or graphics programs, where it is further used for technical processing, visualization or preparation for virtual reality.

Working on specialized software enables additional processing and creation of virtual representations of traditional boats, which opens up new possibilities for their presentation in museums, educational platforms or digital archives. In this way, the long-term preservation and modern interpretation of the rich maritime heritage is ensured.

3D scanning and digital reconstruction of historic vessels

3D scanning is a modern method that provides a digital reconstruction of a real object – such as a historic boat or ship – in the form of a precise spatial model. During the scan, a point cloud is collected. Point Cloud), where each point has its own spatial coordinates (x, y, z). By connecting them in computer software, a digital 3D model of the object is created.

The most commonly used are non-contact active 3D scanners, which function according to the principle of structured light. Such a system usually consists of a projector and two cameras. The projector emits a predefined pattern of light onto the surface of the object, and the cameras record the deformations of the pattern caused by the shapes of the surface. The software then analyses these deformations and converts them into accurate geometric information – a point cloud that shows the shape and dimensions of the scanned object.

The process of 3D scanning and digitization involves several stages. First, the preparation of the object for scanning is carried out, followed by the installation and calibration of the 3D scanner. The very act of scanning the object results in the creation of a point cloud, which is entered into the processing and reconstruction software in the next phase. During this processing, the point cloud is transformed into a 3D mesh – a digital model ready for further analysis and use. The final stage includes the analysis and optimization of the model, to ensure accuracy and functionality.

The application of 3D models in the context of traditional vessels and maritime heritage is multiple. In the field of documentation and archiving, such models enable the creation of precise digital records of historic ships, which can be used to permanently preserve the shape and details of vessels. In inspection and condition analysis, the 3D model helps to



detect deformation, corrosion and structural damage, which is extremely useful for restoration and conservation work.

In the context of design and reconstruction, 3D scanning is used in engineering and shipbuilding analyses – for example, to make new parts based on existing ones (so-called reversible engineering). In addition, such models find their role in simulations and visualizations, including virtual reality, navigation training, and interactive museum displays, bringing traditional maritime heritage closer to the general public in a modern and accessible way.

4.1.3 Methods of building traditional vessels - Tools and techniques of traditional shipbuilding

The construction of traditional boats, such as pasara, guc or bracera, required exceptional precision, patience and masterful skill. Shipbuilders used a variety of tools and techniques, which have been passed down through generations, and many are still used today in the restoration and construction of wooden ships.

Preparation and measurement

At the very beginning, the shipbuilding semi-model – a miniature wooden model of a ship, most often for the pasara – served as the basis for drawing the hull lines. These lines were then transferred to actual size using a set of shipbuilding templates, while accurate measurements were determined using angles (cinders) and movable protractors (cartabons). For this purpose, metal measuring instruments, a carpenter's gauge (rafet) and a carpenter's tape measure (pâté) were also used.

Woodwork

For the initial processing of wooden logs, a large saw, also known as a martyr's saw, was used, while the use of a band saw (bansega) was increasingly common for sawing thinner elements. In finer phases, classic carpentry saws were used, as well as smaller saws (šegaci or šegeti).

When shaping and aligning elements, shipbuilders used different types of planers – from classic planing, planing with replaceable blades, long planing (šoraman), to planing with an adjustable working base, depending on the size and curvature of the wood. A knife and a scythe were used for fine alignment, while shipbuilding tesla and axes were used for rougher processing.



When drilling and shaping holes, hand drills, violas, and various drills were used, and over time mechanical hand drills (trapan). Files and curved chisels were used for precise processing and finishing, while a device for grinding and maintaining teeth was necessary for the maintenance of saws.

Joining and assembling elements

When connecting the wooden parts of the ship, special tools were used, such as a hollow blower (tirabroche) and dedicated pliers (troncheto). To fasten the parts in the construction process, carpentry clamps, both iron and wooden, were used.

Stages of hull construction

The basic construction of the ship begins with the keel, which is connected to the looms (aštas) and contrasts (kontraaštas). Ribs (piani and korbe) are placed on the keel, and then the exchange of friction (cente) and subclamp (contracente) is installed, together with the clamps (žbaji).

Further phases include the installation of a winding rope (pajoli faša), a bench (bank foil), and the construction of linica (dead gangs). On the hull then the platters of the formwork (madera) are installed, and then the deck frictions, which form the deck (envelope).

Finishing & Equipment

After assembly, the hull is subjected to shaping, which involves pressing the rope using a cauldron hammer, chisel and pole (komanda). This is followed by puttying (stuccoing), applying a primer and finally painting (painting) the boat.

In separate workshops, masts are made, as well as equipment such as oars. Before making the sail, it is necessary to trace the sail, and then sew it by hand using needles, overarms (guards) and other hand sewing tools.

Ultimately, an engine can also be installed on the boat, which adapts the tradition to modern needs, while maintaining the authentic shape and functionality of the vessel.

Maintenance of traditional vessels

Sailing ships and braceres were most often maintained by leaning on the karen (karina) – which allowed access to the underwater part of the hull for cleaning, painting and repairs.



4.1.4 Project Arca Adriatica – Academy of Traditional Shipbuilding

The Arca Adriatica project represents a significant initiative aimed at preserving, promoting and valorizing the Adriatic maritime heritage. Launched on January 1, 2019, the project is part of the INTERREG V-A Italy – Croatia program, with a total budget of €3.16 million, of which 85% is co-financed by the European Regional Development Fund.

The main goal of Arca Adriatica is to develop a joint tourist product based on the principles of social and environmental sustainability, which at the same time valorizes, preserves and promotes the rich maritime heritage of the border area. The project involves ten partners from Croatia and Italy, including the Primorje-Gorski Kotar County (lead partner), the Municipality of Malinska – Dubašnica, the Kvarner Tourist Board, the Ecomuseum "House of Batana", the Municipality of Tkon, and the Italian municipalities of Cervia, Cesenatico, San Benedetto del Tronto, the University of Ca' Foscari from Venice and the Mediterranean Agronomy Institute from Bari.

Numerous activities were carried out through the project, including the restoration of 23 traditional boats, the creation of technical descriptions and drawings, and the organization of workshops on old crafts and skills. Seven centers of excellence and five interpretation centers have been established, including those in Malinska, Rovinj, Tkon, Cervija and Venice. Also, cultural and tourist events such as regattas of traditional boats and sea festivals are organized, which further promotes maritime heritage and encourages sustainable tourism.

4.1.5 Preservation and revitalization of the maritime heritage of Kvarner and Istria

The preservation and valorization of the maritime heritage of Kvarner through the Mala Barka and Arca Adriatica projects is not just a local story, but a model of successful European cooperation and sustainable tourism. The project "Little Boat 2" was declared the best EU project of Croatian counties in the category of cross-border cooperation for 2020, according to the decision of the expert jury as part of the competition conducted by Jutarnji list, in cooperation with the Croatian Association of Counties, the Office of the European Parliament in Croatia and the Župan.hr portal.

Following this, the Kvarner Maritime Heritage brand, developed by the Kvarner Tourist Board and partners during the implementation of the Mala Barka 2 and Arca Adriatica projects, has brought a number of international awards. Thus, in 2022, the "Kvarner Maritime Heritage"



project won 1st place for the best thematic product of sustainable cultural tourism in Europe, while Mala Barka previously won 3rd place in the "Community and Government" category for its contribution to sustainable tourism. In addition, the brand was awarded the BIG SEE Award in the category "Creative stories and destination identity as a unique experience".

The Coordination for the Preservation and Promotion of the Maritime Heritage of Kvarner received a special recognition from the Kvarner Tourist Board twice, in 2017 and 2024, for its contribution to the affirmation of the cultural identity of the region and the development of the Kvarner Maritime Heritage brand.

It is especially important to emphasize the recognitions in the field of intangible cultural heritage. "The Art of Building and Navigating the Traditional Boats of Kvarner" has been inscribed as an intangible cultural asset of the Republic of Croatia, and as part of the Arca Adriatica project, an application has been made for the inscription of "The Art of Sailing with Latin and Mainsails along the Croatian Coast" on the same national list. Furthermore, the Association of Maritime Museums of the Mediterranean (AMMM) has launched an initiative to inscribe this art on the UNESCO list of the world's intangible cultural heritage, aware of its value and the need for its permanent protection.

For the purpose of promotion and public awareness, two key conferences were held in the Marble Hall of the Maritime and History Museum of the Croatian Littoral in Rijeka: "Sail Kvarner with Us" (2022) and "The Art of Sailing with Latin and Mainsails" (2023), which brought together numerous experts, sea lovers and representatives of institutions.

However, challenges remain. There is no formal school for traditional shipbuilding, which further highlights the need to stimulate workshops where boats could be built and maintained. It is these masters of traditional craftsmanship who can also serve as educators of new generations, by transferring knowledge and skills that have almost disappeared.

For the commercial use of traditional vessels, it is necessary to meet strict technical and safety regulations, but it is through systematic projects and the support of local communities that it is possible to turn these challenges into opportunities.

The maritime heritage of Kvarner, transformed into a modern identity and tourist product, confirms that tradition can have both economic and cultural value – if we give it a good wind in the sails of tradition.



4.2 MODULE 2 – Dedicated to shipwrights

The training module aimed at shipwrights focused on the traditional construction and restoration of historic wooden boats, with the objective of enhancing artisanal skills related to classic seamanship and promoting the preservation of nautical heritage.

The first part of the session was conducted by Federico Lenardon, a self-taught master shipwright and naval designer with over thirty years of experience at the Monfalcone shipyard, active since 1995. Lenardon shared his artisanal approach, detailing the restoration processes of two historic vessels and the design of a new sailing boat, highlighting construction techniques, design solutions, and innovations introduced in the daily workshop practice.

Following this, the session continued with a technical deep dive by naval architect Dinko Salopek, dedicated to the design of the traditional wooden batana, a typical Adriatic craft.

The module opened with a reflection on the cultural and educational value of preserving traditional naval heritage, understood not only as safeguarding historical memory but also as an opportunity to pass on manual skills, ancient techniques, and specific competencies related to woodworking in the nautical sector.

4.2.1 Federico Lenardon – Restoration and Design of Wooden Boats

Restoration of Onkel Adolph

The vessel Onkel Adolph, designed in 1907, represents an extraordinary historical example of the International Rule Class. It participated in and won the first official regatta of the category held near Paris, becoming a significant reference in the birth of this sailing class.

The boat was recovered from a lake in former East Germany, where it had been deliberately submerged to avoid requisition during World War II. The restoration project followed a philological approach aimed at the utmost preservation of the vessel's historical and structural integrity, also thanks to the availability of the designer's original drawings.

The hull lines, proportions, and main construction elements—such as the keel, frames, and stem—were preserved. All the original internal metal components, made of steel and heavily corroded, were removed and replaced with wooden floors, more consistent with the structural framework and functional to the durability of the restoration.



The boat is built using the Anglo-Saxon method, which involves inserting the frames directly into the keel: a technique that over time has led to rot issues. Therefore, the intervention included targeted treatments to counteract these damages, employing mixed solutions that integrate traditional techniques and modern materials, such as epoxy resins, only where strictly necessary to stabilize original elements.

Point consolidations were carried out on the stem area, while beams and carlings were partially reconstructed, always respecting the original proportions and sections. The interior required complex interventions but many existing components were recovered and reinforced, restoring functional, historical, and aesthetic continuity.

Deck Reconstruction and Planking Work

About 80% of the deck was rebuilt from scratch, faithfully following the original 1907 design. The keel bolts were completely replaced, and the aft section of the keel was redone. The original keel was planed to remove deteriorated parts and reinforced with two layers—one internal and one external—thus creating a composite structure protecting the historic wooden core.

The planking underwent thorough cleaning. Modern sealants (synthetic cotton, polyurethanes) were removed and replaced with a partial splining treatment: thin wooden strips glued on one side only, used to regularize seams and allow traditional recaulk with cotton.

A particularly positive aspect was the good preservation of the original copper rivets: since they did not damage the planking holes, a complete replacement was unnecessary. This allowed preserving almost all original planks, avoiding invasive generalized substitutions.

The entire hull surface was sanded in preparation for finishing: polishing above the waterline and antifouling treatment below. The goal was to achieve a perfectly smooth finish coherent with the elegant, racing appearance typical of these boats.

The transom was also restored, dismantled, and reglued after careful cleaning. The deck's structural framework was almost entirely replaced, except for some central beams, preserved for both structural and historical reasons.



Deck Configuration and Final Fitting

Since the boat originally had a canvas deck, its original appearance was restored, but with a stronger structure. Two thin layers of marine plywood were overlapped, completed with central mahogany strips, thus recreating the historical configuration in a modern key.

The vessel proved slender, light, and surprisingly maneuverable, even in strong wind conditions. The deck layout was faithfully rebuilt, guided by the only available period photograph, which directed the positioning of the original equipment.

The name Onkel Adolph was hand-carved and finished using a traditional technique inspired by wooden models from the upper Adriatic, passed down through the artisan schools of Grado and Piran.

Equipment and Rigging

The original forged iron equipment was only partially recovered. Missing parts were reproduced in stainless steel, shaped to maintain visual consistency with the original. Some components, such as upper rings, were sourced in bronze from Italian suppliers to ensure continuity with historical finishes.

The gaff and peak were made of acacia, with final hand-made reinforcements. Running rigging was spliced manually using 49-strand Atlantic rope, with hand-stitched leather protections to prevent wear on materials and mast.

As per the original design, no winches were installed: all maneuvers are manual, maintaining full adherence to the construction era and the vessel's sporting spirit.

Sea Trials

Upon completion of the restoration, Onkel Adolph was transferred to an alpine lake, where it is kept by an Austrian owner passionate about classic boats. It is currently part of a group of five or six 6 Metre International Rule yachts built between 1908 and 1917, moored in the same waters.

The boat participated in a commemorative regatta for the 110th anniversary of the 6 Metre Class, held under strong wind conditions (15–20 knots). During trials, it demonstrated



excellent stability and responsiveness to maneuvers, standing out for precision and reliability.

The owner prefers to entrust the helm to the restorer during outings but manages maneuvers personally, in a relationship based on mutual trust and respect, acknowledging the historical and cultural value of the restoration work performed.

Restoration of HIAWATHA J. ANKER

The second major restoration project involved HIAWATHA J. ANKER, a rare example of a 7 Metre International Rule yacht, a sailing class now nearly extinct and produced in just over one hundred units worldwide.

The boat was found in Sweden, discovered by chance through an advertisement, and was in extremely poor condition: it had been completely covered in fiberglass between the 1950s and '60s and abandoned for decades in a forest, exposed to the elements. Initially, the possibility of using it as an ornamental sculpture in a park of a historic Austrian residence was considered, but after a year and a half of evaluations, a definitive decision was made: to undertake a full restoration, despite serious technical and historical uncertainties.

The restoration of HIAWATHA J. ANKER took four years of non-continuous work, involving complex phases, artisanal solutions, and numerous precision interventions.

Removal of Fiberglass and Structural Analysis

One of the first difficulties was removing the fiberglass, which could not be done using thermal methods without damaging the underlying wood. A purely mechanical approach was chosen, cutting the fiberglass into small panels and then removing each piece using wooden wedges and a hammer.

The adhesion of the fiberglass varied greatly: in some areas, moisture had weakened the bond, facilitating removal; in others, the adhesion was so strong that original planking had to be removed as well.

The structural investigation then revealed severe electrochemical corrosion: numerous copper rivets, in contact with steel, had completely damaged the heads of the frames and their connections with the keel, irreversibly compromising them.

Identification of the Vessel



With the support of Stockholm University, the historical identity of the vessel was confirmed: it is the Hiawatha, an original 1910 design by Johan Anker. Confirmation also came from a 1913 Norwegian publication containing a classified advertisement related to the boat.

To preserve the original shapes during disassembly, a full 3D scan of the hull was carried out, followed by CAD modeling of the hull lines and internal structure. The sail plan was only slightly modified to improve handling, maintaining the original proportions intact.

Structural Interventions

The restoration followed a precise operational sequence, starting with the construction of a new keel made of solid oak, shaped outside the hull and then inserted. During this phase, part of the fiberglass structure was temporarily kept to guarantee stability.

The reconstruction of the frames involved hybrid solutions:

- The main sawn frames were made partly from solid wood (upper part) and partly from multilayer laminated wood (lower part) to ensure stability and strength.
- The steam-bent frames, placed between the sawn frames, were completely rebuilt in laminated wood, as the internal space did not allow traditional steam bending.

Connections were made using laminated wood floors and stainless steel metal joints, with selective removal of remaining fiberglass and progressive restoration of connections through epoxy resin and appropriate bolting.

The original planking, made of Brazilian cedar (cedrella), showed surprising integrity: about 40% was recovered, particularly in the upper 8 planking courses. The remaining part, damaged near old metal floors, was replaced with selected mahogany due to the impossibility of sourcing cedar planks of compatible length.

The original planks were carefully cleaned and reintegrated into the new structure, glued and screwed to the frames using epoxy resin for greater mechanical strength.

Both terminal elements of the hull were completely rebuilt:

- The stem was remade and integrated into the structural frame with a full scarf joint.
- The sternpost, severely deteriorated at the base, was replaced with a new structure reinforced with a robust solid wood knee, glued and bolted.



Planking was completed "in reverse," starting from the middle towards the keel to maintain access to the ballast area and fastening bolts. This allowed safe completion of the final tightening.

The cast iron ballast, not original, is probably a post-war casting. Its asymmetrical shape required rebalancing by adding melted lead. After repositioning and fixing, the lower planking rabbet was rebuilt, finished with natural putty and cotton caulking. Planks in the submerged area were worked with partial splining to accommodate the cotton seam, while those in the emerged area were glued structurally.

The deck was completely rebuilt: sheathed in laminated plywood and finished with cedar strips, a preferred material for its lightness and durability.

The final result is aesthetically faithful and technically improved, also thanks to the use of selected materials. The rudder stock, originally solid wood, was replaced by a stainless steel component sized to reuse the restored original hardware.

At the owner's request, an electric motor was installed for harbor maneuvers. A dedicated technical compartment was prepared and a compact thruster with lightweight batteries installed, minimizing impact on weight and balance.

Sea Trials and Sailing Test

HIAWATHA J. ANKER returned to the water in September 2023 for the Annapolis Classic Week. During the regattas, it demonstrated excellent sailing performance, facing strong wind conditions with one reef and reduced jib, winning the race.

The behavior on the water confirmed the qualities of designer Johan Anker, nicknamed "Master of Lines" for the purity and functionality of his hulls.

Rig and Sail Plan

The rig chosen is the original sliding gunter rig, with a short mast and long sliding peak, a configuration reminiscent of the lateen sail. This type of rig, common on metric boats of the era, ensures excellent balance, maneuverability, and ease of use even with a small crew.

Project of "NABABBO IV THE BORN"

Introduction



In September of last year, “NABABBO IV THE BORN” was designed, a boat nearly 10 meters long (9.95 m), intended for an experienced owner active in national and European regattas. The main goal was to build a fast cruising yacht, easy to sail single-handedly. For this reason, a long keel hull was chosen, with traditional lines but optimized to be as light and performant as possible. The main challenge was to reconcile the traditional long keel with high performance, uncommon for this type of vessel.

Design and Structural Characteristics

The project features a very slender and sleek hull, as highlighted in the initial hand-drawn preliminary sketches which helped define proportions and present a clear vision to the owner. The waterlines are inspired by historic vessels, particularly the English Clyde cutters of the 19th and 20th centuries, known for their slenderness, deep lines, and low displacement. Further influences come from the studies of Knud Reimers and Lorraine Stevens, designers renowned for their focus on lightness and racing performance.

A distinctive element of “NABABBO IV THE BORN” is the particular curvature of the hull’s main section, characterized by a knee that reduces wetted surface. This design lowers the center of gravity, improving stability and performance. The rudder, with a straight diagonal cut, optimizes weight and volume distribution. The hull ends are flared and shaped to provide necessary drive both in light wind and in more challenging conditions. The external rudder is mounted on a transom, a functional choice that facilitates installation and maintenance.

The boat measures 9.95 m in length and displaces approximately 5,800 kg, with a waterline length of 8.75 m. The waterlines harmonize the profile of the stem and keel, giving the hull the sleek appearance of a fin. The ratio between structural weight and displacement is optimized to keep the structure around 50% of the total weight, concentrating the remainder in the keel’s lead. This ensures high stability despite the narrow hull, guaranteeing excellent performance without excessive weight.

The sail plan was designed to allow simple and safe handling even when sailing solo. There are two jibs, but they are not used simultaneously. This configuration ensures flexibility and safety even with a small crew. The total sail area is about 64 m², significant for a boat of this size.

Materials and Construction



The project was fully developed in 3D, with all components CNC-cut to ensure precision and speed of assembly. The frames were spaced on average 50 cm apart, about twice the usual distance, reducing the total number to 19 and lightening the structure. Steel components, laser-cut, were assembled on site, speeding up construction and ensuring a high-quality standard.

The keel of “NABABBO IV THE BORN” was made of solid wood, with subsequent insertion of lead positioned very precisely to ensure proper boat balance. The supporting structure was completed with the installation of false plywood frames cut by CNC, used as molds to laminate the final acacia wood frames.

The 38 frames (19 per side) were produced with techniques reminiscent of steam bending, using laminated acacia. The lamination jig was made of okoumé, a material chosen for its flexibility and strength. The frames were varnished and fixed to the keel using a cage of stringers and steel bolts, temporarily held in position by supports that were later removed.

The planking was applied following an American system, continuous over the hull, avoiding the typical interruptions of traditional techniques. The first layer consists of longitudinal planking clamped with chain clamps, followed by two diagonal layers that provide resistance comparable to carbon structures. Before the second layer, internal steel reinforcements tailored to support the outer plates were installed, strategically positioned to avoid visible plugs. The second layer was fixed with plastic straps, easing the removal of fastening points.

The interiors are minimal but functional, with an open space design hosting four berths, a watch berth, a galley, and a forward bathroom. Designed in 3D, the interiors optimize space, ensuring comfort and ergonomics, reducing the risk of accidental bumps. Their construction was separated from the hull, allowing uniform and high-quality spray painting.

The keel was built in two phases: an internal shaped part and an external piece that closes the planking. The parts were produced and preassembled in the workshop, then mounted and welded on site, significantly reducing working times. Whereas traditional construction of a boat this size requires about 6,000 hours, thanks to the innovative techniques used the time was reduced to about 4,500 hours.

Performance and Results



“NABABBO IV THE BORN” presents a harmonious design with a raked stem and straight keel, inspired by American models. Navigation tests showed top speeds between 8.5 and 8.7 knots and excellent ease of handling even in sustained wind. The boat participated in regattas with excellent results, achieving class victories and demonstrating a good balance between maneuverability and performance despite its compact size.

4.2.2 Dinko Salopek – Designing the Construction of the Wooden Batana

This section focuses on the *batana*, a small traditional boat typical of the Istrian coast. The batana, ranging from 4 to 8 meters in length and characterized by a flat bottom, is designed to navigate shallow waters. Its name refers to the action of "battering," which alludes both to the simplicity of the materials and construction techniques and to the steady rhythm of navigation that made this boat an everyday working tool for generations of fishermen.

Over time, the batana evolved from a row-and-sail boat to one equipped with a motor, adapting to technological changes and the needs of the local community. Today, it stands as an identity symbol for the city of Rovinj, where it is the centerpiece of the *Batana* Ecomuseum, recognized by UNESCO as an example of intangible cultural heritage preservation.

After introducing the batana and its cultural significance within the Adriatic context, the module offered a historical overview of naval construction evolution. This journey began with Neolithic dugout canoes—rudimentary boats made by hollowing out a single log—considered the earliest forms of water transport. From these simple boats, progressively more complex structures were developed to meet new demands related to navigation, trade, and conquest.

Through the analysis of notable examples, it emerged how wood served as the primary material in shipbuilding for centuries due to its versatility, availability, and strength. Examined vessels included ancient Egyptian boats built with imported cedar wood; Greek triremes, valued for their agility and triple rower arrangement; and Roman galleys, which introduced innovations such as metal joints and tar-based waterproofing.

The module then illustrated the evolution of shipbuilding in Northern Europe, with particular focus on Viking *drakkar* ships—sturdy vessels suitable for open sea navigation—and finally Renaissance ships such as caravels and galleons, used in oceanic exploration and mainly constructed from oak wood.



This historical overview helped to understand how techniques, materials, and cultural needs have continually interacted to shape the appearance, function, and spread of wooden boats, providing a rich and complex picture of maritime knowledge through time.

The batana embodies a perfect balance between functionality and tradition.

Its construction relies on the use of carefully selected woods based on their physical and mechanical properties: oak for structural elements due to its durability and resistance to moisture; teak, waterproof and resilient, used for decks and planking; pine, light and easy to work, employed for interiors; cypress, excellent against saltwater corrosion, reserved for masts; and ash, elastic and strong, ideal for frames and oars. Construction techniques are hybrid, involving treatments such as varnishing, caulking, and various assembly methods—from the typical Nordic *clinker-built* style, which requires no caulking, to the “carvel” planking typical of American tradition. These methods allow balancing historical fidelity with adaptation to modern requirements.

Concurrently, contemporary shipyards have introduced alternative materials to wood to meet new demands for lightness, durability, and ease of maintenance. Among these, FRP (fiberglass reinforced plastic) is widely used: light, strong, and easily repairable, it is ideal for practical, low-impact interventions. Aluminum, valued for its corrosion resistance and ease of fabrication, is used in small yards, though it lacks the material and symbolic value of wood. Steel, strong and formable, is less suitable for light boats like the batana due to its high weight.

Nonetheless, wood remains irreplaceable for those seeking to preserve not only the original aesthetics but also the traditional construction logic based on craftsmanship, manual work, and knowledge handed down through generations of master shipwrights.

The batana design process, as illustrated by Dinko Salopek, begins with an in-depth analysis of the basic needs and characteristics requested by the client. Establishing effective communication with the customer is essential to fully understand the intended use of the boat and to ensure expectations are realistic and shared.

This initial dialogue forms the basis for a detailed study of the vessel, including an accurate evaluation of weight and structural loads it will face during navigation.



Next, a preliminary structural draft is created, defining the general appearance and assessing the most suitable materials, considering their physical properties and resistance to the marine environment. In this phase, the main structural components such as frames and crossbeams are determined, with dimensions and sections designed to ensure robustness and functionality.

Specific details of the boat—such as deck, bow, stern, and planking—are also defined, essential for the technical and aesthetic success of the project.

The design process must comply with current regulations concerning safety and wooden ship construction. Project requirements include not only fundamental dimensions—length, width, and height—but also the layout of internal spaces, the composition of the supporting structure, and the specific weight of the materials used.

To ensure stability and durability, accurate sizing of structural elements is performed, evaluating sections, thicknesses, and volumes, without neglecting important construction details like joints, coatings, and fastenings, which guarantee waterproofing and resistance to weather and marine agents.

As an example, the project includes precise calculations on the dimensions of the side planking, deck covering, and the sections of ribs, frames, and stringers, which vary according to the number and spacing of the structural frames. These data are essential to achieve an optimal balance between lightness and strength of the boat.

Once the technical and structural details are defined, a proposal is drafted and submitted to the client, accompanied by technical drawings and specifications.

At the same time, dialogue is opened with authorities responsible for navigation permits, ensuring the vessel complies with all regulations and can be legally used in public waters.

The final stage of the project consists of preparing the executive technical drawings, including all construction details—from joints to coverings, fastenings, and arrangement of structural elements.

These drawings represent an indispensable guide for master shipwrights, enabling the creation of a batana faithful to traditional craftsmanship while meeting the most modern requirements of safety and functionality.



4.3 MODULE 3 – Dedicated to designers of the naval sector

4.3.1 Giovanni da Ponte Shipyard: Venetian Maritime Heritage, Craftsmanship Innovation, and Inclusive Boat Design

The shipyard of Giovanni da Ponte – an expert Venetian master shipwright – is located in Venice and is renowned for its long-standing artisanal tradition.

It stands out for its dedication to the design, construction, and repair of boats, particularly water taxis and motorboats used for passenger transport.

Although the shipbuilding industry in Venice today is significantly smaller compared to the times of the Serenissima Republic – with many small businesses often employing only a few workers – Giovanni da Ponte’s shipyard has chosen to invest significantly in order to continue growing, focusing on quality and innovation.

This commitment is reflected in an approach that skillfully combines craftsmanship and modernity. While modernizing its production processes, the shipyard maintains a strong connection to tradition, as demonstrated by the use of historical techniques for hull construction. Among these is the use of linen cloths soaked in linseed oil, which ensures both waterproofing and durability.

This combination of traditional and innovative methods allows the shipyard to guarantee the high quality of its boats, meeting market demands and continuously improving its facilities.

Craftsmanship remains central to the shipyard’s work: each boat is a unique piece, designed and built to measure according to the specific needs of the customer or project.

The shipyard also undertakes projects on behalf of public bodies and local law enforcement, developing specialized boats. One such collaboration involved the construction of the first armored boat for the Carabinieri in Venice – a 12-meter-long boat designed to ensure security during the transport of authorities within the city.

In the past, authorities would travel in armored cars as far as Piazzale Roma, and then continue in a gondola, facing significant vulnerability. The challenge of designing an armored boat was successfully met, addressing a need that had not previously existed in Venice.



The shipyard is also active in the field of accessible design, developing solutions to make boats usable for people with disabilities. The most complex project in this area involves a traditional wooden boat equipped with a movable platform designed to facilitate access for wheelchair users.

The platform lifts automatically, allowing barrier-free boarding, and the entire boat is designed to ensure stability even in the presence of high or low tides.

During the design phase, the importance of providing adjustable gangways was highlighted, as these are essential for ensuring access to the boat for people with disabilities.

One of the main challenges with gangway design relates to the excessive difference in height between the boat and the dock. Indeed, adjustable gangways have proven only partially effective in resolving this issue. In some cases, the slope becomes too steep, making it difficult for people using mobility aids to board or disembark safely.

As an alternative to gangways, the option of installing small cranes to lift the person directly from the dock to the boat has been considered.

This solution is particularly useful in ports or contexts where it is not possible to modify existing infrastructure to install accessible gangways. While more costly, the use of cranes represents a functional option when accessibility is a priority.

Regarding the boat's interior, during the design phase, the most appropriate solution was identified as adopting models with customizable interiors and modular configurations, capable of adapting to the various needs of passengers, particularly those with disabilities.

Among the proposed solutions, the use of customizable and modular interiors has been implemented in the developed boat and is considered a best practice in the field of accessible design. Features include removable seats, movable benches, and the ability to reconfigure spaces according to the specific requirements of passengers.

For example, in the presence of wheelchairs, some interior elements can be repositioned to ensure optimal comfort and safety, and to provide greater freedom of movement on board.

Special attention has also been paid to the shape of the boat's hull: a wide and stable design, ideal for navigating the narrow canals of Venice, where conditions are complicated by tidal



variations. In such contexts, boats must be designed to adapt to continuous water level changes, representing a significant design challenge to ensure accessibility in all situations.

The technical aspects described represent not only a design challenge but also a concrete commitment to social inclusion, ensuring that all people – including those with reduced mobility – can enjoy the fundamental right to barrier-free mobility.

The shipyard is committed to continuing the process of improving and refining its boats, with particular attention to accessibility for people with disabilities.

Among the planned initiatives is the development of a new prototype specifically designed to meet the needs of users with reduced mobility. This prototype will be created in collaboration with associations working with young people.

This experience represents a replicable model, with the goal of spreading accessible solutions in other urban settings or similar contexts, thus helping to respond to the growing demand for boats designed to ensure inclusivity and full usability.

4.3.2 Analysis of Traditional Construction Techniques of the Venetian Gondola: Visit to the Historic Headquarters of the Arzanà Association

The visit to the historic headquarters of the Arzanà Association, located in the Cannaregio district of Venice, provided an in-depth study of the construction methodology of local traditional wooden boats.

Among the boats preserved and restored over the years by the Arzanà Association, one of the most significant is a small gondola dating back to 1870, the only surviving example of a smaller type of gondola compared to the traditional one.

This model represents an exceptional historical asset, as it is currently the oldest existing gondola in Venice. Its uniqueness lies not only in its size, similar to those used in the Historical Regatta, but especially in its structure: unlike racing boats, this small gondola was designed for passenger transport within the lagoon, serving as a concrete testimony to the evolution of the use and construction of Venetian boats.

Venetian gondolas feature complex construction and morphological characteristics, the result of a historical evolution that led to the current shape, now mostly associated with tourism along the city's canals.



However, in the past, there were several gondola variants, differing in size and use: from small “gondollette,” employed for internal city transport, to four-oar gondolas used for longer routes, such as those toward Chioggia.

A significant example of this diversification is the 1870 gondola, currently conserved by the Arzanà Association. This was once a common type in the lagoon but has now almost entirely disappeared.

From a construction perspective, the building of a traditional Venetian boat begins with laying a central beam, a structural element that serves as the main axis.

The bottom planks and oak ribs—oak being a particularly durable wood—are then mounted on this beam, followed by the framing that defines the shape of the boat, developing symmetrically toward the bow and stern.

In simpler boats, the process follows a linear and regular sequence.

In contrast, gondola construction requires greater technical complexity due to its asymmetrical shape. Unlike other boats, the gondola is not symmetrical along its longitudinal axis: this asymmetry, necessary to optimize navigation with a single oar, is determined by the curvature of the central beam and the specific arrangement of the framing.

The gondola is built using so-called “sesti,” predefined templates that guide the shaping of the boat’s curves. Each template corresponds to a specific section and serves to precisely define the position of the framing and the curvature of the bottom, sides, and stern. Although similar in external dimensions, every gondola is custom-built, adapted to the client’s needs, following a technique that is both flexible and rigorous.

In particular, the assembly phase requires great precision: the framing must fit perfectly, and the “maestre” - beams that determine width and shape—are positioned with different inclinations between bow and stern to ensure the correct floating balance of the boat.

Materials play a fundamental role in boat construction. Elm has historically been one of the main woods used, especially for ribs and main beams, while the “forcole” (oarlocks) are sometimes made of walnut or maple due to their strength and compactness.

Elm is preferred for its high resistance and ability to withstand mechanical stresses and the humidity typical of the lagoon environment.



However, the availability of quality elm has progressively diminished over time, pushing builders to resort to alternative materials such as larch or, more recently, plywood. Despite these material substitutions, the traditional gondola construction technique remains essentially unchanged, preserving its uniqueness and connection to Venetian artisanal tradition.

Certain construction details merit special mention.

Among these is the use of “trincarini”- ribs connecting the framing—which play a crucial role in providing structural stability to the boat. These elements are not fixed with glue or nails but are assembled using manual joints, ensuring a precise and lasting fit between components.

A distinctive feature of 19th-century gondolas, no longer present in modern boats, is the finely crafted decoration of the side planks, often featuring fish-shaped motifs.

The gondola’s structural characteristics, such as a bottom approximately 30 centimeters high and inclined by several degrees, have been studied to compensate for the natural tilt during rowing, thus promoting effective maneuverability and optimal use of the oar. This bottom inclination contributes to the overall balance of the boat, allowing the rower to apply force more precisely while reducing water resistance. Similarly, the shape of the side is designed to allow the boat to lean slightly to one side, further improving stability and rowing efficiency.

Although these features may cause some instability in rough waters, the gondola was primarily designed to operate in calm, protected lagoon waters.

Additionally, the materials and thicknesses used—such as the approximately 3.5-centimeter-thick deck—have been calibrated to support the weight of a standing person while ensuring stability and ease of boarding and disembarking.

Every component is crafted with extreme precision, with particular attention to plank joints. Traditionally, cotton ropes impregnated with pitch were used to ensure watertightness between planks. The “calafato,” a skilled artisan specialized in sealing these joints, carefully applied the pitch to guarantee the boat’s waterproof integrity, preventing water infiltration.



During the second part of the visit, the manual *La gondola nei secoli* by Gianfranco Munerotto was examined. This work revisits and interprets traditional gondola construction techniques based on a 16th-century treatise by Teodoro Danicolo.

The historic text describes the procedure for building a gondola, providing practical guidelines on the boat's dimensions and geometry.

Although the boat described does not exactly match current models, it shares characteristics with those historically used as ferries, such as those crossing the Grand Canal.

Munerotto's manual provides precise technical data concerning the boat's dimensions, though it does not extensively address construction aspects related to the shipyard or internal reinforcements.

The information, while presented succinctly, proves surprisingly accurate when carefully read and properly contextualized.

Based on these indications, it was possible to reconstruct a gondola with slightly different shapes compared to modern ones but fully functional.

In particular, the analysis of geometric sequences shows how the bottom shape is designed to progressively contract, favoring optimal balance and greater rowing efficiency.

A central topic in the text is the concept of the "sesto," the geometric reference system used to define the gondola's shape.

The measurements related to the sesto are not expressed in minute detail but represent an essential starting point for design. The sesto drawing, provided in reduced scale, shows side lines that may appear somewhat irregular. However, this apparent imprecision is intentional: it reflects a construction approach where functionality prevails over strict symmetry. An experienced builder could interpret and flexibly adapt the outlines, shaping the structure according to practical needs.

The treatise also highlights that the final shape of the side was not rigidly fixed but could be deduced by comparing old drawings, particularly from the 19th century.

This analysis reveals the adoption of a parabolic curvature as an optimal solution to guarantee stability and maneuverability, although this is not exclusive to modern gondolas.



Finally, the parameter called “scorrere” (sliding) is examined—a fundamental technical measure that governs the progressive adaptation of the side curvature relative to the bottom line. Unlike the side shape, which is more flexible, scorrere is precisely defined with limits within which the builder must operate. This ensures the correct inclination, contributing to the boat’s stability and dynamic balance.

The concept of “scorrere” is based on the ability to progressively rotate and shift the frames, adjusting the boat’s curvature according to specific needs.

For example, to modify the bottom angle and achieve greater stability at the stern, the builder can regulate the curvature’s attachment point, producing a less pronounced line in the boat’s central part. Although the principle is simple, its application requires precise tools and careful planning.

The shaping of the frames also plays a crucial role.

Starting from the central frame, which serves as a reference, the successive frames are positioned according to a geometric progression that guarantees coherence along the entire structure.

This approach allows modulation of the gondola’s cross-section: a more “bulky” shape at the center increases stability, while a more streamlined line at the bottom favors speed and maneuverability.

Functionally, the “scorrere” and progressive rotation techniques enable control of the boat’s shape to suit its intended use, maintaining a balance between stability and agility necessary for navigation in both the lagoon’s calm canals and more dynamic conditions. The “sesto” thus becomes not only a geometric outline but a true grammar of naval construction.

Despite the evolution of materials and the introduction of new technologies, traditional practices remain central to Venetian gondola construction.

Shipyards continue to value centuries-old artisanal knowledge based on precise use of shapes, proportions, and assembly techniques.

What is particularly significant is how these historical methods still offer valid design insights today. The techniques described in ancient treatises, such as the “scorrere” of frames or



construction based on the “sesto,” contain geometric principles applicable in contemporary contexts.

If carefully reinterpreted, this knowledge allows the creation of efficient and well-balanced boats, demonstrating how tradition can form a solid foundation for innovation in naval design.



5. Proposal of intensive 1-Week training program

This 1-week training program addresses multiple areas and subjects. Several detailed training courses that form part of a comprehensive program. These include:

1. *Fundamentals of Traditional Boat Building: A Practical Workshop* – This course provides an immersive introduction to traditional boat building, teaching participants about materials, construction techniques, and safety features required for tourist-ready boats. The course combines practical workshops with theoretical knowledge to equip participants with skills for both modern and heritage boat construction.
2. *Heritage Boat Design Techniques: From Concept to Creation* – This course focuses on the design of traditional boats with an emphasis on both aesthetic and functional aspects. Participants learn to draft boat designs that meet modern safety standards while preserving historical elements. The course culminates in a comprehensive design project.
3. *Woodworking for Maritime Crafts: Constructing Tourist-Ready Boats* – This course blends traditional woodworking techniques with modern requirements for tourist boats. Students gain hands-on experience with material selection, boat construction, and safety features. Marketing and business strategies for promoting these crafts in tourism are also discussed.
4. *Artisanal Methods in Boat Construction: Tools, Techniques, and Applications* – This course emphasizes advanced boat-building craftsmanship, combining historical techniques with modern materials. Practical workshops allow participants to construct small-scale boats, while discussions on market trends and regulations ensure they understand the business aspects of artisanal boat building.
5. *Sustainable Design in Traditional Boats: Adapting Heritage Crafts for Accessibility* – This course focuses on integrating sustainable practices into traditional boat design, with a special emphasis on accessibility for people with disabilities. It covers eco-friendly materials, legal frameworks, and hands-on projects that incorporate inclusivity and sustainability into boat designs.

These courses offer a mix of theoretical learning and practical application, with a strong focus on sustainability, accessibility, and cultural preservation in the context of traditional boat building.



Table 1. Course summary

No of Modules:	5
Module duration (hours):	5
Course Duration:	1 week (total of 25 hours)
Course Level:	Intermediate
Completion Certificate: (if agreed by the consortium)	University of Rijeka, Faculty of Maritime Studies (or another institution)
Course Language:	English/Italian/Croatian

5.1 Fundamentals of Traditional Boat Building: A Practical Workshop

Traditional boat building is an art that combines time-honored techniques with the practical requirements of modern use. This course provides an immersive introduction to the construction of traditional vessels, emphasizing the integration of classical design elements with contemporary needs. Participants will learn about the various types of wood and other materials traditionally used in boat building, alongside modern substitutes that offer durability, sustainability, and cost-efficiency. The interaction between materials and design principles forms the core of the curriculum, allowing craftsmen to recreate historical boats that meet today's standards for safety and functionality.

The scope of this workshop includes understanding the structural integrity required for boats intended for tourism, focusing on stability, capacity, and comfort. Instruction on how different building techniques affect the vessel's performance in water will be provided, demonstrating how traditional aesthetics can be preserved while enhancing vessel functionality. The workshop also covers the adaptation of these boats for various tourism purposes, such as sightseeing, fishing, or cultural demonstrations, ensuring that they serve both educational and recreational roles effectively.

Challenges in traditional boat building, such as the sourcing of authentic materials and the mastery of nearly lost construction techniques, will be addressed. The course will explore solutions that respect historical accuracy while embracing modern innovations that can improve the longevity and performance of the boats. Participants will engage in hands-on



projects, where they will apply their learning to construct models that reflect both the heritage and the future of maritime crafts.

This practical workshop is designed not only to teach the skills needed to build traditional boats but also to inspire a deeper appreciation of maritime heritage. It ensures that participants understand the importance of preserving these skills in a world where such knowledge is rare, yet increasingly sought after by markets that value authenticity and craftsmanship in tourism.

By the end of this course, participants will be equipped with the knowledge to start their own projects, capable of making informed decisions about materials, designs, and construction methods that align with both historical practices and modern requirements. This balance is essential for the successful integration of traditional boats into the booming tourism industry, locally and globally.

Learning Outcomes for "Fundamentals of Traditional Boat Building: A Practical Workshop":

1. Identify and describe the traditional materials and tools used in boat building.
2. Analyze and apply traditional and modern design principles in constructing tourist-friendly boats.
3. Evaluate different boat building techniques and their suitability for various types of traditional vessels.
4. Assess the structural integrity and safety features required for tourist boats.
5. Design adaptations of traditional boats to enhance accessibility for passengers, including those with disabilities.
6. Develop solutions for integrating sustainability into traditional boat building practices.

Evaluation of Learning Outcomes (examples):

1. What are the primary types of wood used in traditional boat building and what are their properties?
2. Describe the design process for creating a traditional boat that meets modern safety standards.



3. What are the advantages and disadvantages of using fiberglass versus wood in traditional boat construction?
4. How does the construction of a boat's hull affect its stability and performance in water?
5. Identify key considerations when modifying traditional boats to be accessible for passengers with disabilities.
6. Discuss the role of sustainability in traditional boat building and suggest ways to incorporate eco-friendly practices.

These outcomes and evaluation questions ensure that participants not only acquire theoretical knowledge but also practical skills applicable in real-world settings, crucial for anyone looking to engage in or enhance their capabilities in traditional boat building for tourism.

5.2 Heritage Boat Design Techniques: From Concept to Creation

Heritage Boat Design Techniques is a specialized course that delves into the artistic and functional aspects of traditional boat building. It blends time-honored methods with contemporary demands to create vessels that are both beautiful and practical for modern use. The course begins with an exploration of the different types of traditional boats and their historical contexts, offering students an understanding of the cultural and practical reasons behind various design choices.

Throughout the curriculum, participants engage with the materials traditionally used in boat construction, such as different types of wood and natural fibers, while also considering modern materials that can complement traditional aesthetics without compromising the integrity and authenticity of the final product. The course covers essential design principles, including buoyancy, stability, and hydrodynamics, ensuring that each boat design is not only attractive but seaworthy and durable.

As safety standards have evolved, so too must the designs of traditional boats intended for tourist purposes. This course addresses how to integrate modern safety features into traditional designs seamlessly, making them suitable for public use without detracting from their historic charm. Special attention is given to designing boats that are accessible to



passengers with disabilities, incorporating features that enhance accessibility while maintaining the boat's traditional look and feel.

Practical workshops form the core of the learning experience, where participants apply their knowledge by drafting plans and constructing scale models based on historical blueprints. These sessions provide hands-on experience that reinforces the theoretical knowledge gained in earlier modules. Additionally, sustainability in boat building is a key component of the course, instructing students on how to select sustainable materials and employ construction methods that minimize environmental impact.

The course culminates in a comprehensive design project where participants are tasked with creating a complete boat design that incorporates all aspects of the curriculum. This project is critiqued by peers and instructors, providing critical feedback that helps refine each design to professional standards.

The ultimate goal of this course is to empower new and experienced shipwrights with the skills and insights needed to continue the tradition of building beautiful, functional, and sustainable boats. Graduates of this course will be equipped to contribute to the preservation of maritime heritage through the creation of boats that meet modern-day demands while celebrating historical craftsmanship. They will leave with a portfolio of designs ready for implementation, marking their entry into the elite circle of heritage boat designers.

Learning Outcomes for "Heritage Boat Design Techniques: From Concept to Creation":

1. Identify and describe the essential terms and concepts of traditional boat design.
2. Analyze the impact of traditional boat designs on the tourism industry and cultural preservation.
3. Apply the knowledge acquired to create original designs of traditional boats that meet contemporary needs.
4. Assess the integration of modern safety standards into traditional boat designs.
5. Identify and address challenges and opportunities in preserving maritime heritage within modern regulatory and economic frameworks.
6. Evaluate the cultural and societal implications of traditional boat building in modern contexts.



Evaluation of Learning Outcomes (examples):

1. What are the core principles of traditional boat design, and how do they influence the construction process?
2. Why is traditional boat building considered a sustainable approach to maritime construction?
3. Discuss the challenges of sourcing materials for traditional boat building in today's market.
4. What types of adaptations are necessary to make traditional boats accessible to people with disabilities?
5. What are the benefits of maintaining traditional boat building techniques in today's world?

These outcomes and evaluation questions ensure that students not only understand the historical and technical aspects of traditional boat design but also grasp the modern implications and adaptations required to sustain this age-old craft in the contemporary world.

5.3 Woodworking for Maritime Crafts: Constructing Tourist-Ready Boats

Woodworking for Maritime Crafts: Constructing Tourist-Ready Boats" is an extensive course designed to bridge the gap between traditional boat building techniques and the contemporary demands of the tourism industry. This curriculum focuses on imparting essential woodworking skills while also incorporating modern design principles to create boats that are not only functional and safe but also appealing to tourists seeking unique maritime experiences.

The course begins with a deep dive into the types of woods traditionally used in maritime crafts, examining their properties, sustainability, and suitability for various styles of boats. Participants learn to select and prepare these materials using both time-honored hand tools and modern machinery, ensuring that the crafts are durable enough to withstand maritime conditions while retaining the aesthetic qualities that make traditional boats so appealing.



As the curriculum progresses, it emphasizes the importance of safety and functionality in boat design, particularly for vessels intended for public use. Students explore various design strategies that integrate essential safety features seamlessly with traditional aesthetics. These features include stable decking, adequate emergency exits, and non-slip surfaces, all designed to ensure passenger safety without compromising the boat's traditional look.

A significant portion of the course is dedicated to hands-on workshops where participants apply what they've learned in a practical setting. Under the guidance of experienced craftsmen, they undertake projects to construct parts of a boat, focusing on techniques that combine efficiency with artistic expression. This practical application helps to solidify their skills and gives them confidence in their ability to manage both small-scale projects and larger, more complex constructions.

Finally, the curriculum covers the business aspects of maritime crafts, teaching participants how to market their boats to potential buyers and tourists. Discussions include identifying target markets, understanding consumer preferences within the tourism industry, and developing effective marketing strategies. Participants also learn how to navigate the regulatory landscape of boat building, ensuring that their crafts meet all necessary safety standards and legal requirements.

Upon completion of the course, participants are expected to have a thorough understanding of both the technical and creative aspects of building tourist-ready boats. They will possess the skills to start their own boat building business or work with existing manufacturers to produce crafts that meet the highest standards of safety, functionality, and aesthetic appeal. The course aims to not only preserve the art of traditional boat building but to also adapt it to meet the needs of modern tourism, ensuring its continued relevance and sustainability in the industry.

Learning Outcomes for "Woodworking for Maritime Crafts: Constructing Tourist-Ready Boats":

1. Identify and select appropriate wood types and materials for different styles of boats.
2. Understand and implement traditional and modern woodworking tools and techniques.
3. Design boats that integrate safety features with traditional aesthetic elements.



4. Develop effective construction plans that meet both aesthetic and functional requirements.
5. Apply regulatory and safety standards to boat building projects.
6. Formulate marketing and business strategies for selling boats in the tourism sector.

Evaluation of Learning Outcomes (examples):

1. What are the key properties to consider when selecting wood for maritime crafts, and why?
2. Describe the process of preparing wood from raw material to ready-for-use in boat construction.
3. How can modern safety features be integrated into traditional boat designs without compromising their historical aesthetics?
4. Outline a construction plan for a tourist-friendly boat, detailing the steps from design to final product.
5. What are the critical safety regulations that must be considered when designing and building a tourist boat?
6. Develop a marketing plan for a boat designed for tourist use. What elements would you highlight to attract your target market?

These outcomes and evaluation questions ensure that participants not only gain a comprehensive understanding of the technical skills required in maritime woodworking but also appreciate the broader implications of their craft, including safety, regulatory compliance, and marketability within the tourism industry.

5.4 Artisanal Methods in Boat Construction: Tools, Techniques, and Applications

"Artisanal Methods in Boat Construction: Tools, Techniques, and Applications" is an advanced course designed to equip participants with a deep understanding of the tools and methods used in the traditional construction of boats, while integrating innovative techniques to enhance their functionality and appeal in modern markets. This curriculum



blends hands-on learning with theoretical knowledge to prepare students for the challenges of crafting boats that meet both aesthetic and practical standards required by today's tourism industry.

The course begins by exploring the rich history and evolution of artisanal boat building techniques, highlighting how these methods have adapted over time to incorporate new materials and technologies without losing the essence of traditional craftsmanship. Participants will gain an understanding of the various tools—from ancient hand tools to contemporary power tools—and how they are employed in crafting different components of boats.

As the curriculum progresses, it focuses on detailed techniques for constructing durable and efficient boats. Students will learn about different types of woods and other materials suitable for maritime construction, including how to select, treat, and manipulate these materials to achieve desired outcomes. The course emphasizes the importance of structural integrity, watertightness, and aesthetics, teaching students to balance these elements within their projects.

Participants will also delve into modern adaptations of traditional boats, such as incorporating lightweight materials for better performance and designing features that enhance the boat's utility for tourism, such as improved seating arrangements, safety features, and accessibility for passengers with disabilities. Special sessions will be dedicated to sustainability practices in boat building, exploring eco-friendly materials and methods that minimize environmental impact.

Practical workshops make up a significant portion of the course, allowing students to apply their knowledge in real-world settings. Under the guidance of expert craftsmen, participants will undertake a series of projects that culminate in the construction of a small-scale boat designed for tourist use. These hands-on activities not only reinforce theoretical learning but also foster a deeper appreciation for the skill and artistry involved in boat construction.

The course concludes with discussions on the business aspects of artisanal boat construction. Participants will explore market trends, customer preferences, and effective marketing strategies. They will learn how to present and sell their crafts to potential buyers, including tourism operators and private collectors, and how to navigate the regulatory landscape of boat building.



Upon completion of the course, participants will have a comprehensive skill set that enables them to produce boats that are not only beautiful and traditionally crafted but also equipped to meet the demands of modern tourism. They will leave with a portfolio of designs and the knowledge necessary to start or enhance their careers in the maritime construction industry. This course aims to preserve the art of traditional boat building while ensuring its relevance in contemporary markets through innovation and adaptation.

Learning Outcomes for "Artisanal Methods in Boat Construction: Tools, Techniques, and Applications":

1. Analyze traditional and modern boat construction methodologies.
2. Describe the integration of new materials and technologies in traditional boat building.
3. Define and apply sustainable building practices in maritime crafts.
4. Evaluate the impact of design innovations on boat functionality and tourist appeal.
5. Assess the balance between aesthetic values and practical requirements in boat construction.
6. Implement advanced craftsmanship techniques in the creation of tourist-friendly boats.

Evaluation of Learning Outcomes (examples):

1. What are the key factors to consider when choosing materials for building a traditional boat?
2. Can you give an example of a technology that has revolutionized traditional boat building and explain its impact?
3. What are some sustainable practices that can be applied in the construction of maritime crafts?
4. Describe how modern design innovations can enhance the functionality of traditional boats without compromising their traditional appeal.
5. How do aesthetic considerations influence the structural design of boats intended for tourism?



6. Outline the process of incorporating advanced craftsmanship techniques into the construction of a tourist-friendly boat.

These outcomes and evaluation questions ensure that participants gain a deep understanding of both the artistic and functional aspects of traditional boat building, while being able to adapt these methods to meet modern needs and sustainability goals.

5.5 Sustainable Design in Traditional Boats: Adapting Heritage Crafts for Accessibility

"Sustainable Design in Traditional Boats: Adapting Heritage Crafts for Accessibility" is a specialized course aimed at exploring the intersection of sustainable design principles and traditional boat building techniques, with a focus on making maritime crafts accessible to all individuals, including those with disabilities. This curriculum blends theoretical concepts with hands-on learning experiences to equip participants with the knowledge and skills necessary to create boats that are not only environmentally friendly but also inclusive and user-friendly for a diverse range of passengers.

The course begins with an in-depth examination of sustainable design principles, emphasizing the importance of minimizing environmental impact while maximizing social equity and economic viability. Participants will learn about the concept of sustainability in the context of boat building, exploring topics such as eco-friendly materials, energy-efficient propulsion systems, and waste reduction strategies.

As the curriculum progresses, it shifts its focus to the unique challenges and opportunities associated with adapting traditional boat designs for accessibility. Participants will explore innovative design solutions that accommodate individuals with various mobility impairments, including wheelchair users, people with visual or hearing impairments, and those with limited dexterity.

Practical workshops form a significant portion of the course, allowing participants to apply sustainable design principles and accessibility considerations to real-world boat building projects. Under the guidance of expert craftsmen and accessibility experts, students will undertake hands-on exercises to modify existing boat designs or create new prototypes that prioritize inclusivity and sustainability.



The course also covers regulatory requirements and best practices related to accessibility in maritime crafts, ensuring that participants understand their obligations and responsibilities as boat builders. Topics include relevant accessibility standards and guidelines, legal frameworks, and certification processes for accessible boats.

In the final stages of the course, participants will explore the economic and social implications of sustainable and accessible boat design. They will learn how inclusive design practices can enhance the marketability of maritime crafts, broaden their appeal to diverse customer segments, and contribute to a more equitable and inclusive society.

Upon completion of the course, participants will have a comprehensive understanding of sustainable design principles and accessibility considerations in boat building, as well as the practical skills to apply these concepts to their own projects. They will be equipped to create boats that not only respect the environment but also cater to the needs of all individuals, ensuring that everyone can experience the joy of sailing and boating safely and comfortably.

Learning Outcomes for "Sustainable Design in Traditional Boats: Adapting Heritage Crafts for Accessibility":

1. Analyze and interpret solutions for sustainable and accessible boat design derived from theoretical principles and practical exercises.
2. Identify challenges and opportunities in the field of maritime craft design that can be addressed through sustainable and accessible design methodologies.
3. Apply appropriate sustainable design and accessibility principles to develop innovative solutions for boat building projects.
4. Develop a comprehensive understanding of the decision-making process involved in creating sustainable and accessible boats, informed by simulation experiments and real-world case studies.
5. Create simulation models using specialized software tools to evaluate the environmental impact and user accessibility of different boat designs.
6. Analyze and evaluate the output data of simulation experiments to assess the effectiveness and feasibility of sustainable and accessible boat designs.

Evaluation of Learning Outcomes (examples):



1. What factors might contribute to discrepancies between theoretical predictions and experimental results in the context of sustainable boat design?
2. Describe three specific business problems in the maritime industry that could benefit from the application of sustainable and accessible design principles in boat building.
3. Explain the methodologies used in simulation modeling for assessing the environmental sustainability and accessibility of boat designs.
4. Define agent-based modeling and simulation and discuss its potential applications in creating inclusive and environmentally friendly maritime crafts.
5. Using specialized software such as Rhino3D or AutoCAD, create a simulation model of a traditional boat design adapted for wheelchair accessibility.
6. Based on the simulation model developed in question 5, generate visual representations (e.g., diagrams or graphs) illustrating the workload distribution of crew members and the accessibility features of the boat for passengers with disabilities.



6. Conclusion

The TOFOLA project has developed a comprehensive and innovative training program that bridges traditional boatbuilding craftsmanship with contemporary needs for sustainability, accessibility, and market relevance. By effectively combining theoretical knowledge with hands-on practice, the program has enabled participants to acquire deep technical skills, with particular emphasis on eco-friendly materials and inclusive design solutions catering to diverse users.

This training model not only serves to protect and valorize maritime cultural heritage but also provides a concrete opportunity to update and revitalize these skills within a modern and competitive framework. The proposed one-week intensive course offers a valuable opportunity to further consolidate and expand knowledge, promoting broader dissemination and adaptability of the curriculum in different contexts.

Overall, this training program offers participants a pathway to not only gain technical expertise in traditional boat construction but also to apply these skills in ways that align with current tourism trends and market needs. By the end of the training, participants are expected to be capable of creating boats that combine historical craftsmanship with modern functionality, making them relevant to today's tourism industry while contributing to the preservation of maritime heritage. This initiative fosters innovation, inclusivity, and sustainability, ensuring that traditional boat building remains a vibrant and viable craft in the modern world.

In conclusion, the project has laid a solid foundation to promote innovation, inclusivity, and sustainability within traditional shipbuilding, ensuring that this craft continues to thrive and remain relevant in today's world, with significant benefits for both participants and the development of sustainable cultural tourism.

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