



## Supporting the transition of handicraft teachers and trainers to the Digital Age

### IO2: Training Modules on ICT-based teaching methods in VET for crafts sector



Co-funded by the  
Erasmus+ Programme  
of the European Union

This project (2017-1-ES01-KA202-038435) has been funded with support from the European Commission through the ERASMUS+ Programme. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

## **CRAFTS3.0**

### **Supporting the transition of handicraft teachers and trainers to the Digital Age**

2017-1-ES01-KA202-038435

[www.crafts-project.eu](http://www.crafts-project.eu)

## **Intellectual Output 2**

### **Training Modules on ICT-based teaching methods in VET for crafts sector**

#### **Coordinated by:**

CEARTE - Centro de Formação Profissional do Artesanato. Portugal

#### **Developed by:**

FOACAL - Federación de Organizaciones Artesanas de Castilla y León. Spain

INFODEF - Instituto para el Fomento del Desarrollo y la Formación S.L. Spain

RINOVA – Rinova Limited. United Kingdom

DANMAR – Danmar Computers sp z o.o. Poland

DIMITRA - Dimitra Education and Consulting. Greece

FTT - Fundatia Transilvania Trust. Romania

INQS - Innoquality Systems Limited. Ireland

## INDEX

### A. INTRODUCTION TO ICT SKILLS

A.1 THE POTENTIAL FOR USING DIGITAL TECHNOLOGY IN CRAFTS.....	3
A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE.....	9

### B. ONLINE AND DIGITAL TRAINING FOR CRAFTS

B.1 LEARNING TOOLS.....	21
B.2 CONTENT CREATION.....	24
B.3 TRAINING METHODS.....	31

### C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS...

C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT.....	39
C.2 CREATION AND USE OF PRINTABLE FILES 3D, NUMERICAL CONTROL SYSTEM AND LASER CUTTING.....	54
C.3 DIGITALIZATION OF IMAGES.....	76
C.4 USE OF DIGITAL TOOLS.....	84
C.5 MEASURES TO PREVENT OCCUPATIONAL AND ENVIRONMENTAL RISK.....	94

### D. DIGITAL TOOLS FOR CRAFT BUSINESS

D.1 BUSINESS DEVELOPMENT, FROM THE IDEA TO THE SCALE UP.....	104
D.2 ONLINE DIGITAL MARKETING SKILLS FOR CRAFTS BUSINESS.....	107
D.3 DIGITAL COMMUNICATION FOR CRAFT PRACTITIONERS.....	110

## A. INTRODUCTION TO ICT SKILLS

### A.1 THE POTENTIAL FOR USING DIGITAL TECHNOLOGY IN CRAFTS

<b>Title of Module</b> <i>A. INTRODUCTION TO ICT SKILLS</i>	
<b>Title of Submodule</b>	
<b>Title of Unit</b> <i>A.1 THE POTENTIAL FOR USING DIGITAL TECHNOLOGY IN CRAFTS</i>	(hours) 15
<b>LEARNING OUTCOMES</b> A.1.1: Transition to the digital age A.1.2: Using technology in teaching crafts A.1.3: Using Technology in Crafts Practice A.1.4: Using Technology in Crafts Business	
<b>CONTENTS</b> <b>A.1 THE POTENTIAL FOR USING DIGITAL TECHNOLOGY IN CRAFTS</b> <p>The UNESCO defines crafts as part of intangible heritage: an artistic expression rooted in community traditions based on the knowledge transmitted from one generation to the next, often orally. According to the <b>definition</b> adopted by the UNESCO (Symposium “Crafts and the International Market: Trade and Customs Codification”, Manila, 1997), “<b>handicrafts</b> are the ones produced by artisans, either completely handmade or with the help of manual or mechanical tools, as long as the direct manual contribution of the artisan remains the most substantial component of the finished product. Handicrafts are made without restriction in terms of quantity and using raw materials from sustainable resources. The special nature of artisanal products derives from their distinctive features, which can be utilitarian, aesthetic, artistic, creative, culturally significant, decorative, functional, traditional, religiously and socially symbolic and significant”<sup>1</sup>. Craft has a strong cultural, creative and economic component, and is generally considered to be part of the cultural and creative industries (CCIs). <b>Craft activities</b> are generally distinguished by the following characteristics, applied to the making, repair or restoration of objects, structures and buildings:</p> <ul style="list-style-type: none"> <li>- “Understanding of and engagement with materials.</li> <li>- The application of haptic skills and hand-controlled tools.</li> <li>- The honing of skills learnt over time.</li> <li>- One-off or relatively small batch rather than mass production.</li> <li>- Maker impact on conception, design and aesthetics of finished product.</li> <li>- Cultural embedding of finished product”<sup>2</sup>.</li> </ul> <p>New technologies and innovation have revolutionised social and economic orders making practices, tools and professions obsolete, and offering the possibilities to forge new, more effective ones. As a tacit knowledge-based tradition, the value of craft resides firmly in the people who possess, embody and apply a complex range of knowledge, skills, techniques and sensibilities towards materials<sup>3</sup>. The RICHES project analysed how social and economic changes in 21<sup>st</sup> century in Europe affect cultural heritage and its engagements with human beings. The research conducted in the RICHES project framework showed that: “in the process of shifting towards knowledge-based economies, established, traditional knowledge is relevant and can coexist productively with new knowledge. Rather than undermining its status, digital technology (in conjunction with other factors as the maker movement) has served to reposition craft in the economy and contribute to increasing the value of craft products. It has the potential for further strengthening the link between the past (heritage, traditional craft) and the creative future”<sup>4</sup>. In this new</p>	

<sup>1</sup> UNESCO. Source: <http://www.unesco.org/new/en/santiago/culture/creative-industries/crafts-design/>

<sup>2</sup> RICHES European Policy Brief, April 2016, p. 12

<sup>3</sup> Ibid., p. 8

<sup>4</sup> RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts, May 2015

economic and social context, craft can bring together “a distinctive set of knowledges, skills and aptitudes, centred around a process of reflective engagement with the material and digital worlds”<sup>5</sup>.

In modern consumer societies, the availability of affordable, mass-produced goods has seriously reduced the potential market for the hand-made to a niche position. This has placed craft in a vulnerable position, with some types of craft – especially heritage craft – being particularly affected. The factors that influence the decline of craft vary across European countries, and include:

- Drastically reduced market demand, as consumers opt for cheaper or imported products;
- Competition with imported products, especially cheap products produced in Asian countries;
- The regression of the workforce, as skilled craftspeople get older, and younger generations demonstrate little interest in taking up these professions, often considered unprofitable;
- The globalisation of the economy, which has led to a general reduction in production activities and their commercialisation, for both internal and export markets;
- The rise in the cost of raw materials, especially ‘natural’ materials (e.g. wood, silk, cotton);
- The lack of fiscal and government incentives to support craft production and entrepreneurship;
- Lack of access to start-up finance for craft businesses;
- An ‘image problem’ that associates craft only with heritage and the past, and dismissive attitudes towards tacit knowledge which make it unattractive for young people when choosing a profession in advanced economies such as EU countries.

Even so, paradoxically, the gradual decline of craft in many European economies is accompanied by a counter-balancing phenomenon of revival manifested as:

- A resurgence of interest in craft skills and a Do-It-Yourself (DIY) culture and ethic;
- The emergence of digital fabrication and hybrid forms of making, spearheaded by online and offline maker communities;
- Rising consumer demand for unique, customised or bespoke products;
- The contemporary reinvention and repositioning of craft skills, techniques, patterns and materials, and their augmentation through the integration of digital technology; and
- The promotion of ethical approaches advocating sustainability, ecologic use and local production and development<sup>6</sup>.

In the current social context, where changes are moving towards a digital age, **new technologies bring** the following **opportunities to makers** facilitating them the access to several resources needed to develop the lifecycle of crafts products:

- **Democratization of design:** patterns, techniques, tools and resources being freely exchanged, and consumers often involved in co-creation of products and services.
- **Democratization of the production:** manufacturing processes (which in the past could be conducted only by large companies) can be easily overseen by micro-entrepreneurs who outsource the production of components for objects they design or have others design for themselves. These components are ordered and produced quickly through the mediation of web-based specialised portals. All operations can be conducted seamlessly from behind a computer.
- **Democratization of innovation:** expertise, free access to mostly Internet-sourced information and prototyping tools and accessibility of suppliers also opens the field for the democratisation of innovation. New access to the know-how and the tools to design and produce those products. Open source software development is now expanding rapidly to manufacturing. And online communities of open source software users produce and share the knowledge and results of innovation<sup>7</sup>.

All these suggest that craft is one of the economic sectors that is benefitting significantly from the integration of digital technologies at all levels from design and production to marketing and sales (craft businesses are thriving on e-commerce or combinations of traditional and e-commerce activities)<sup>8</sup>.

### **New technologies innovation in Design and Making Processes**

<sup>5</sup> Op. Cit. RICHES European Policy Brief, p. 2-3

<sup>6</sup> Op. Cit. RICHES European Policy Brief, p. 3

<sup>7</sup> Op. Cit. RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts, p. 65-66

<sup>8</sup> Op. Cit. RICHES European Policy Brief, p. 2



The integration of technology in craft practice has affected virtually every aspect in the craft products lifecycle from conception and design to final sale. Moreover, the integration of technology in design and making needs to consider **how it affects the value of craft products** (often relying on the handmade) **and the makers' practice** beyond financial and productivity considerations.

New technologies that can be used in the phases of conceptualisation, design and making craft objects are those like: computer-generated imagery (CGI), laser cutting, Quick Response (QR) and additive manufacturing (or 3D printing) among others. For example, through additive manufacturing, 3D objects can be crafted through the addition of layers of material, following a digital pattern. From all technologies that can cover design and making processes, additive manufacturing is one of the most all-encompassing, as it can be integrated at any stage, from initial concept development and testing to making end products. The technology can be used as well only for concept development and prototyping to test initial concepts.

Integrating of new technologies in design and making processes can enhanced *efficiency, creativity, interactivity, and customisation*:

- *Efficiency* is brought by speeding up the design and making processes and increasing production volumes. It is afforded by technologies such as laser cutting and additive manufacturing in particular. One of the challenges is to enhance efficiency while retaining the value of the handmade and leaving enough space for choice and human creativity. This can be done, for instance, through hybrid manufactured and handmade production, by which objects are speedily produced by machines in raw forms, and then finished by hand.
- *Creativity* is enhanced through the exploration and visualisation of concepts and ideas (e.g. through CGI), and also by enabling experimentation. Rapid prototyping, afforded by additive manufacturing, can be used to rapidly translate abstract concepts into prototypes. Additive manufacturing enables makers, moreover, to play with space and form in ways that could not be afforded by previous technologies or by hand. Creativity can also be stimulated by interaction over the web: active maker communities exchange ideas, concepts, models, and resources.
- *Interactivity* refers to the capacity of craft objects to interact in an intelligent manner with users, for instance through the integration of QR codes. Information can be added onto objects, or these can be augmented to fit seamlessly in environments and respond in complex interactive patterns.
- *Customisation* refers to the personalisation of objects in response to a customer's taste or desire. Handmade objects can be custom-made, and craft has retained for long the distinctive age of customisation as a critical advantage over machine manufacturing. Customisation by additive manufacturing can be integrated in a variety of contexts ranging from commercial venues to museums, offering customers the possibility to choose a model or desired modifications to a model and have it printed on the spot for them<sup>9</sup>.

The RICHES project report also highlights that new technologies **improve production processes** by:

- speeding up production and increasing volumes while retaining aesthetic characteristics and unique craft qualities through hybrid manufactured and handmade production;
- enhancing digital creativity through the exploration and visualisation of concepts and ideas;
- facilitating experimentation through rapid translation of design concepts into prototypes and/or final pieces;
- and enabling the production of new objects and unique designs affordable only through new technologies<sup>10</sup>.

How technological intervention affects the positioning of a product from pure craft to machine-manufactured? **The value of craft** is often seen to lie less in aesthetics (which can be reproduced by machines), and more in the process, the element of human intervention, and the labour involved. Can therefore more **machine intervention translate into less value** (social, cultural, but also economic)? New technologies can be used without detracting from the value of craft products if employed for facilitating the mechanical part of making; making processes that are mechanised to an extent exceeding 50% are more likely to be categorised as mass produced objects rather than handmade. The integration of technology into crafts making processes affects the value of crafts objects depending on the preservation of other making aspects (such as traditional motifs and chromatics and natural materials).

<sup>9</sup> Op. Cit. RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts

<sup>10</sup> Op. Cit. RICHES European Policy Brief

As conclusion, “technology can both add and subtract value to the crafted product. (...) the impact of technology on the value of craft products needs to be assessed in specific cases, in relation to the product and also the type of technology used, and the stage in the making process at which it is integrated”<sup>11</sup>.

### New technologies Innovation in Product Marketing and Distribution

Digital technologies can be used for five purposes which are either part of or influencing the process of taking the finite craft products from makers to consumers:

- Product showcase and communication of product attributes
- Product sales
- Engaging and relating with consumers
- Networking and relating with professionals, makers, and peers
- Learning and resource and information exchange

A wide range of technologies and online tools, applications and portals can support these activities. The following **opportunities are opened up by digital technologies**, particularly over the online medium:

- **Communicating value and brand image building.** Digital media, particularly the web, offer makers the possibility to showcase their products and communicate their attributes. Online spaces offer the possibility to display the product and showcase their material attributes, while stressing those attributes that confer them value. This can be done by using a variety of approaches and media, from storytelling to videos of the making process, to communicate such attributes as artistry, skill, use of special techniques, relation to heritage, timeless motives, etc.
- **New routes to (global) markets.** A variety of ways for approaching customers and closing transactions have emerged, which can be employed by makers singularly, or in complement to traditional channels (shops, boutiques, commissioning, galleries and museums etc.) Online marketplaces operating globally (such as *Etsy*) or locally (such as *Breslo* in Romania and *Folksy* in the UK). Electronic commerce can use the Internet as a tool to link traditional crafts products to global. This opened up global markets for makers, who can now sell internationally.
- **Engaging and relating with consumers** is enhanced by online spaces and tools. Web servers and social media platforms can be used to attract new customers, build loyalty, and guarantee rapid response. Customer satisfaction becomes important also as a direct mechanism for accountability.
- **Networking with peers** and involvement in **online maker communities** serve product marketing indirectly. By engaging in such communities makers can expand their network of contacts, learn from best practices and examples, see and adopt more efficient ways of marketing products.

### New Business Models and Organisational Forms

Several national studies attest to the contribution of craft to the economy, through quantifiable measures such as employment, Gross Value Added (GVA) and number of businesses. Craft businesses operating on local resources, using environmentally friendly and salvaged materials, and encouraging sustainable and ethical consumption provide an example of how productivity, business innovation and environmental protection can be reconciled<sup>12</sup>.

Elements of innovative business models are offered by technology integration at all stages in the product lifecycle: makers can build their businesses around innovative models drawing on “e-tailing” (electronic retailing, the E-commerce of retail goods where a business is selling to the consumer) and capitalising on the potential of web tools, social media in particular, for communication and promotion<sup>13</sup>. Innovation in **product marketing and distribution** is afforded by **web-based technologies**, in particular social media, which offers makers: new venues and means for communicating value and brand image building; new routes to (global) markets; new opportunities to engage with customers; and possibilities for growing professional networks. To translate these opportunities into business growth, there is a need for: entrepreneurship and strategic business skills; knowing the market, customers and competitors, along with a clear understanding of products positioning; knowing how to communicate the value of products, which can stand in product attributes, the process of making or maker’s skills; skills to enable a seamless use of a variety of web-based tools for displaying products for sale, communicating attributes, and engaging with customers. New business models and organisational forms are afforded by the integration

<sup>11</sup> Op. Cit. RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts

<sup>12</sup> Op. Cit. RICHES European Policy Brief

<sup>13</sup> Op. Cit. RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts, p. 74

of digital technology, for instance: models based on emerging technologies such as digital manufacturing; models thriving on e-commerce; collectives and partnerships between makers and creative entrepreneurs and other forms of association. Taking hold of these opportunities requires business acumen and entrepreneurial skills, which are less accessible to makers in some contexts, especially in rural and more isolated environments<sup>14</sup>.

The democratisation of design and production serves best micro-entrepreneurs. **E-commerce** can be supported by online marketplaces, social media sales pages, or one's own e-commerce website. They require little or no technical expertise to be set-up, and all it takes thereafter to close the deals is the service of transport and delivery companies. Figures indicate pronounced trends towards flexible working patterns and home-based businesses. For example, **social media platforms** were not initially configured to enable sales, but nowadays can be used as platforms where technology entrepreneurs capture market demands and respond with added features or new tools. Solutions can be free or close to free for people who have minimum technical expertise, or can come at a price choosing from a variety of software for online store building.

Some of the most promising of these new business models look quite simple: product marketing and transactions can be conducted entirely online, and after being set up operations can be conducted as a matter of routine. Yet the following attributes appear to be critical for setting up and maintaining successful online businesses:

- Entrepreneurship and strategic business skills
- Knowing the market, customers and competitors, along with a clear understanding of product positioning
- Knowing how to communicate the *value* of products, which can stand in product attributes or process of making
- Skills to enable a seamless use of a variety of web-based tools for displaying products for sale, communicating attributes, and engaging with customers

### Using technology to learn digital skills and to teach online crafts

But also, several issues arise related to the handcraft production transition to the digital age, like an **unequal access to specialised skills, devices and tools**. Using new technologies in crafts requires **specialised skills**, makers need to develop advanced techniques and skills in technology (such as the skills needed to model objects and programme them before being 3D printed, or skills needed to work with CGI), branding, marketing and articulation of value; as well as their understanding of the opportunities presented by evolving consumer trends. Such skills and digital training programmes in craft-related technologies are increasingly integrated in formal education programmes, yet the most advanced techniques and skills (e.g. modelling software for additive manufacturing) are still seen as experimental.

Broadly speaking, *E-learning* can be defined as a learning method which is supported by new Information and Communication Technology. This new form of learning seems to be appropriate to meet the very specific demands of the craft sector. Considering some limitations e-learning offers several opportunities and advantages. Through e-learning, the learning process can take place independently of time and space, the content is always available and the learning process can be adapted to the user's time frame. Furthermore, travel expenses and time are eliminated which makes this form of learning even more attractive for the craft sector, especially for those professionals located in rural or isolated areas. Summing up, E-learning and the use of new information and communication technologies offer a great opportunity for professionals across the craft sector to develop their skills in order to fulfil market potential<sup>15</sup>.

Teachers' ability to teach with ICT and access to e-learning to everyone should be guaranteed. Relevant and interesting studying material, pedagogies and practices are needed. However, ICT cannot replace all skills needed in teaching and learning handicraft: *ICT used for education in crafts can only support teaching and learning by bringing in new teaching and studying methods*. The existing teaching methodologies seem to concentrate on building understanding of logical structures. A majority of these methods can be considered as good reception, storing and repeating techniques. However, creativity if

<sup>14</sup> *Ibid.*, p. 5-6

<sup>15</sup> Cr@ftsman Project. Report on the Situation of Craftsmanship in Europe (2015), p. 19-20



often contradictory to logical thinking: creativity harnesses the pre-conscious and even unconscious areas of thinking.

[http://ims.mii.lt/ims/konferenciju\\_medziaga/e-learningConference/ecel08-cd2.pdf](http://ims.mii.lt/ims/konferenciju_medziaga/e-learningConference/ecel08-cd2.pdf) **Craftopolis** is a creative e-learning environment aiming to foster creative thinking, multidisciplinary and use of ICT in the crafts field. The end users of the Craftopolis are second level craft students and teachers in the EU area. (...) The research focused on the state of art analysis, creativity, usability and attractiveness of e-learning environments. Craftopolis was tested by the end users and evaluated twice during its development process. The findings supported the need for a high usability of an e-learning environment and positive attitudes towards a story-based learning environment. The Craftopolis uses elements of the story-telling society. Stories are used as metaphors and engaging elements, to focus attention and foster the memorizing process. The learning environment itself is a story, each task is a story and stories are used as source of inspiration. The creativity in the learning environment is supported by the tasks, which are structured around creativity theories. The pedagogic solution is constructive. The learning environment guides students towards independent working through tasks divided in three levels of difficulty. The learning process is guided by the teacher, who also selects the most suitable tasks for each study group and moves the whole study group to the next level all together. The novelty values of the Craftopolis can be defined as: creating a model of virtual creativity pedagogy, that guides students towards independent thinking and problem solving; offering a modular structure applicable to various fields; unifying old and new, and updating and bringing old traditions to this day; introducing a highly user-friendly learning environment. E-learning is a possibility to renew thinking and know-how related to handicraft.

#### ASSESSMENT CRITERIA

Knowledge of how affects technology to handicrafts products (its value, new markets opportunities, etc.)

Knowledge and identify new technology tools used to enhance handicrafts products lifecycle.

Ability to find and select useful and specialised information in Internet to learning by doing how to integrate technology into the crafts production and sales.

#### RESOURCES

RICHES Project (<http://www.riches-project.eu/>):

- RICHES. Deliverable 5.1. The Use of Craft Skills in New Contexts, May 2015
- RICHES European Policy Brief, April 2016

Cr@ftsman Project. Report on the Situation of Craftsmanship in Europe (2015)

#### PRODUCTS/OUTPUTS

Training Modules IO2

#### SELF ASSESSMENT TOOL

Select as truth or false the following sentences:

- a) Digital technology has the potential for further strengthening the link between the past (heritage, traditional craft) and the creative future.
- b) Craft can bring together “a distinctive set of knowledges, skills and aptitudes, centred around a process of reflective engagement with the material and digital worlds”
- c) Computer-generated imagery (CGI) is used in crafts to print 3D objects.
- d) The technology most commonly introduced during the phases of conceptualisation, design and making craft objects is: computer-generated imagery (CGI), laser cutting, Quick Response (QR) and additive manufacturing (or 3D printing).
- e) Technologies such as laser cutting and additive manufacturing can increase benefits by reducing production costs during design and making processes.
- f) Machine intervention translates into less value of craft products (social, cultural, but also economic), it has a negative impact in its quality.
- g) E-tailing means electronic retailing, is a subset of E-commerce majority connected to retail goods, where a business is selling to the consumer

- h) Digital media, particularly the web, offers makers the opportunity to develop complex and sophisticated business models to allocated their products into international markets.

Answers: False (c, e, f, h); Truth (a, b, d, g)

## A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE

**A.2.1: Online Communication, networking and collaboration**

**A.2.2 Online storage (Quick and easy access of information**

**A.2.3: Security measures Intellectual Property, GDPR**

**A.2.4: Continuous Professional Development in a Digital Age**

<b>Title of Module</b>	
<i>A. INTRODUCTION TO ICT SKILLS</i>	
<b>Title of Submodule</b>	
<i>A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE</i>	
<b>Title of Unit</b>	(hours)
<i>A.2.1 Online ways for communication, networking and collaboration</i>	20
<b>LEARNING OUTCOMES</b>	
The learner should be able to use online ways for communication, networking and collaboration	
<ul style="list-style-type: none"> <li>- To identify the available online communication ways and social networks</li> <li>- To explain what online communication is</li> <li>- To illustrate by example the available applications for mobile devices</li> <li>- Willingness to communicate online through several online ways (e.g., emails, forums, social networks)</li> </ul>	
<b>CONTENTS</b>	
<b>Introduction</b>	
Before the beginning of the electronic media, there were only two kinds of communication, verbal and non-verbal. But with the arrival of the internet, there are a plethora of methods and tools that people can communicate with each other. The online communication refers to how people communicate with each other through computer or other devices (e.g., tablets, smartphones), and the internet.	
<b>Which are the types of online communication?</b>	
Online communication can include a wide variety of ways like communicating through electronic mails (e-mails) or through fora or through messaging applications or through different social media sites or blogs or through e-platforms and virtual networks or else. All these types of online communication are being used increasingly and enhance both networking and collaboration.	
<b>Emails:</b> Emails or electronic mails were the earliest forms of online communication. Email is one of the most fundamental internet communication tools. Email addresses are required to sign up for many services online, and it's generally assumed that everyone on the internet has at least one email address. Email addresses are available from many free services. Emails work through an online interface and are hosted on the servers of different Internet Service Providers. Email is a communication way that saves time and money; it is still widely used by a multitude of people across the world for personal and professional communication.	
<b>How to send an email?</b> Please see the following tutorial: <a href="https://www.youtube.com/watch?v=-cxlyeV-ioA&amp;t=32s">https://www.youtube.com/watch?v=-cxlyeV-ioA&amp;t=32s</a>	
<b>Short messaging services (SMS):</b> As the name suggests, these are short messages with a capping of certain alphanumeric characters that are transmitted from the sender to the receiver through telephone, internet, and mobile-device systems. The protocols allowed users to send and receive	

messages of up to 160 alphanumeric characters to and from mobiles. Although most SMS messages are mobile-to-mobile text messages, support for the service has expanded to include other mobile technologies.

**Chats:** This is a very popular method of online communication as it allows a user to carry on a discussion with one or multiple people at the same time. This way of online communication is conducted through chat rooms. These are specific areas on the Internet, typically communicated to a particular topic, where members can communicate and share their interests/ideas/views/experiences with others. One member types a message that is accessed by all members who are online in the chat room. The member can also see a list of all members who are online. He or she can also click on another member, whether online or not, to send a private message or view his/her profile.

**Fora:** These are online sessions that have multiple users interact with each other by posting messages on the same chat trail. This is popular for having discussion and debates on any particular topic. People can also communicate online through fora. A forum is a type of website that allows members to post questions, start a discussion or contribute to various discussions. Each individual question or discussion is referred to as a thread. A forum is usually updated and monitored by the admin or moderator.

**Whiteboards:** This tool or application works like a physical whiteboard and enables the user to draw or write on an online interface. It is popular in educational institutions and is good for one-way communication. An introductory video on how to use the whiteboards is given in the following link: <https://www.youtube.com/watch?v=ILxVjw1yvRk>

**Social networks/Social media:** These platforms allow members to connect with their friends and make new friends from across the world. They also allow members to share with their friends, followers or connect within the platform. To get started, you must register and complete your profile. Once you are done, you can view other users you want to become friends or communicate with. Some of the most popular social networks you can sign up for free and start communicating include Facebook, Twitter, Instagram, YouTube and others.



Common used applications for social networking are:

- [Facebook](#): is a social networking website where users can post comments, share photographs and post links to news or other interesting content on the web, chat live, and watch short-form video. Shared content can be made publicly accessible, or it can be shared only among a select group of friends or family, or with a single person. Facebook is user-friendly and open to everyone. Even the least technical-minded people can sign up and begin posting on Facebook. Although it started out as a way to keep in touch or reconnect with long-lost friends, it rapidly became the darling of businesses that were able to closely target an audience and deliver ads directly to the people most likely to want their products or services. The key characteristics of Facebook are that:
  - Facebook allows you to maintain a friends list and choose privacy settings to tailor who can see content on your profile.
  - Facebook allows you to upload photos and maintain photo albums that can be shared with your friends.

- Facebook supports interactive online chat and the ability to comment on your friend's profile pages to keep in touch, share information etc.
- Facebook supports group pages, fan pages, and business pages that let businesses use Facebook as a vehicle for social media marketing.
- Facebook's developer network delivers advanced functionality and monetization options.
- You can stream video live using Facebook Live.
- Chat with Facebook friends and family members, or auto-display Facebook pictures with the Facebook Portal device.
- [Messenger](#): Facebook Messenger is a free mobile messaging app used for instant messaging, sharing photos, videos, audio recordings and for group chats. The app, which is free to download, can be used to communicate with your friends on Facebook and with your phone contacts. The Messenger app is a separate app to Facebook. However, users' profiles can be set using their Facebook account or telephone number.
- [Twitter](#): is an online news and social networking site where people communicate in short messages called tweets. Tweeting is posting short messages for anyone who follows you on Twitter, with the hope that your messages are useful and interesting to someone in your audience. Another description of Twitter and tweeting might be microblogging. Some people use Twitter to discover interesting people and companies online, opting to follow their tweets. Thousands of people advertise their recruiting services, consulting businesses, and retail stores by using Twitter, and it works. People prefer advertising that is fast, less intrusive, and can be turned on or off at will. Twitter is exactly that.
- [WhatsApp](#): WhatsApp is free to download messenger app for smartphones. WhatsApp uses the internet to send messages, images, audio or video. The service is very similar to text messaging services, however, because WhatsApp uses the internet to send messages, the cost of using WhatsApp is significantly less than texting. You can also use Whatsapp on your desktop, simply go to the Whatsapp website and download it to Mac or Windows. It is popular with teenagers because of features like group chatting, voice messages and location sharing.
- [Viber](#): Viber is a free to download app that allows users to make free calls, send texts, pictures and video messages to other Viber users. It works on both mobile and computer and can be used to connect with people around the world. The app can be downloaded directly to your phone or computer, users simply need to enter their phone number to get started.
- [Instagram](#): Similar to Facebook or Twitter, everyone who creates an Instagram account has a profile and news feed. When you post a photo or video on Instagram, it will be displayed on your profile. Other users who follow you will see your posts in their own feed. Likewise, you'll see posts from other users whom you choose to follow. It's like a simplified version of Facebook, with an emphasis on mobile use and visual sharing. Just like other social networks, you can interact with other users on Instagram by following them, being followed by them, commenting, and liking, tagging and private messaging.
- [LinkedIn](#): LinkedIn is a social network for professionals. The goal of the site is to allow registered members to establish and document networks of people they know and trust professionally. A LinkedIn member's profile page, which emphasizes skills, employment history and education, has professional network news feeds and a limited number of customizable modules. Basic membership for LinkedIn is free. Network members are called "connections." Unlike other free social networking sites like Facebook or Twitter, LinkedIn requires connections to have a pre-existing relationship.
- [YouTube](#): YouTube is a video sharing service where users can watch, like, share, comment and upload their own videos. The video service can be accessed on PCs, laptops, tablets and via mobile phones. The main function of YouTube are summarized below:
  - Users can search for and watch videos
  - Create a personal YouTube channel
  - Upload videos to your channel
  - Like/Comment/share other YouTube videos
  - Users can subscribe/follow other YouTube channels and users
  - Create playlists to organize videos and group videos together
- [Skype](#): Skype is software that enables the world's conversations. Millions of individuals and businesses use Skype to make free video and voice one-to-one and group calls, send instant

messages and share files with other people on Skype. You can use Skype on whatever works best for you – on your mobile, computer or tablet. Skype is free to download and easy to use.

A video for advantages and disadvantages of social media is presented in the following link:

<https://www.youtube.com/watch?v=0nwlUZcMci8>

#### What are some benefits of online communication?

1. Accessibility 24/7, any place as long as you have an internet connection
2. Another way of communication where no one can interrupt you
3. Unlike verbal conversation, online discussion is lasting and can be revisited
4. Participants don't have to contribute until they've thought about the issue and feel ready
5. Online discussion fora encourage deeper reflection than fast paced face to face processes
6. Way to promote your job and ideas/views/experiences

#### ASSESSMENT CRITERIA

- Analyse the main types of online communication
- List the most common used social networking applications
- Name at least two advantages and two disadvantages of social media

#### RESOURCES

CDC (2012). CDC's Guide to Writing for Social Media

(<https://www.cdc.gov/socialmedia/Tools/guidelines/pdf/GuidetoWritingforSocialMedia.pdf>)

Talpau A. (2014) Social Media – A new way of communication

([http://webbut.unitbv.ro/BU2014/Series%20V/BULETIN%20V/I-06\\_TALPAU-1.pdf](http://webbut.unitbv.ro/BU2014/Series%20V/BULETIN%20V/I-06_TALPAU-1.pdf))

Online communication channels ([https://www.europarc.org/communication-skills/pdf/Online%20Communication%20Channels\\_Extract%20from%20Manual%20for%20Effective%20Communication.pdf](https://www.europarc.org/communication-skills/pdf/Online%20Communication%20Channels_Extract%20from%20Manual%20for%20Effective%20Communication.pdf))

#### PRODUCTS/OUTPUTS

Learners have knowledge and skills on online communication

Learners can illustrate by examples the available applications for social networking

Learners are willing to communicate online through several online ways



<b>Title of Module</b>	
<i>A. INTRODUCTION TO ICT SKILLS</i>	
<b>Title of Submodule</b>	
<i>A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE</i>	
<b>Title of Unit</b>	(hours)
<i>A.2.2 Online storage (Quick and easy access of information)</i>	20
<b>LEARNING OUTCOMES</b>	
<p>The learner will be able to distinguish between online storage solutions with the aim of quick and easy access to information.</p> <ul style="list-style-type: none"> <li>- Have knowledge of online document sharing and emphasise document ownership rights</li> <li>- Select adequate solutions for storing, sharing and managing data online (e.g. clouds)</li> <li>- Use available online sharing solutions, clouds and collaboration tools</li> </ul>	
<b>CONTENTS</b>	
<p><b>Introduction</b></p> <p>In order for a wider audience to find out about your products and/or crafts production, learn about online techniques for quick and easy access of/to information. Clouds, online platforms and collaboration applications can simplify the process of communication of designers or any online users. Most of the solutions available on the market are compatible with mobile devices, syncing once downloaded the file.</p> <p>You can use a cloud for:</p> <ul style="list-style-type: none"> <li>✓ File storage</li> <li>✓ File sharing</li> <li>✓ File protection (back up)</li> </ul> <p>Most of the cloud storage providers provide free access to sharing and/or storing your files. Other advantages of cloud storage include:</p> <ul style="list-style-type: none"> <li>✓ Remotely backed up and maintained data</li> <li>✓ Access data from anywhere provided Internet connection</li> <li>✓ Avoid emailing files to recipients, just a single link</li> <li>✓ Drag and drop function to share documents</li> <li>✓ Saves costs as you do not need to invest in additional hard drives</li> <li>✓ Quick set up</li> </ul> <p>Digitalization also enables to contribute to an online community, in order to share own ideas, benefit from already made patterns, consult other craft makers or download instructions for simplifying processes. This is known as <b>collaboration</b>.</p> <p><b>Document ownership rights regarding online sharing</b></p> <p>Files sharing involves exchange of intellectual property. In the case you are sharing own work, consider the rights you want to grant to users, i.e. to view, download, edit, share or amend. If you are deciding to share any work that is not of your primary ownership, revert to the original source for confirming ownership rights and further dissemination possibilities.</p> <p>According to EU law, making temporary copies on the user's screen or in the user's cache is not, in itself, illegal (5 June 2014, the Court of Justice of the European Union (CJEU), British Meltwater case). Clouds may be used to share works without consent of the copyright owner.</p> <p>Differentiate between copy write and patent</p> <p>If you can show that you developed your work from a different path and didn't simply copy someone else's work, that's a defence to the allegation that you have infringed their copy write.</p>	

**Additional guidelines for teachers of crafts for introducing online storage:**

- 1) Allow learners to explore available freeware for online storage and decide on their own the one that will be the most appropriate for them.
- 2) Start by sharing a photo, video, etc. with learners, so they first learn how to download and then share on their own.

**ASSESSMENT CRITERIA**

Identify and explain document sharing and clouds;  
Determine availability of cloud storage and other online sharing solutions;  
Outline steps to sharing and accessing information online;  
Plan making data available online (sharing);  
Select adequate online storage (clouds)  
Make use of online collaboration tools  
Use available online collaboration tools;  
Apply sharing solutions adjusted to the target audience;  
Depict between document ownership rights and copyright.

**RESOURCES**


Equipment: Computer with internet connection; optional: projector.  
Additional online resources:  
List of collaboration software listed on Wikipedia  
[https://en.wikipedia.org/wiki/List\\_of\\_collaborative\\_software](https://en.wikipedia.org/wiki/List_of_collaborative_software)  
Tutorials on using different cloud solutions  
<https://edu.gcfglobal.org/en/topics/usingthecloud/>

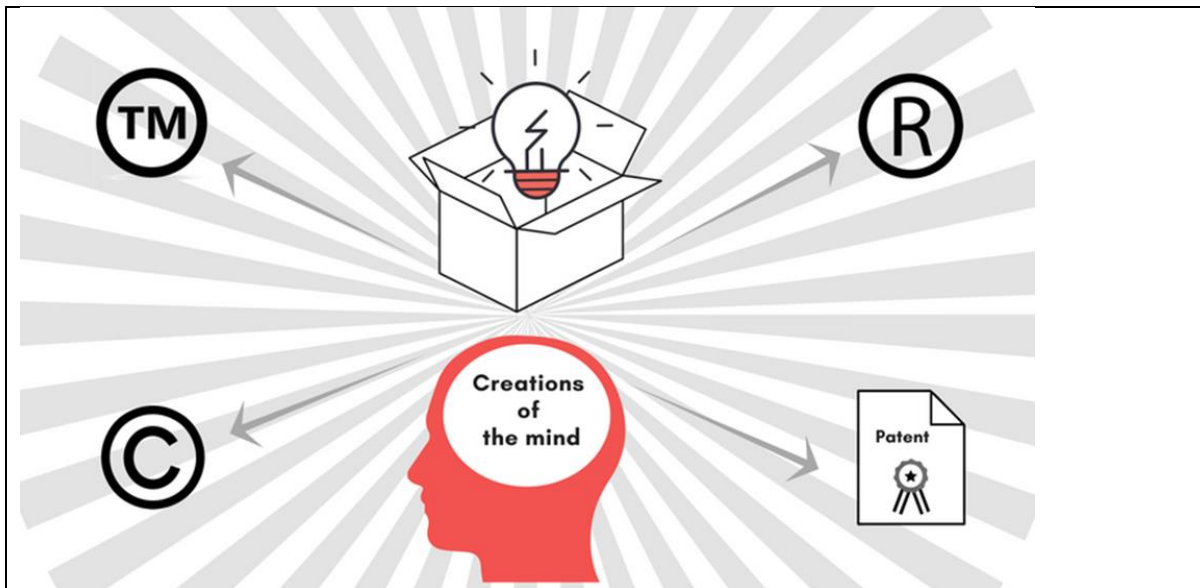
**PRODUCTS/OUTPUTS**

Learners have knowledge and skills on online document sharing.  
Learners can select adequate solutions for storing, sharing and managing data online (e.g. clouds)  
Learners can demonstrate how to use clouds with a selected freeware.

**SELF ASSESSMENT TOOL**

1. What is the purpose of online clouds?
2. How can you as a design benefit from using online clouds?
3. What examples of freeware for sharing, storing or collaboration are you familiar with?
4. What are the principles behind document ownership rights regarding online sharing?

<b>Title of Module</b> <i>A. INTRODUCTION TO ICT SKILLS</i>	
<b>Title of Submodule</b> <i>A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE</i>	
<b>Title of Unit</b> <i>A.2.3 Security measures Intellectual Property, GDPR</i>	(hours) 20
<b>LEARNING OBJECTIVES</b> <ul style="list-style-type: none"> <li>• to clarify the notion of the intellectual property</li> <li>• to clarify the meanings of the GDPR</li> <li>• to recognise and apply data protection tools and safety procedures</li> </ul>	
<b>CONTENTS</b> <p><b>Intellectual property</b> (IP) is a term for any intangible asset -- something proprietary that doesn't exist as a physical object but has value. Examples of intellectual property include designs, concepts, software, inventions, trade secrets, formulas and brand names, as well as works of art. Intellectual property can be protected by copyright, trademark, patent or other legal measure.</p> <ul style="list-style-type: none"> <li>- in the contemporary digital era the intellectual property faces new challenges which need to be reflected throughout security measures and safety procedures</li> <li>- GDPR – On 25 May 2018 was launched the General Data Protection Regulation (GDPR), aiming to improve data protection for individuals across the EU, became directly applicable</li> <li>- the crafts practitioners should know the notion of intellectual property, tools for protection, and should apply safety procedures which help them to assume responsibility and to have self-confidence</li> </ul> <p>Themes discussed - <i>If you think that you created something new and would like to know how to protect your creation</i></p> <ol style="list-style-type: none"> <li>1. Why is important intellectual property – <i>terms, protection, confidentiality agreement</i> <ol style="list-style-type: none"> <li>1.1 What is a Patent? <i>The inventor has the right to exclude others from making the invention</i></li> <li>1.2 What are Trademarks? <i>Logos, words and/or phrases that identify a unique source of goods or services</i></li> <li>1.3 What is a Copyright? <i>Copyrights can include published or unpublished works from being copied.</i></li> <li>1.4 Trade secrets - <i>customer lists, secrets of manufacturing, company strategies</i></li> </ol> </li> </ol>  <ol style="list-style-type: none"> <li>2. How to manage intellectual property risks</li> <li>3. How to navigate complicated legal structures</li> </ol>	



engo.com

### General Data Protection Regulation (GDPR)

On 25 May 2018, the General Data Protection Regulation (GDPR), aiming to improve data protection for individuals across the EU, became directly applicable.

Themes discussed:

1. Fundamentals of data protection
  - The notions of „privacy” and “personal data protection” and their conceptualization
  - Privacy and personal data protection as fundamental rights
  - Key definitions in personal data protection law
2. Main principles of EU data protection
3. Information, obligations
  - Transparency principle
  - Right of data success
  - Layered noticed
  - Information notices under different circumstances
4. Case studies
  - The use of cookies
  - Electronic contracts
  - The use of social networking sites
5. Data protection
6. Liabilities and sanctions
7. Impact of GDPR

### EVALUATION CRITERIA

#### Questionnaires

1. Why is important the intellectual property
2. Please enumerate 2 types of data protection in this field
3. What could be considered trade secret? Enumerate!

### RESOURCES

[www.digitalsme.eu](http://www.digitalsme.eu)  
[www.futurelearn.com](http://www.futurelearn.com)  
[www.itpro.co.uk](http://www.itpro.co.uk)  
[www.wipo.int](http://www.wipo.int)  
<https://money.howstuffworks.com/>  
<https://www.youtube.com/watch?v=RQ0JgEA5e1k>  
[www.engo.com](http://www.engo.com)  
<http://continuingprofessionaldevelopment.org/>

[www.rand.org](http://www.rand.org)  
[www.ifdc.global](http://www.ifdc.global)  
[www.researchgate.net](http://www.researchgate.net)

**PRODUCTS/OUTPUTS**

- Assume responsibility for safety procedures
- Self-confidence to act independently
- Knowledge of the notion of the intellectual property
- Knowledge of the meanings of the GDPR
- Knowledge and applying data protection tools and safety procedures



<b>Title of Module</b> <i>A. INTRODUCTION TO ICT SKILLS</i>	
<b>Title of SubModule</b> <i>A.2 ESSENTIAL SKILLS FOR THE DIGITAL AGE</i>	
<b>Title of Unit</b> <i>A.2.4 Continuous Professional Development in a Digital Age</i>	(hours) 25
<b>LEARNING OBJECTIVES</b> <ul style="list-style-type: none"> <li>• to have knowledge of the importance of continuous professional development in the Digital Age</li> <li>• to discover and demonstrate new learning modalities</li> <li>• to update crafts skills and technologies</li> <li>• to discover new tools for continuous professional development.</li> </ul>	
<b>CONTENTS</b> <p>The <b>Continuing Professional Development</b> (CPD) refers to the process of tracking and documenting the skills, knowledge and experience that you gain both formally and informally as you work, beyond any initial training.</p> <ul style="list-style-type: none"> <li>- Continuous professional development - refers to the process of tracking and documenting the skills, knowledge and experience that you gain both formally and informally as you work, beyond any initial training.</li> <li>- New learning modalities – are strong related to knowledge management and lifelong learning process</li> <li>- New tools and technologies – serve to update technological and digital crafts skills</li> </ul> <p>The CPD demonstrates the craftsmen professional standing to clients and/or employers. IT and business operations of crafts are no longer separate.</p> <p>Themes:</p> <ol style="list-style-type: none"> <li>1. CPD <ul style="list-style-type: none"> <li>✓ learning from colleagues or shared learning from networking</li> <li>✓ reading about new technologies, new methods of working, legislative changes</li> <li>✓ shadowing or assisting an experienced colleague</li> </ul> </li> <li>2. The use of digital technologies – learning and skills development into a lifelong process.</li> <li>3. Digital skills – as technical skills</li> <li>4. Digital navigation skills – needed to succeed in the digital world, ex. prioritizing information and assessing the quality and reliability of information.</li> <li>5. Knowledge management (e.g. validation of information, quality assurance of information).</li> <li>6. Self-learning and lifelong learning.</li> <li>7. Discerning the limits and barriers of technology (e.g. knowing when technology is helpful and when it is not).</li> </ol>	



*Epma.ae*

#### EVALUATION CRITERIA

##### Questionnaires:

1. What is the difference between digital technical skills and digital navigation skills?
2. Please explain the term of lifelong learning
3. Please enumerate 3 digital tools which could be used in your field of activities

#### RESOURCES

[www.digitalsme.eu](http://www.digitalsme.eu)  
[www.futurelearn.com](http://www.futurelearn.com)  
[www.itpro.co.uk](http://www.itpro.co.uk)  
[www.wipo.int](http://www.wipo.int)  
<https://money.howstuffworks.com/>  
<https://www.youtube.com/watch?v=RQOIgEA5e1k>  
[www.enago.com](http://www.enago.com)  
<http://continuingprofessionaldevelopment.org/>  
[www.rand.org](http://www.rand.org)  
[www.ifdc.global](http://www.ifdc.global)  
[www.researchgate.net](http://www.researchgate.net)

**PRODUCTS/OUTPUTS**

- Willingness to act independently, to update existing skills, learning modalities, technologies and tools
- Knowledge of the importance of continuous professional development in the Digital Age
- Knowledge of new learning modalities
- Update crafts skills and technologies
- Knowledge of new tools for continuous professional development.

## B. ONLINE AND DIGITAL TRAINING FOR CRAFTS

### B.1 LEARNING TOOLS

<b>Title of Module:</b> <i>B. ONLINE &amp; DIGITAL TRAINING FOR CRAFTS</i>	
<b>Title of submodule</b> <i>B.1. LEARNING TOOLS</i>	
<b>Title of Unit</b> <i>LEARNING TOOLS</i>	25 hours
<b>LEARNING OUTCOMES</b> The learner should be able to use Online Communication, networking and collaboration tools.	
<b>CONTENTS</b>  <b>Online Communication, networking and collaboration</b> The Web is an ideal medium for tutor-student and student-student communication, also supported by newsgroups and e-mail lists. Various Web based mechanisms can be used to facilitate student feedback and communication, with different degrees of complexity. For example, a simple anonymous Web form can be used within a specific course to encourage students to ask questions regarding specific assignments or other course-related issues and to share this information across the group. More sophisticated tools are threaded discussion and Web conferencing, as well as fully-fledged learning environments. The most common Communication tools used in online courses include, e-mail, Instant Messaging and Blogging. <b>E-mail:</b> E-mail stands for electronic mail; e-mail is defined as the transmission of messages over communication networks. There are many e-mail service providers and the most famous ones are Yahoo mail and G mail. Exchanging-mail messages with a mentor or peer is an e-learning experience. <b>Instant Messaging (IM):</b> Instant messaging is the exchange of text messages through a software application in real-time. Instant messaging allows learners to chat with one another through text messages. This has become very popular as here, everything is performed in a faster, more reliable and cohesive manner. Instant messaging helps teachers to create subject specific groups for exchange of information and sharing of resources. Instant messaging applications like WhatsUp are extensively used by teaching community as reliable communication tool. <b>Chat:</b> Chat is synchronous communication tool facilitating online communication. This tool helps teachers and learners to schedule a discussion on a particular question or theme and later save the chat discussion for later use. The chat tool is an integrated tool in all the LMS and there are many standalone chat applications which can be used outside the LMS. <b>Blogging:</b> A blog is your own website that you are going to update on an on-going basis. A blog is a frequently updated online personal journal or diary. In blogs entries are commonly displayed in reverse-chronological order. Most blogs are interactive, allowing visitors to leave comments and even message each other via widgets on the blogs and it is this interactivity that distinguishes them from other static websites. Many blogs provide commentary or news on a particular subject; others function as more personal online diaries. A typical blog combines text, images, and links to other blogs, Web pages, and other media related to its topic. Most blogs are primarily textual, although some focus on art (art blog), photographs (photo blog), videos (video blogging), music (MP3 blog), and audio (podcasting) <sup>16</sup> .  <b>Collaboration Tools</b> All around the globe we are witnessing the transition towards collaborative learning. The benefits of collaborative learning are immense. It lets the learners gain from the experience of their peers and help them acquire and retain information in a more involved and engaged way. Thus, we see most of the online training is also social. The learners learn through collaboration with peers in smaller or larger groups. The e-learning	

<sup>16</sup> Padrón, C., et. al. The collaborative development of didactic materials. Source: <https://pdfs.semanticscholar.org/0f8f/4b353292c5d14922adba5d11bef20494e6c4.pdf>

technology offers a number of collaborations, some of the popular collaboration tools include Chat, forum, wiki, online groups, audio/video conferencing, social bookmarking and social networking.

**Collaborative learning forums** promote learner interaction through message boards, where students can post questions and answers; text chat or forums where learners can communicate; and threaded discussions, where facilitators and students can discuss a given topic and review each other's responses.

**Wiki:** A wiki is a collaborative web site that collects and organizes content, created and revised by its users. The most well-known example is Wikipedia. Wikis are a way to grow a knowledge base around a particular content area, be it best practices in a particular field or how to use a specific piece of software. Several software helps to create online wiki and one of the most famous one among that is Wordpress. Wiki is also a feature available in all the Learner Management System. In an e-learning context wiki permits teachers to give many kinds of task to the learners to collaborate and create content on any topic. Wiki platforms are used extensively to create and share open educational resources and in Karnataka the KOER initiative is developed on a wiki platform.

**Social Bookmarking:** A social bookmarking service is a centralized online service which enables users to add, annotate, edit, and share bookmarks of web documents. Social bookmarking websites enhance and improve the learning experiences by encouraging group collaboration. They also help in organizing and saving web resources faster and easier for students. Social bookmarking services offer greater scope for research, integration, and collaboration compared to the more traditional bookmarking applications such as browsers, which offer limited functionality. There are many services which are available freely for creating and sharing social bookmarks and most famous among them are Diigo, Delicious, and StumbleUpon. Teachers can create social bookmarks of resources chapter wise and invite other teachers to contribute and annotate. The social bookmarks thus created can be shared with the learners and teachers can also give assignments to learners to collaboratively build social bookmarks related to a particular topic.

**Social Networking Sites.** Social Networking site is the phrase used to describe any Web site that enables users to create public profiles within that Web site and form relationships with other users of the same Web site who access their profile. Social networking sites can be used to describe community-based Web sites, online discussions forums, chatrooms and other social spaces online. Examples include Facebook, twitter, LinkedIn, Google+ etc. Social networking can be used effectively for e-learning by creating specific interest groups. The learners within this group can share information, photographs, videos, graphics related to a particular topic. This can also be used by teachers to collaborate in generating and sharing resources online with ease thereby facilitating learning.

Online courses integrate multimedia presentations using streaming media technology. **Webcasting** uses streaming media to transmit audio and video over the Internet. The term "webcasting" refers to audios and videos sent from a single source to multiple passive receivers. The typical application is the video lesson, where an expert talks to many learners simultaneously, without any interaction. However, recorded webcasts can be provided for asynchronous use. Videos can be used by the facilitator to provide content (e.g. short video lessons where an expert talks), motivation or orientation. They are used to show moving objects or processes (e.g. assembling components of a machine), present real people talking (e.g. the instructor), etc.

**Web conferencing** provides two-way communication, coordination and collaboration in the learning situations. Web conferencing refers to a live online educational presentation during which participating viewers can submit questions and comments. Web conferencing is a synchronous e-learning communication tool (recorded web conferences can be provided for asynchronous use, but then is not possible any interaction). Web conferencing is highly interactive, Internet-based applications with a rich collaboration feature set (e.g. audio/video from presenters and learners, application sharing, white boarding and mark-up tools, breakout rooms, polling, quizzing, hand raising and emoticon responses, slides and media, Web site tours, public/private text Chat). It is capable of scaling from small groups to hundreds or thousands of simultaneous users.

#### ASSESSMENT CRITERIA

Recognise the methods and tools applied to online communication, networking and collaboration

Be able to select a tool appropriate for a particular learning environment

Be able to act with the selected tool



**RESOURCES**

Technology based learning methodologies: [https://www.doleta.gov/reports/papers/tbl\\_paper\\_final.pdf](https://www.doleta.gov/reports/papers/tbl_paper_final.pdf)

Devezic, Vladan. Semantic web and education

Adapting learning materials for distance learning:

[http://oasis.col.org/bitstream/handle/11599/29/KS2007\\_Adapting-Learning-Materials.pdf?sequence=1&isAllowed=y](http://oasis.col.org/bitstream/handle/11599/29/KS2007_Adapting-Learning-Materials.pdf?sequence=1&isAllowed=y)

UNESCO. "ICT in Schools: A Handbook for Teachers or How ICT Can Create New, Open Learning Environments"

**PRODUCTS/OUTPUTS**

Training Modules IO2

**SELF ASSESSMENT TOOL**

Read the following sentences related with the content of this learning unit and identify which of them are false or truth:

- a) The most common communication tools used in online education are: e-mail based tools, discussion forums, wikis and other shared writing/editing tools, blogs, webcasting, chat and instant messaging (IM), whiteboard and screen-sharing tools, audio and video conferences.
- b) Popular collaboration tools include Chat, forum, wiki, online groups, audio/video conferencing, social bookmarking and social networking.
- c) Online course supported by Moodle LMS promote a collaborative approach. Moodle aims to help educators to create online courses with e-learning environments focused on interaction and collaboration.
- d) Webcasting allows viewers to participate submitting questions and comments during online educational presentation; while web conferencing is a passive listening/viewing video activity with no interaction between participants during the presentation.

*Answers: truth (a, b, c); false (d)*

## B.ONLINE AND DIGITAL TRAINING FOR CRAFTS

### B.2 CONTENT CREATION

#### B.2.1 Open Educational Resources

#### B.2.2 Free Tools and Platforms for Creating and Publishing Learning Resources

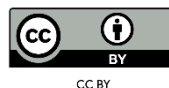
#### B.2.3. Collecting, Curating, and Organizing Learning Resources

<b>Title of Module</b>	
<i>B. ONLINE AND DIGITAL TRAINING FOR CRAFTS</i>	
<b>Title of submodule</b>	
<i>B.2 Content Creation</i>	
<b>Title of Unit</b>	(hours)
<i>B.2.1 Open Educational Resources</i>	17
<b>LEARNING OUTCOMES</b> <b>The learner should be able to deliver content for a learning platform</b> Knowledge: <ul style="list-style-type: none"> <li>Recognise the different audiovisual materials needed to devise Learning Content., including Open educational resources.</li> </ul> Skills: <ul style="list-style-type: none"> <li>Be able to plan OPEN learning material, e-learning content and activities for online learning platforms.</li> <li>Be able to produce learning material, e learning content and activities for online learning platforms.</li> </ul> Competences: <ul style="list-style-type: none"> <li>To make a plan and produce e learning content accordingly.</li> <li>To deliver your own e learning material for a specific training program, according to a given learning platform.</li> </ul>	
<b>CONTENTS</b> <b>Introduction</b> Open Educational Resources (OERs) are education/training materials (from simple texts to complete modules) that are available for people to access, use, adapt and redistribute freely or with very little restrictions. The key aspects are the legal ones, not the technical ones: a PDF file can be available online, but if its access is contingent to having paid a subscription or accepting an agreement preventing you from sharing it or from adding comments, from including it into a set of learning materials for a class, etc. then it is not an open resource. <b>Tools and concepts</b> <ul style="list-style-type: none"> <li>The <a href="#">2012 Paris Open Educational Resources Declaration</a> is a recommendation to states by the World OER Congress held at UNESCO. It calls for a diversity of actions to foster awareness and use of OERs, promote the understanding and use of open licensing frameworks, facilitate finding, retrieving, and sharing of OERs, encourage the open licensing of educational materials produced with public funds and many others.</li> <li><a href="#">OER Commons</a> is an online site with tools to help build and publish OERs such as lesson plans and courses, a library of OERs, and a diversity of other tools for connecting and sharing OERs.</li> <li><a href="#">OERCRAFT</a> is a project funded by the European Commission with the aims of developing and deploying OERs (targeted at micro and craft-type enterprises.</li> <li><a href="#">Creative Commons</a> is a global non-profit organization that aims to enable sharing and reuse of works through the provision of free legal tools. Its <a href="#">licenses</a> range from mere attribution (authors allow their works to be distributed, remixed, adapted or build upon, even if for profit purposes, as long as they are acknowledged as the original creators) to attribution preventing profit purposes and forbidding derivations (the most restrictive license).</li> </ul>	



### Practice

1. Pick one of your own original works (a text, a picture, etc.) or create a simple one for this practice. Apply to it the Creative Common "Attribution" license, by including in it the appropriate graphic label, the letters CC BY, and linking to the license summary and legal text, all of which are in the [licenses page of the Creative Commons site](#). Create an example of appropriate use of your work and an example of inappropriate use.
2. Do the same for the other licenses on the Creative Commons site. Note: for commercial uses of a work you may simply produce an example of what such a use would look like.
3. Search for various resources on the Web (videos, pictures, texts, courses, guidebooks, etc.). Can you identify the use terms for each? Look for the licensing terms and other legal texts associated with the resources or with the site that provide them. Notice that they may not be using creative commons, instead you must ascertain from their terms your freedom or not for access, use, adaptation, and redistribution.
4. List, for each resource you identified: openness of access (direct? free registration? paid/restricted registration?); use (who can use the resource for a training course? no-one? only public schools? any school? what about private tutors or training companies?); adaptation (can the resource be changed or must it be used "as is"? is the answer dependent on payment?); redistribution (can you redistribute the resource or only refer to it at its current location?).



### Further readings

Educase Open Educational Resources collection - <https://library.educause.edu/topics/teaching-and-learning/open-educational-resources-oer>

Open Educational Resources site of the International Council for Open and Distance Education - <https://www.icde.org/open-education-resources>

OER Portals: <http://www.pearltrees.com/joycevalenza/oer-portals/id17856381#l198>

### Additional guidelines for teachers of crafts for open educational resources:

1. Before publishing your work to an only repository or tool, check its licensing terms to see what control you kept over your work (can you still share it elsewhere, for instance?)
2. Think of how to express the license in non-text works. For instance, on the opening credits or final credits of a video; as a white banner on a picture; as a side text on a Web site where you distribute the work; as a piece of audio at the opening or end of a recording; etc.

### ASSESSMENT CRITERIA

- 1 – If someone sees the work you employed in practice task 1, can that person find the license icon, the letters CC BY, and click to reach the license summary and legal text? Have you produced an example where author attribution is made, and one where it isn't made?
- 2 – For each of the other licenses, have you produced a sample work and both an example of conformity and non-conformity?
- 3 – Did you search for an adequate number and diversity of resources, and have you managed to identify for each your authorization (or non-authorization) for access, use, adaptation, and redistribution, that is, the level of openness?

### RESOURCES

#### Equipment:

Computer with Internet connection; optional: projector.

### PRODUCTS/OUTPUTS

Learners have knowledge and skills on open educational resources  
Learners can select and use OERs within the bounds of their licensing, plan learning resources as OERs, and choose adequate licensing for self-made OERs

**SELF ASSESSMENT TOOL**

1. Show someone your examples of works with Creative Commons licenses and ask them if they can find out the licensing terms for each.
2. Show someone your examples of appropriate and inappropriate use. Can they guess which is which? Do they agree with the correctness of your examples?
3. E-mail the people in charge of some of the Web resources you found for practice tasks 3 and 4 and ask them if you understood correctly that you can/cannot use, adapt or redistribute their work for a specific case of crafts training. From their responses, have you understood correctly the original terms?

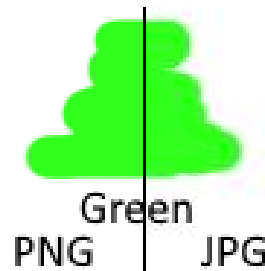
<b>Title of Module</b> <i>B. ONLINE AND DIGITAL TRAINING FOR CRAFTS</i>	
<b>Title of submodule</b> <i>B.2 CONTENT CREATION</i>	
<b>Title of Unit</b> <i>B.2.2 Free Tools and Platforms for Creating and Publishing Learning Resources</i>	(hours) 17
<b>LEARNING OUTCOMES</b> The learner should be able to select and use free tools for creating learning resources. Knowledge: <ul style="list-style-type: none"> <li>• Which audio and video formats are the most common and their properties</li> <li>• Which text and hypertext formats are the most common and their properties</li> <li>• Existing tools for creating interactive learning resources</li> <li>• Existing platforms for publishing learning resources</li> </ul> Skills: <ul style="list-style-type: none"> <li>• Using recording and editing tools for audio and video</li> <li>• Using online shared text and hypertext editing tools</li> <li>• Using interactive content creation tools</li> <li>• Using online platforms for storing and retrieving resources</li> </ul> Competences: <ul style="list-style-type: none"> <li>• Creating multimedia learning resources using audio, video, text, and hypertext</li> <li>• Creating interactive learning resources</li> <li>• Combine learning resources with online platforms for publishing</li> </ul>	
<b>CONTENTS</b> <b>Introduction</b> While learning resources can be varied and strikingly different, from static text to interactive games and simulations, a significant portion relies on some combination of text, audio and video, often with hyperlinks that enable users to explore other parts of the resources – or entirely new resources – by merely clicking on them. Since computational devices store only numerical information, all non-numerical content, from text to video, must be encoded as numbers. This means that for every image, sound, text, and video that must be saved, a process must be executed behind the scenes, converting sound pressure and frequency, image and video colours and intensity, letters and other symbols into a numerical representation. And when we need to hear and see that, another process must be executed behind the scenes, rendering the numbers as sound, light or some other form of output that humans understand. Over time, many different processes for this were created, each service different priorities. Some were meant to be fast. Others were meant to occupy the smallest amount for space or the shortest transmission time. Other yet were meant to be resilient to transmission errors. And some were simply meant to be owned by their creators, locking users into using (and paying) only a limited number of tools. It is thus relevant to have at least a cursory understanding of the most common format for audio, graphics, video, text, and hypertext, to manage to use as much available resources as possible, and for rendering one's creations accessible. The main concern on file formats for crafts education is that they are common, so that students can access them easily and also that as many tools as possible recognize them, for greater flexibility producing and developing educational activities. <b>Audio, image, and video formats</b> Among the current diversity of formats, the main differentiator is whether a format optimizes for file size (saving space and meaning faster transmission over the Internet) or quality (meaning larger file formats and longer transmission times, but less noise and better precision). <b>Audio:</b> MP3 ("MPEG Layer 3") is the most common format, due to providing low file size with good quality of audio. However, its low file size is achieved by losing some quality. For no loss in quality, the most	



common format is WAV (“Waveform”) or, for some compression without loss of quality, FLAC (Free Lossless Audio Codec), albeit fewer tools recognize this format.

#### Image:

The overwhelming majority of photographic images are stored as JPEG/JPG (“Joint Photographic Experts Group”), because it provides very good quality of small file sizes. However, for non-photographic images, the loss of quality of JPEG is very noticeable as blurs or smudges of colour, as shown on the sample image on the right. For photographic images where colour precision is critical, this is also a serious limitation of JPEG. For storing images without any loss of quality, the most used format is PNG (“Portable Network Graphics”), since it manages good compression of non-photographic images and preserves colour information on photographs. Other formats may occur such as TIFF/TIFF or BMP, but they are becoming uncommon outside professional editing contexts. Some images may be stored as drawing instructions (in technical language, in vector format) instead of static images, enabling them to be enlarged without any loss of quality (static images, when enlarged start to exhibit jagged lines – the “stairway” effect). These formats are less common but may be found as SVG (“Scalable Vector Graphics”) or EPS (“Encapsulated PostScript”).

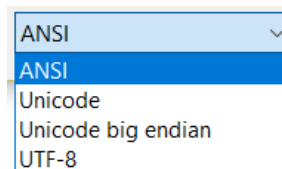


#### Video:

Videos are sequences of images and sound, which means their file sizes (and transmission times) are much greater than those of images. For this reason, it is uncommon to work with uncompressed video outside professional contexts. Unlike images and audio, video formats have not coalesced around a few formats, with at least 5 formats being commonly found: MP4 (“MPEG-4”), AVI (“Audio Video Interleave”), MOV (from “movie”, a format actually called QuickTime, often used by Apple), FLV (“Flash Video”), and WMV (“Windows Media Video”). These formats further accept multiple internal encodings, with names such as H.264, H.265, MPEG-4, DivX, XviD, and more. The technical features are quickly changing, but when you find that a tool does not support a video format, you can use some other tool to convert between formats. However, since all these formats compress video with loss of quality, there is always a degradation of quality when converting, so you should always keep a copy of the original video and convert from that one, whenever possible.

#### Text & Hypertext:

The simplest numerical representation of text is called ASCII (“American Standard Code for Information Interchange”), often simply called “Plain Text”. However, this should be avoided for non-English texts, since accented chars such as “á”, “ä”, “ü” and others such as Greek, Arabic, or Chinese characters are not represented in a standard way in this format and hence may appear garbled in different computers, across different countries. For this reason, whenever a tool allows it, one should use “Unicode” text encoding, which ensures that text is stored consistently across languages. Unicode may appear as “UTF-8” or “UTF-16”, but for most educational content issues, the difference between these two is not relevant. The image on the right shows the “Encoding” dropdown menu of Windows Notepad, which is available when saving. Hypertext refers to text which contains within instructions for placement of additional elements or behaviours, such as images, alignment and formatting, and links (called “hyperlinks”) to other parts of the same text or other texts, images, videos and resources in general. The most common format is HTML (“HyperText Markup Language”), which powers the Web, but often formatted and hyperlinked text is provided as PDF (“Portable Document Format”) documents. Typically, HTML pages will be used when we need to edit them regularly, and PDF for more final presentation of results. The most common ways to create a PDF is to “save as PDF” in other document-editing tools or by “printing as PDF” using a “PDF Printer”.



#### Interactive learning resources

Many online tools provide services for creating interactive content, with varying degrees of simplicity (or complexity). These will enable you to combine text, audio, image, and video resources, attribute rules for navigating them or react to user actions. For instance, [PurposeGames](#) enables quick creation of quiz games (textual, image, matching, etc) that can be shared on any Web page. [Sploder](#) enables the creation of online games such as classic arcade games, platformers, shooters and more, which can be employed for engaging students, helping them express the dynamics of learning concepts and their

viewpoints. For instance, by enabling students to create games that reflect stories, recollections, personal perspectives, fears and doubts, expectations and goals. Somewhere in between, many tools enable other sorts of interactive content creation, such as interactive stories or slideshows ([Adobe Spark](#), [Google Photos](#), [Prezi](#)), interactive infographics and reports ([Infogram](#)), and many more.

### Platforms for publishing learning resources

Invariably, learning platforms such as Moodle and others enable uploading and publishing of basic content such as text/hypertext, files, images, and small videos or audio files. For larger videos and audio files, large photo galleries, and any interactive content, however, the most common option is to employ an online repository or hosting service. Videos are commonly stored on [YouTube](#) and [Vimeo](#), audio either as a video soundtrack or in platforms such as [SoundCloud](#), and interactive content often on the sites that enable its creation. Several services also enable the quick creation of Web sites, such as [Google Sites](#), which enable crafts educators to assemble and combine static and interactive content from various sources on the Web.

### Tools

[Audacity](#) – audio recording and editing software

[Bullzip](#) – PDF printer

[FormatFactory](#) – tool for converting between multiple video and audio formats

[Lightworks](#) – Video creation and editing software

[Paint.Net](#) – image editing software

[VLC](#) – Almost universal video player.

### Practice

1. Download the tools and create various audio, video, image and PDF files. Employ the tools to convert them among different formats, and compare the results, by opening them in your computer and checking quality, speed, size, and how quick you can send them to other people over the Web.
2. Use Audacity to record an audio file, and edit it by cutting sections (for instance, deleting silent bits in the beginning or end), and applying effects such as amplification and noise reduction.
3. Use Lightworks to combine videos and audio into a movie, and by editing an existing video by cutting extra parts and retaining only a relevant section.
4. Upload audio and video files to services such as YouTube and SoundCloud. Then create a site on Google Sites and organize a page with text, images, and embedding the YouTube videos and SoundCloud audios, by following their “embed” instructions.
5. Explore the mentioned interactive learning resources to create some interactive content, and include it on the previously-created Google Sites page following each site’s instructions for embedding.

### Further readings

10 Common Video File Formats, Codecs, and Containers -

<https://www.borrowlenses.com/blog/video-file-formats/>

51 Best Free Visual Content Creation Tools To Make Marketing Easy - <https://optinmonster.com/best-visual-content-creation-tools/>

Get Started with Sites - <https://gsuite.google.com/learning-center/products/sites/get-started/#!/>

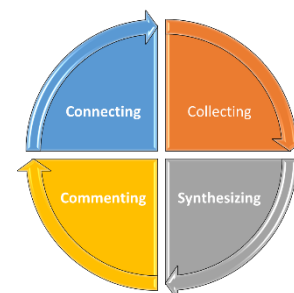
Designing Accessible Learning Content - <http://www.teaching-learning.utas.edu.au/content-and-resources/accessibility>

### Additional guidelines for teachers of crafts for creating and publishing learning resources:

1. Whenever possible, keep personal copies of all resources – texts, audio, image, and video files, and save your Web pages. This will enable you to recover content if some online services cease to be available or cease to be free.
2. Use interactive content as a complement, not as your core content – this way, students can access most of the content offline or even save it, since they may have low bandwidth or pay connectivity fees.
3. Remember that sometimes learners access content on the move, in public transportation or crowded places, so ensure that there are ways to engage with your content on small screens and without requiring sound.

<p>4. Some of your students may have disabilities. Plan for alternatives when producing content. For instance, blind users are not able to follow a video, so having a textual description may provide them with the same information. Graphic symbols and textual cues may help blind users interpret contextual cues such as music/noise. For interactive content, remember that some learners may have motion disabilities and require more time, so refrain from demanding time-based interaction (for instance, if you use action games, have alternative learning paths for learners with visual and motion disabilities). More info on the “Designing Accessible Learning Content” link above.</p>
<p><b>ASSESSMENT CRITERIA</b></p> <ol style="list-style-type: none"> <li>1- Diversity of versions of the same audios, images, and videos using different formats</li> <li>2- Comparison of pre-editing and post-editing versions of audio and video files</li> <li>3- Existence of a movie created as a combination of other video and audio files</li> <li>4- Links to content that was uploaded to online platforms and the matching local files</li> <li>5- Existence of a Google Site hosting a combination of texts, images, and audio/video content embedded from online platforms</li> <li>6- Existence of interactive learning content on the same site, embedded from its originating online platform</li> </ol>
<p><b>RESOURCES</b></p> <p><b>Equipment:</b> Computer with Internet connection; optional: projector.</p>
<p><b>PRODUCTS/OUTPUTS</b></p> <p>Learners have knowledge and skills on free tools and platforms for creating and publishing learning resources</p> <p>Learners can create multimedia learning resources using audio, video, text, and hypertext, create interactive learning resources, and combine learning resources with online platforms for publishing.</p>
<p><b>SELF ASSESSMENT TOOL</b></p> <ol style="list-style-type: none"> <li>1. Have you managed to create several versions of the same audio, image, and video files, in different formats?</li> <li>2. Did you manage to detect differences between them, along the dimensions of quality, speed, size, etc.?</li> <li>3. Did you manage to record and edit the audio file, including amplification and noise reduction?</li> <li>4. Did you manage to create a movie by combining videos and audio?</li> <li>5. Did you manage to edit an existing video by cutting extra parts and retaining only a relevant section?</li> <li>6. Did you manage to upload audio and video into online platforms?</li> <li>7. Did you manage to create a Web site and embed into it audio and video hosted by online platforms?</li> <li>8. Did you create a diversity of interactive learning resources and provided them embedded on your Web site?</li> <li>9. Have you created alternative forms of content to render it accessible to disabled learners?</li> </ol>

<b>Title of Module</b> <b>B. ONLINE AND DIGITAL TRAINING FOR CRAFTS</b>	
<b>Title of submodule</b> <b>B.2 CONTENT CREATION</b>	
<b>Title of Unit</b> <b>B.2.3. Collecting, Curating, and Organizing Learning Resources</b>	(hours) 17
<b>LEARNING OUTCOMES</b> The learner should be able to collect, curate and organize learning resources Knowledge: <ul style="list-style-type: none"> <li>• Concept of content curation for personal learning</li> <li>• Stages of content curation: collecting, synthesizing, commenting, connecting</li> </ul> Skills: <ul style="list-style-type: none"> <li>• Relating content curation stages to actions upon learning content</li> <li>• Discovering tools for content curation</li> <li>• Experimenting with tools for content curation</li> <li>• Selecting and applying content curation tools for each stage of content curation</li> </ul> Competences: <ul style="list-style-type: none"> <li>• Construct and develop curated content learning spaces for the crafts sector</li> </ul>	
<b>CONTENTS</b> <b>Introduction</b> Learning resources for the crafts appear and disappear on online platforms. Their quality, usefulness, and scope varies immensely, which can be daunting or disorienting for learners. Online educators must thus be partners in the process of navigating and exploring the ever-changing sea of learning resources. The mere collection and indexing of them soon becomes so large and outdated that it becomes useless. Thus, educators must be content curators. Besides acting as curators for their students, educators should also encourage students to curate their own learning resources as part of their reflective learning process. Curating content is going beyond collecting resources: it's organizing them in useful ways, providing contextual information, such as quality, theme, area of application, how current they are, etc. The resulting organized contents are thus more valuable for learning than their mere individual elements. Also, educational content curation can be generic in terms of target group or more focused. For instance, generic curated contents for the crafts sector may include all sorts of raw materials advice, but curated contents for a specific school may need to provide greater emphasis on which raw materials are readily available or within the budget of students, which techniques are being prioritized by the school project, and many other local context elements. <b>Stages of content curation</b> The curation process is a cycle, with four continuous (and parallel) stages: <ul style="list-style-type: none"> <li>• <b>Collecting</b>, the process of regularly searching and indexing relevant resources and organizing them in logical and consistent ways;</li> <li>• <b>Synthesizing</b>, the task of reducing the complexity and extension of resources by summarizing their most relevant aspects;</li> <li>• <b>Commenting</b>, the task of associating contextual information to resources, such as their degree of usefulness or applicability, completeness, how they compare to others, which aspects relate to other resources, how up-to-date they are, etc.</li> </ul>	



- **Connecting**, the process of presenting your curated resources to a community, engaging that community to improve the quality of the curation process, and change all aspects (collection, syntheses, comments) to better suit the needs and goals of the community.

### Tools

Team Curation Tools and Platforms - <https://www.pearltrees.com/t/curation-tools-platforms/id17762089#1346>

16 Curation Tools for Teachers and Students - <https://shakeuplearning.com/blog/16-curation-tools-for-teachers-and-students/>

### Practice

1. Select a specific learning topic about crafts (for instance, dyeing) and a target audience (for instance, vocational education and training students) which will be used to follow the four stages of curation for a minimum of 10 resources about your topic (as instructed in the following items).
2. Collect 10 different resources by a combination of searching Google.com, searching Twitter & Facebook and other social media, and searching publication platforms such as [SlideShare](#), [Scribd](#), and [Issuu](#). Organize them under at least three categories.
3. Synthesize each resource (max. 30 words).
4. Comment the categories or individual resources, as appropriate.
5. Publish the curated result and share it with other people, ideally from the target audience; connect with those people, getting their feedback.
6. Using the lists of tools, review the previous steps and perform them with different tools, trying them out and experimenting.

### Further readings

Content Curation for Learning - The Complete Guide from Anders Pink.

<https://anderspink.com/documents/content-curation-book.pdf>

Content Curation Official Guide. <https://medium.com/content-curation-official-guide/about>

### Additional guidelines for teachers of crafts for developing personal learning environments:

1. Be valuable: do not synthesize or comment by copy/pasting text from the tools, create syntheses and comments that are adequate for your target audience.
2. Focus on quality rather than quantity: decide which of your findings should and shouldn't be in the curated contents, think whether some content merely duplicates existing content, think of the added value of each piece of curated content.

### ASSESSMENT CRITERIA

1. Have a target topic and a target audience been identified? Are they clear or too generic?
2. Diversity of sources and types of the collected resources.
3. Adequacy of the categories to the topic and target audience, adequacy of the assignment of resources to categories.
4. Quality of the syntheses in view of the topic and target audience.
5. Quality of the comments: value and diversity of the contextual information they provide in view of the target audience.
6. Ease of access and commenting of the curated content that was published, level of personal commitment when sharing.
7. Variety and richness of the different tools used.

### RESOURCES

#### Equipment:

Computer with Internet connection; optional: projector.

### PRODUCTS/OUTPUTS

Learners have knowledge and skills on collecting, curating, and organizing learning resources  
Learners can construct and develop curated content learning spaces for the crafts sector

### SELF ASSESSMENT TOOL

1. Did you select a target topic and a target audience? Are they specific or too generic (i.e., “teenagers”)?
2. Did you collect at least 10 resources? Are they diverse enough to be valuable to the target audience, providing different information, and stemming from different sources among those suggested?
3. Have you grouped the resources under at least three categories? Are the categories useful from the perspective of the audience? For instance, if the audience wants textile patterns, grouping them by photo file format isn’t useful, but grouping them by material/technique/cost/effort may be.
4. Are the syntheses useful for your target audience? Or do they require opening the resource to realize its value? Are they too short, too long, or adequate in length?
5. Are the comments providing contextual value for the audience? Is the time spent by the audience reading your comments saving them time when deciding which resources to use and for what purpose?
6. Are the published resources making clear their categories? Are the syntheses and comments visible?
7. Can people easily provide feedback and discuss your curation, contributing to improve it?
8. Have you approached the audience with text framing the usefulness of your curated content and your willingness to receive comments and suggestions? Or have you simply informed people of their existence?
9. Have you gone through the steps with different tools?
10. Are the different tools you selected diverse, or are they simply variations of the same kind of tool?



## B.ONLINE AND DIGITAL TRAINING FOR CRAFTS

### B.3 TRAINING METHODS

<b>Title of Module:</b> <i>B. ONLINE &amp; DIGITAL TRAINING FOR CRAFTS</i>	
<b>Title of submodule:</b> <i>B.3. TRAINING METHODS</i>	
<b>Title of Unit:</b> <i>TRAINING METHODS</i>	25 hours
<b>LEARNING OUTCOMES</b> The learner should be able to customize digital training systems and adapt didactic materials	
<b>CONTENTS</b> Learning Management System (LMS) provides an infrastructure platform through which learning content is delivered and the learning and learners are managed. It provides a combination of software tools that perform a variety of functions related to online and offline training administration and performance management. Typically, an LMS is internet-based software that deploys, manages, tracks, reports on the interaction between the learner and the content, and the learner and the instructor. Administratively, an LMS makes it easy to enter, track, manage, and report on learning activities and competencies. An LMS is not limited to e-learning and can also manage other forms of instruction (also it is adapted to operate with mobile learning devices). After the introduction of ITC devices, like computers, in education, the use of e-learning and mobile learning has made a transformative progress in this field: the development of a ubiquitous learning environment that combines the advantages of an adaptive learning environment with the benefits of ubiquitous computing and the flexibility of mobile devices. U-learning (ubiquitous) means every where, every time, every content learning. Cloud computing has changed the role of ubiquitous devices, providing better usability than devices that perform data storage and processing locally <sup>17</sup> . U-Learning consists of two components: <ul style="list-style-type: none"> <li>- E-learning includes a wide range of application and processes including computer-based learning, web-based learning, virtual class room, digital content. Delivery of content through e- learning is via all electronic media including internet, intranet, extranet, CD-ROM, interactive TV, audio-videotape<sup>18</sup>.</li> <li>- A mobile learning (m-learning) environment is a learning environment supported by mobile devices. According to a UNESCO report (2013), mobile devices include any portable, connected technology, such as basic mobile phones, smartphones, e-readers, netbooks, tablets, iPads and computers. Although not designed primarily for educational use, modern mobile devices enable new possibilities for learning. They integrate old with new learning tools: book, paper, pencil, camera, video camera, radio, computer, and telephone, to support learning that is personal, contextualised, and controlled by the learner<sup>19</sup>. M-learning is considered either as a subset of e-learning or an extension of e-learning. M-learning is not just e-learning with mobile devices. Information is accessed from anyplace (spatial aspect of mobility), at any time (temporal aspect of mobility) and also by anyone (individually and collaboratively)<sup>20</sup>. The three fundamental components of mobile learning are: hardware, interface and pedagogical design. Regarding the relationship between M-Learning and the educational fields, mobile learning has traditionally developed within the non-formal education field. Mobile terminals offer many possibilities to students regarding communication and autonomous work, being an important resource when it comes to develop Personal Learning Environments or in collaborative work contexts<sup>21</sup>.</li> </ul>	

<sup>17</sup> Marinagi, C.; et. al. "The 2nd International Conference on Integrated Information. Employing ubiquitous devices in High Education". Procedia: Social and Behavioral Sciences, n° 73, 2013, pp. 487–494

<sup>18</sup> Sharma, S. "Role of ITC in the process of teaching and learning". Journal of Education and Practice, vol 2, n° 5, 2011, p. 6

<sup>19</sup> Marinagi, C., [Op. cit., p. 3](#)

<sup>20</sup> [Ibid.](#)

<sup>21</sup> García-Peñalvo, F.; Olmos, S.; Sánchez-Prieto, J. "Understanding mobile learning: Devices, pedagogical implications and research lines". TESI, n° 15, 2013, pp. 20-42

ICT and [communications technology](#) can be a powerful tool for **personalized learning** as it allows learners access to research and information, and provides a mechanism for communication, debate, and recording learning achievements. Personalized learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may all vary based on learner needs. In e-learning area, “Personalized learning is the tailoring of pedagogy, curriculum and learning environments to meet the needs and learning styles of individual learners”<sup>22</sup>. In contrary to conventional e-learning which tends to treat learners as a homogeneous entity, personalized e-learning recognizes learners as a heterogeneous mix of individuals. Moreover, “the topic of personalization is strictly related to the shift from a teacher-centered perspective of teaching to a **learner-centered**, competency-oriented one”<sup>23</sup>. A learner-centric model is well aligned with **constructivist learning pedagogy** which maintains that students learn best when they can actively participate in their learning and build their knowledge, rather than just act as passive recipients of knowledge. Personalized e-learning uses proactive learning strategy, which enable learner to control learning content, pace and scope.

Essentially **personalized e-learning** offers to learner’s customization of a variety of the elements of the online education process:

- The learning environment: content and its appearance to the learner (like backgrounds, themes, font sizes, colours, and so on)
- The learning content itself: multimedia representations (like textual, graphical, audio, video, and so on)
- The interaction: include facilitator, student and the learning content (e.g. mouse, keyboard, tap/swipe; e.g. using Quizzes, Online discussions, “Gaming”, Tutorials, Adaptive learning approaches)<sup>24</sup>

Usually, three essential **types of adaptation** have been proposed in literature:

1. Interface-based (also known as adaptive navigation). It relates to elements and options of the interface and usability and adaptability: where particular elements are positioned on the screen, which properties are defined (size, colour, etc.) and so on.
2. Learning flow-based. The learning process is dynamically adapted to the sequence in appropriate (different) ways the contents of the course is delivered.
3. Content-based. In such systems resources and activities dynamically change their actual content (for example systems based on adaptive presentation)<sup>25</sup>

Analysis of trends in modern e-learning systems showed that the **most popular types of personalization** in today’s e-learning systems are:

- Learning style identification. Personalization of the system is based on the identified learning styles of each user of the system (adaptive learning approaches).
- Recommendation systems. These systems are used to recommend appropriate educational material to the learner and to select optimal paths through the learning materials. A recommendation system is the system that has, as principal task, to choose certain objects (any kind of information or articles, such as books, movies, songs, Web pages, blogs, etc.) that meet the users requirements. It is an application capable of presenting a user a suggestion for an object, obtained on the basis of his previous preferences and the preferences of a community which has likings and opinions similar to his/her.
- Link adaptation. The system modifies the appearance and/or availability of every link that appears on a course Web page, in order to show the learner, whether the link leads to interesting new information, to new information the learner is not ready for, or to a page that provides no new knowledge. The system makes some links inaccessible to the learner if the system estimates from the learner model that such links take him/her for the irrelevant information.
- Personalised pedagogical agents. Usually e-learning environments are equipped with different kinds of agents that support more intelligent and human-like (teacher-to-student) communication within the system. Personal, pedagogical avatars are a way to facilitate higher quality of delivering topics and assessing acquired knowledge<sup>26</sup>. There are two groups of agents: *pedagogical* agents with diverse functionalities and potential; and *harvesting* agents employed in educational environments with the

<sup>22</sup> Klačnja-Milićević, A.; et al. E-Learning Systems. Intelligent Systems Reference Library 112

<sup>23</sup> [Ibid.](#)

<sup>24</sup> [Ibid., p. 22](#)

<sup>25</sup> [Ibid., p. 24](#)

<sup>26</sup> [Ibid.](#)

main goal of collecting different learning resources. Pedagogical agents are defined as “lifelike characters presented on a computer screen that guide users through multimedia learning environments”. Their main design goal is to engage, motivate, and guide learners through the learning process. One of the main characteristics of pedagogical agents is interactivity. A *harvester* is an object that collects resources and metadata records from remote repositories<sup>27</sup>.

Among the types of individualized online learning named above, an **adaptive e-learning system** is considered as one of the most recent variants. This system attempts to adapt to each user by offering learning resources in accordance with one or several characteristics of the user. There are two kinds of adaptation in the adaptive e-learning system depending on who takes the initiatives: the system or the student. If the system which initiates, it is called adaptivity and if the student who initiates, it is called adaptability. Adaptivity means the capability of a system to adjust its presentation according to the student characteristics automatically, while adaptability means the capability of the system to support user adjustment. Systems that can adapt automatically to the user based on the system’s assumptions about user characteristics are called **adaptive**. Systems that allow the user to change certain aspects and adapt their behaviour accordingly are called **adaptable**<sup>28</sup>. An **e-learning system is considered to be adaptive** if it is capable of: monitoring the activities of its users; interpreting these on the basis of domain-specific models; inferring user requirements and preferences out of the interpreted activities, appropriately representing these in associated models; and, finally, acting upon the available knowledge on its users and the subject matter at hand, to dynamically facilitate the learning process. Since the system behaviour adapts to a person, this kind of adaptation is also called personalization. Thus, adaptive e-learning system can be described as **personalized system**, which beside contents discovery and assembly, is able to provide adaptive course delivery, adaptive interaction, and adaptive collaboration support<sup>29</sup>.

**Adaptive learning system based on learners’ styles.** Learning is a cognitive activity that differs from student to student. Analysing adaptability in e-learning system has explicitly pointed out the importance of the modelling learners’ cognitive characteristics, particularly, learning styles as the most explored cognitive features. **Learning styles** are used to specify how learners perceive, process and interact with learning environment. There are several different learning style models presented in literature; however, **Felder-Silverman Learning Styles Model (FSLSM)** is often used for providing adaptability regarding learning styles in e-learning environments. Felder-Silverman model describes single student in accordance to six dimensions (active vs. reflective, sensing vs. intuitive, visual vs. verbal, sequential vs. global, Traditional vs. Advanced and Work in group vs. Standalone):

- The active learners gain information through a learning by doing style, discussing or explaining it to others, while reflective learners gain information by thinking about it quietly first.
- Sensing learners tend to learn facts through their senses, while intuitive learners prefer discovering possibilities and relationships.
- Visual learners prefer images, diagrams, and graphics, while verbal learners remember what they’ve heard, read or said.
- Sequential learners gain understanding from logical continuous steps, while global learners take big intuitive leaps with the information.
- Traditional learners could assimilate information better using the traditional learning way without using illustrative educational tools, while Advanced are keen to try things out, they tend to be impatient with long discussions and are practical and down to earth.
- Work in group learners tend to like group work and become more effective and motivated, while Standalone learners prefer working alone or in a small group contains only few persons so they could understand better<sup>30</sup>.

<sup>27</sup> Ivanović, M.; et. al. Different Roles of Agents in Personalized Programming Learning Environment. Source: <http://www.sudskavestacenja.com/wp-content/uploads/2017/09/Different-roles-of-agents-in-Personalized-Programming-Learning-Environment.pdf>

<sup>28</sup> Herman Dwi Surjono. “The Development of an Adaptive E-Learning System by Customizing an LMS Moodle”. International Journal of Computer Science and Information Technologies, Vol. 4, 2013, pp. 632 - 635

<sup>29</sup> “Creating Adaptive Environment for e-Learning Courses”. JIOS, VOL. 33, n° 1, 2009

<sup>30</sup> Oneto, L.; et. al. Making today’s Learning Management Systems adaptive. Source: [http://www.wis.win.tue.nl/lms-ale-09/Oneto\\_paper.pdf](http://www.wis.win.tue.nl/lms-ale-09/Oneto_paper.pdf)

To build the initial model, the system's authors must firstly establish the rules to match learning styles with the resource's characteristics in order to determine which resources are more appropriate to a particular learning style. There are adaptive learning systems implemented by customizing the LMS of Moodle. These systems identify the student's learning styles tendency through a set of questionnaires. The questionnaire scores are used by the system as basis to provide the student a presentation of learning resources differently. There are different tools used to categorize each person according to their learning styles: Kolb questionnaire, honey and Mumford questionnaire, GRSLS questionnaire, Myers-Briggs type indicator, and finally FelderSilverman.

Some adaptive learning frameworks are WINDS, AHA!, InterBook, APeLS:

- WINDS is an adaptive learning environment integrating an intelligent tutoring system (ITS), a computer instruction management system and a set of cooperative tools. WINDS system provides adaptability and personalization of study materials according to the learner model and history of the performed actions in a context of Virtual University of Architecture and Engineering Design.
- AHA! is an open source general-purpose adaptive hypermedia system mainly used in education domain. It supports adaptation techniques such as adaptive guiding, link annotation, link hiding and adaptive presentation.
- InterBook is a tool for authoring and delivering adaptive electronic textbooks on the World Wide Web. It supports adaptive navigation that guides the users in their hyperspace exploration.
- APeLS is a multi-model metadata driven adaptive hypermedia system that manages narrative, content and learner into different models. It is based on a rule-based engine that produces a model for personalized courses based on a narrative and the learner model<sup>31</sup>.

#### ASSESSMENT CRITERIA

Knowledge of different types of personalized systems to delivery an online course

Be able to customize a Learning Management System to provide an online course

Be able to adapt didactic materials to the customized Learning Management System

#### RESOURCES

Technology based learning methodologies: [https://www.doleta.gov/reports/papers/tbl\\_paper\\_final.pdf](https://www.doleta.gov/reports/papers/tbl_paper_final.pdf)

Devezic, Vladan. Semantic web and education

Adapting learning materials for distance learning:

[http://oasis.col.org/bitstream/handle/11599/29/KS2007\\_Adapting-Learning-Materials.pdf?sequence=1&isAllowed=y](http://oasis.col.org/bitstream/handle/11599/29/KS2007_Adapting-Learning-Materials.pdf?sequence=1&isAllowed=y)

UNESCO. "ICT in Schools: A Handbook for Teachers or How ICT Can Create New, Open Learning Environments"

#### PRODUCTS/OUTPUTS

Training Modules IO2

#### SELF ASSESSMENT TOOL

Read the following sentences related with the content of this learning unit and identify which of them are false or truth:

- b. Personalization is strictly related to a learner-centered perspective aligned with constructivist learning pedagogy which maintains that students learn best when they can actively participate in their learning and build their knowledge, rather than just act as passive recipients of knowledge.
- c. Adaptive learning systems cannot be implemented by customizing the LMS of Moodle, learner's learning styles can be identified through a set of questionnaires.
- d. Learning styles are used to specify how learners perceive, process and interact with learning environment. For example, the reflective learners gain information through a learning by doing style, discussing or explaining it to others, while active learners gain information by thinking about it quietly first.

*Answers: truth (a); false (b, c)*

<sup>31</sup> Ibid., [p. 2](#)



## C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS

### C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT

**C.1.1: Open Source and Open Hardware Solutions, Pros, Cons and common deployment aspects.**

**C.1.2: 3D formats, Frameworks and Industry standards.**

**C.1.3: 2D formats, Frameworks and Industry Standards.**

**C.1.4: Open Hardware Vs Proprietary solutions. Industry Standards.**

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT</i>	
<b>Title of Unit</b> <i>C.1.1: Open Source and Open Hardware Solutions, Pros, Cons and common deployment aspects.</i>	(hours) 3
<b>LEARNING OUTCOMES</b> The student must know what are the advantages and disadvantages of the use of programs and open computer supports in digital tools. - Have knowledge of open-use programs. - Have knowledge of open-source computer supports. - Possibilities of development of open supports.	
<b>CONTENTS</b> <b>Introduction</b>  <p><b>FREE SOFTWARE:</b> It is the name of the software that provides freedom to the users on their acquired product and therefore, once obtained it can be used, copied, studied, modified and redistributed freely.</p> <p><b>FREE HARDWARE:</b> For the great majority, the English term "hardware" is strange, which is nothing more than a general term that is used to describe the physical artifacts of a technology. In this sense, the hardware can be important military equipment, electronic equipment, or computer equipment. In computing, hardware or hardware is called the set of material elements that make up a computer. Hardware are also the physical components of a computer such as the hard disk, the optical disk drive, the floppy disk drive, etc. Hardware refers to what is tangible (that can be touched), that is, all the physical components of the computer.</p> <p>Free software offers the user four freedoms: freedom of use, study and modification, distribution, and redistribution of modified versions. There are licenses that guarantee them and that give legal coverage, such as the GNU GPL license. Free hardware takes these same ideas from free software to apply them in your field.</p> <p>There is an important group of people who think that the only advantage of free software with respect to proprietary software is that it is free. This thought is totally false and there are full advantages of free software over proprietary software.</p> <p><b>Advantages of free software with respect to private software:</b></p> <ul style="list-style-type: none"> <li>• Advantage 1: Only sometimes free software and applications are not free. This fact supposes an important saving in licenses on the part of the companies and of the</li> </ul>	



particular users. At this point you have to keep in mind that free software is not synonymous with free software. There are times when it is necessary to pay to be able to use free software and other cases in which the technical support behind free software must be paid.

- Advantage 2: The technical support of free software applications is usually carried out by local companies close to us and much of what we pay stays in these companies. The support of proprietary software can also be carried out by local companies nearby, but unlike the previous case, the great part of the support benefit is borne by the company that owns the software. Therefore, using free software is a way to favor our closest community.
- Advantage 3: On many occasions the programs or applications of Free Software are really good and surpass or equal their private counterparts. Some examples are Thunderbird, Firefox, Filezilla (Open Source), VLC, Blender, Gimp, Libreoffice etc. Therefore, the belief that free software is free and offers limited services software is totally false.
- Advantage 4: Free software, and also open source software, have their source code available. This is an important advantage because it guarantees that the program or application we are using will always be at our disposal, and there will always be developers willing to write new code and improve the program. In the case of using programs or proprietary software applications, it is possible that on a certain day the software disappears because the developer who was developing the application or program becomes tired, because the company behind the software goes bankrupt, because the developer of the program decides that it comes to mind to invest resources in the program, etc.
- Advantage 5: The user is the software owner. The same cannot be said for proprietary software applications. In most proprietary software applications, the license does not make you the owner of the software, but simply gives you a right to use while you pay for your license and while the company behind the software continues to exist.
- Advantage 6: Free software projects are projects in which it is possible for a large number of people to participate forming a large multidisciplinary team. This fact undoubtedly helps the quality of the written code is superior and that projects that otherwise would be completely impossible can be carried out.
- Advantage 7: The source code is available for everyone. Having access to the source code we can know at all times what the software is doing and in this way we can be sure that our privacy and security are not being compromised. Through the source code, computer programmers can check that there are no backdoors, that there are no security vulnerabilities and that the quality of the written code is optimal.
- Advantage 8: In the case of having problems with a free software application, usually we will always have a large community willing to offer their help in a completely disinterested way. Free software is used to create communities to share knowledge.
- Advantage 9: Using free software is a way to combat piracy and monopolies created by proprietary software companies.
- Advantage 10: The big companies that make privative software do everything possible so that their software is adopted as the only way to use a personal computer. This fact generates large monopolies, unfair competition and that in many cases we end up using software that is not the most suitable for our needs.
- Advantage 11: Companies that generate proprietary software tend to use closed file formats, such as .doc, .dwg, .tiff, .mp3, etc., while companies that develop free software usually use open formats such as example the .odf, .pdf, jpeg, .ogg etc. The fact of using

an open format will allow anyone to program a software that allows opening and editing this file, while if we use a closed / proprietary file format it is possible that only the proprietary program that created the file can open it. This is important, because if we use files with closed format it is possible that in the future we have problems / difficulties to recover the information stored in them.

- Advantage 12: Free software can be easily adapted to the needs of a person or corporate entity, while proprietary software does not offer this type of flexibility. The proprietary software can only be modified by the person and company creating the software and each modification made will have an associated cost.
- Advantage 13: Most Free and Open Source programs tend to be present in all operating systems (Linux, Windows, Mac OS).
- Advantage 14: Free software gives you freedom. With free software you can do absolutely whatever you want. You can study the source code, you can modify the source code to adapt it to your needs, and you can also distribute modified or unmodified copies of the software without any legal problem. The only condition for distributing free software copies is that distributed copies must continue to be free software.
- Advantage 15: Free software promotes education, technological development and culture. It also facilitates equal opportunities in general and in access to technology in particular. It promotes equality, social justice, solidarity, etc.

#### **Disadvantages of free software**

If we observe the current situation, that is to say the majority existence of Proprietary Software, we have:

1. Difficulty in the exchange of files: this is mostly in text documents (usually created with Microsoft Word), because if we want to open them with a Free Software (eg Open Office or LaTeX) we get an error or data is lost.
2. Higher costs of implementation and interoperability: given that the software is "something new", this means facing a cost of learning, installation, migration, interoperability, etc., whose amount can be diminished by: greater ease in installations and / or in the use, use of emulators (eg If the user uses Microsoft Windows, the solution would be to install some GNU / Linux distribution and then a Windows emulator, such as Wine, VMWare, Terminal X, Win4Lin) .

It is worth mentioning that the cost of migration is referred to software, since in what does Hardware generally Free Software does not have greater requirements than the Proprietary Software.

#### **ASSESSMENT CRITERIA**

- Recognize open-source computer programs for digital tools.
- Evaluate open-source software for digital tools.
- Recognize open-source computer supports for digital tools.
- Evaluate open-source computer supports for digital tools.

**RESOURCES**

- Equipment: Computer with internet connection;
- Optional: projector.

**PRODUCTS/OUTPUTS**

- List of open-source computer programs with their most appropriate indications for use in digital tools: 3D printers; numerical control milling machines and laser cutting.
- Relationship of computer supports such as motherboards and similar with their indications of use more suitable with digital tools: 3D printers; numerical control milling machines and laser cutting

**SELF ASSESSMENT TOOL**

Choose between true or false in the following statements:

1. The free software does not generate any difficulty in the exchange of files.
2. Most Free and Open Source programs are not usually present in all operating systems (Linux, Windows, Mac OS).
3. Hardware is used to describe the physical artifacts of a technology
4. Companies that generate proprietary software do not usually use closed file formats.
5. Using free software is a way to combat piracy and monopolies created by proprietary software companies.
6. The use of free software implies higher costs of implementation and interoperability.
7. Free software offers the user freedom of study and modification.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT</i>	
<b>Title of Unit</b> <i>C.1.2: 3D formats, frameworks and Industry standards.</i>	(hours) 3
<b>LEARNING OUTCOMES</b> The student must know what are the usual frames for 3D formats for use within industrial margins. <ul style="list-style-type: none"> <li>- Know what are the usual formats of 3D files</li> </ul>	
<b>CONTENTS</b> <b>The 3D printing formats:</b> <p>Perhaps the first format of 3D digital models is the .DWG. It was created in 1982 with the release of the first version of AutoCAD. Even today it is used as the native file format of this program, although it sometimes represents a difficulty for the migration of a file from one place to another.</p> <p>One of the most widespread formats in 3D printing is the .STL, from English Stereo Lithography, which achieves a certain precision in the geometry of the modeled objects by means of the creation of a Cartesian plane in which objects are constructed through triangles, but discards the information of the chromatic properties, as well as of the textures, reason why already it is a little obsolete and they have come out to him to pass other formats more decanted.</p> <p>However, the STL format has some features that make it not as efficient for many users as it should be. Often very delicate repair systems are needed to detect and repair holes, triangles that are upside down and other details of STL files that make unprintable figures. However, the industry of 3D printing marketplaces has overcome the shortcomings of the STL format and nowadays almost all online print-on-demand services accept other more flexible formats.</p> <p>Of course, we cannot deny that the STL format fulfilled its mission, but the reality is that it is seen more and more surpassed by other formats with more features. There are many types of files that are printable and not only improve their handling, but some significantly increase the performance of a standard STL. On the other hand, a format that has been standardized little by little is the .AMF (in English "Additive Manufacturing File"). It is based on XML language, allows the reading of chromatic information and work with multiple materials. With it you can build more complex structures, so it offers many more possibilities. In addition, files in this format weigh less than in STL format. Among the best known is also the 3FM format was created a few years ago by a consortium composed of companies such as Microsoft and Hewlett Packard. One of its advantages is that it contains all the information of the product in a single file simplifying the process. It is also one of the most complete because it achieves a very accurate description of the modeled product.</p>	

**ASSESSMENT CRITERIA**

- Identify file formats for 3D printing.
- Know the differences of use of 3D printing formats.

**RESOURCES**

Equipment: Computer with internet connection.

Optional: projector.

**PRODUCTS/OUTPUTS**

- List of formats of use in 3D printers with the indications of most appropriate use.

**SELF ASSESSMENT TOOL**

Choose between true or false:

1. STL 3D printing files model objects by creating a Cartesian plane through triangles.
2. The 3FM format was created a few years ago by a consortium made up of companies such as Microsoft and Apple.
3. The first format of 3D digital models was created in 1982.
4. The AMF format (in English "Additive Manufacturing File"). It is based on HTML language
5. One of the advantages of the 3FM.es format that contains all the product information in a single file simplifying the process.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT</i>	
<b>Title of Unit</b> <i>C.1.3: 2D formats, Frameworks and Industry Standards.</i>	(hours) 3
<b>LEARNING OUTCOMES</b> The student must know what are the usual frames for 2D image formats for use within industrial margins. <ul style="list-style-type: none"> <li>- Know what are the usual formats of 2D files</li> </ul>	
<b>CONTENTS</b>  Introduction  There is a wide variety of formats to store images in two dimensions that are related to raster graphics and vectors.  <b>Raster graphics.</b>  The peculiarity of the raster images is that they are composed of small pieces that form a mosaic. Those pieces are the pixels. The higher the resolution, the more pixels there will be per unit area. For example: an image of 600x800px. It literally means the following: your chart contains 600 vertical pixels and 800 horizontal pixels. If you print the image on paper, let's say in A4 size, you will see a mosaic.  <div data-bbox="395 1305 1072 1568" data-label="Image"> </div> <p style="text-align: center;">Photo printcnx.com</p> Raster images are used when you need to show smooth transitions of colors and shadows. The most common use is in the processing of photographs, creation of collages, etc. Raster images require more disk space than the same image in vector format. The most popular raster graphics editor is Photoshop.	



**Raster formats.**

The most common images in raster format are JPG and PNG.

**JPEG**

It is the most common and recognizable format. In a few words, it allows saving images with sufficient quality occupying the least space. This is very important especially for use on the Internet.

What makes this format stand out is the ability to control the loss of quality during compression. It is very simple: you choose how much you want to reduce the quality of the image, thus being able to define the size of the future file. This feature saves space enormously on your computer or computer.

JPG is the most suitable format to store digital photos (images that contain smooth transitions of color, shadows and brightness) and to share raster images on the Internet.

**PNG**

The PNG image is compressed without any loss of quality. Normally the PNG format is used to save files with sharp edges, text graphics and graphic elements (logos, designs, icons).

The main advantage of the PNG format is the storage and use of intermediate editing stages. This is due to the fact that compression at any stage of conservation happens without any loss of quality.

**Vector graphics**

Unlike raster images, a vector image is not composed of independent points or pixels. The logic of a vector image is completely different. In vector graphics there are so-called control points, which have curves between them. The curvature of these curves is defined by a mathematical formula. This does not mean that the designer must be a genius in advanced mathematics and must remember all kinds of formulas of hyperbolas and parabolas. This is work for the graphics editor.

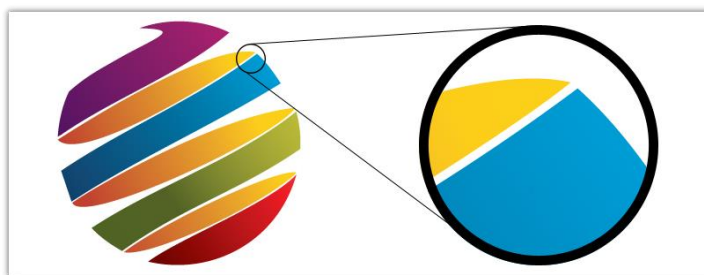


Photo printcnx.com

The most popular graphics editors are CorelDraw and Adobe Illustrator. Vector graphics are often used in the printing of brochures, pamphlets, business cards, etc. In other words, products that have text, logo, designs, symbols; anything that does not require an accurate transmission of the 16 shades of each color, and that can be described by curves.

A great advantage of vector images is their ability to be scaled. Although the scales, the vector image is not affected and will still have good quality. For example, a vector image will look good whether you print it on a business card or on a billboard.

### Vector formats

#### PDF

PDF is a known format for all those who are so stuck with printing materials. Printed product designs (flyers, brochures, catalogs) are provided for printing in PDF format. This format can contain vector elements and raster graphics, such as text, icons or even videos.

The uniqueness of PDF is its versatility and popularity. Many programs understand this format and you can open a PDF format using not only a special program such as Adobe Reader, but also Microsoft Word.

#### SVG

SVG literally means "resizable vector graphics". This format is used to create and save 2D vector images. Since this is a vector image, it is possible to scale the image or just one section without losing the quality. SVG allows you to edit the text of the image in any text editor.

### ASSESSMENT CRITERIA

- Identify file formats for 2D printing.
- Know the differences in the use of 2D printing formats.

### RESOURCES

Equipment: Computer with internet connection; 2D printer.

Optional: projector.

### PRODUCTS/OUTPUTS

- Relation of file formats for 2D printing with the most appropriate usage indications.

### SELF ASSESSMENT TOOL

Choose between true or false:

1. PDF is a vector format
2. A vector image is composed of independent points or pixels.
3. Normally the PNG format is used to save files with sharp edges.
4. The raster images is that they are composed of small pieces that form a mosaic.
5. JPG is the most common and recognizable format but it does not allow saving images with sufficient quality occupying the least space.
6. Raster images should not be used when you need to show smooth transitions of colors and shadows.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.1 DIGITAL TOOLS OVERVIEW FOR DIGITAL CRAFT</i>	
<b>Title of Unit</b> <i>C.1.4: Open Hardware Vs Proprietary solutions. Industry Standards.</i>	(hours) 3
<b>LEARNING OUTCOMES</b> The student must know the advantages of free computer supports for use the industrial and private computer supports for use with digital tools. - Know the computer supports for open use. - Know the computer supports for private use. - Knowledge of the industrial requirements of use.	
<b>CONTENTS</b> <b>Introduction</b> Hardware refers to what is tangible (that can be touched), that is, all the physical components of the computer.  <b>What is Free Hardware?</b>  <div data-bbox="609 992 871 1187" data-label="Image"> </div> <p>In the same way that software can be free, so can hardware. While with the software it is possible to share their modifications, and any suggestions or knowledge acquired through the study of the code and its operation, the same happens with the hardware through its schemes, the lists of materials, the physical layout of the components and any additional element to achieve its operation. Although the concept of free hardware is certainly less known than its software, the truth is that very interesting projects have been carried out over the years. Its objective is to create computer equipment designs in an open manner, so that all people can access, at least, the construction plans of the devices. Information on how to communicate with the hardware, its design and the tools used to create that design must be published to be used freely. In this way the control, implementation and design improvements are facilitated by the developer community.</p> <b>Examples:</b> An example: A developer A creates a license plate capable of controlling the lights of his garage, and shares with the community everything necessary to duplicate said license plate, including plans, schematics, lists of materials, and any software necessary for its operation. A developer B decides to make a replica of the board, and finds changes for the original components, with a lower cost and a more compact design. This is shared with the developer A, who from these improvements creates the version 2.0 of its board, while continuing to share the schemes for its construction. We would be in what we can call free hardware.	

Something very important is not to confuse free with free, that something is free does not mean that it has to be free, and vice versa.

Arduino:

[https://www.youtube.com/watch?reload=9&time\\_continue=9&v=qhy5UtIzZfo](https://www.youtube.com/watch?reload=9&time_continue=9&v=qhy5UtIzZfo)

The number of available projects based on this open hardware is huge, which makes their classification extremely complex. Suffice it to say that Arduino started as the project of a design that uses the Atmel AVR processor. Coming from Italy, it was born in 2005, and since then more than 120,000 Arduino boards have been officially created. There are many variants, some of them a product of the high level of interest on the part of users, but the most remarkable thing about the Arduino is, without doubt, its applications. From controlling simple toys to being an integral part of the most complex systems of home automation, at first glance it seems that an Arduino can do everything:

### **Advantages and disadvantages of free hardware**

#### **Advantage**

Protects and defends sovereignty, allowing nations not to depend on any other that provides the necessary resources for their development and technological independence.

Encourages that the hardware can be of quality, open standards and that they are more economical.

The reuse and adaptation of designs (cores) thus allowing to innovate and improve designs collaboratively worldwide.

Help companies save costs and design time in their jobs.

There is design, programming, testing and support communities that grow day by day in a dynamic and participative way.

Avoid the alliance of trusted computing and the management of digital rights (DRM), which impose restrictions on electronic devices such as electrical appliances, computers, among others.

#### **Disadvantages**

The four freedoms of free software cannot be directly applied to hardware, given their different nature. One has a physical existence, the other does not. This causes a series of problems to arise:

A physical design is unique. The sharing depends on the ease of reproduction that it has.

The sharing has a cost associated with it. The person who wants to use the hardware that someone else has designed first has to make it, for which he will have to check the necessary components, build the design and verify that it has been done correctly. All this has a cost.

Availability of the components. Are the chips available? When trying to make a design we can find the problem of lack of material. In one country there may be no problem, but in another country they may not meet.

The world of hardware is full of patents; is a reality, that's why many of the motivations of the authors of this concept is that the code or design is not released if you do not want it, but new companies are encouraged to develop and release new hardware, in order to create public standards and free, in which everyone can collaborate.

### **ASSESSMENT CRITERIA**

Identificar las ventajas de los soportes informáticos de uso libre.

Identificar los inconvenientes de los soportes informáticos de uso libre.

Identificar las ventajas de los soportes informáticos de uso privado.

Identificar los inconvenientes de los soportes informáticos de uso privado.

<b>RESOURCES</b> Equipment: Computer with internet connection. Optional: projector. Additional online resources: <a href="https://www.arduino.cc/">https://www.arduino.cc/</a>
<b>PRODUCTS/OUTPUTS</b> Identify the advantages of free-use computer supports. Identify the drawbacks of free-use computer media. Identify the advantages of computer media for private use. Identify the disadvantages of the computer supports for private use.
<b>SELF ASSESSMENT TOOL</b> Choose between false or true: In the same way that software can be free, so can hardware. The use of free hardware means that it is free. The goal of free hardware is to create computer equipment designs in an open manner, so that all companies can access and control the dissemination mechanisms. Free hardware can only be used by people and never by companies. The free hardware meets the same standards as the private one. Free hardware is only used for personal entertainment

## C.2 CREATION AND USE OF PRINTABLE FILES 3D, NUMERICAL CONTROL SYSTEM AND LASER CUTTING

C.2.1: Types of files and their conversion. Orders in laser cutting files

C.2.2: Orders in the printable 3D files

C.2.3: Orders in the numerical control system archives

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.2 CREATION AND USE OF PRINTABLE FILES 3D, NUMERICAL CONTROL SYSTEM AND LASER CUTTING</i>	
<b>Title of Unit</b> <i>C.2.1: Types of files and their conversion. Orders in laser cutting files</i>	(hours) 7
<b>LEARNING OUTCOMES</b> The student must know how to create and convert files to give cutting orders with a laser. - Know the formats of use in a laser cutting. - Give cutting orders to a laser.	
<b>CONTENTS</b> Introduction Laser Cutting is a digital subtractive manufacturing technique that consists of cutting or engraving a material by laser. The Laser Cut can be used in various materials such as plastic, wood, cardboard, etc. The process involves cutting the material with a powerful, high-precision laser that focuses on a small area of the material. The high-power density results in rapid heating, melting and partial or total vaporization of the material. Since the area affected by heat is small (around 0.5 mm), the cut pieces have minimal deformation. Usually, a computer directs the high-power laser over the material and traces the path of the cut. The laser equipment available in the market is distinguished by the laser source they use. Currently, there are only three main types of lasers that have sufficient efficiency and power output to process materials on a large scale: <ul style="list-style-type: none"> <li>• CO2 laser: the carbon dioxide sealed inside the laser is "pumped" (activated by heating) by an electric current that creates the flow of photons. It is usually used for cutting, drilling, welding and engraving.</li> <li>• Yttrium-aluminum garnet laser doped with neodymium (Nd-YAG): the YAG is pumped using a lamp or diode to emit the flow of photons. It is normally used for cutting, welding and engraving metals and ceramics.</li> <li>• Fiber laser: uses semiconductor diodes as a pumping mechanism and an optical fiber doped with a rare earth element as a laser medium.</li> </ul> The main differences between CO2 lasers and Nd-YAG and fiber lasers are the wavelength of the beam they produce. CO2 lasers emit a far infrared light with a wavelength of 10.6 microns. This wavelength is very effective for processing a wide range of materials, including wood, paper, plastics, glass, textiles, rubber and metals. The fiber lasers and Nd-YAG emit a wavelength of 1.06 microns and are suitable for processing metals. However, plastic or organic materials do not support this wavelength.  Laser cutting is particularly effective in a number of sectors where production rate and speed are	



essential where traditional manufacturing methods have proved ineffective. The laser facilitates precise cuts in all types of materials while traditional production processes impose limits and restrictions, laser cutting allows freedom of design and quantity.

Together, laser cutting allows:

- High level of accuracy and positional accuracy
- Material savings
- Great production speed
- Sharp and clean edges
- Minimum deformation of the material
- Safe processes

Laser Cutting allows the use of 2D vector files such as SVG, DXF, AI, etc. You can create 2D files using vector graphics programs such as Inkscape (free) or Adobe Illustrator. There are a large number of tutorials that show how to use these programs on the Internet. The 2D files send information to the laser cutter, which will perform the cut, raster engraving or vector marking on the chosen material with the selected design. It is not necessary to be an expert in design to use laser cutting.

The most suitable designs for this type of action are those made in 2D or layered. You can cut all kinds of materials, acrylics, plastics, wood, fabrics, although there are certain restrictions with some chemical compounds present in some materials.

Possibilities of the Laser

The laser allows three types of cutting:

- Cut: depending on the material leaves a finish or another. In wood the burnt edge remains (it can be polished in postproduction), in corrugated cardboard leaves a perfect finish, leaves the edges of the methacrylate perfectly polished.
- Marking: allows you to make lines without cutting the material completely. It is possible to create lines of different thicknesses.
- Engraving: starts a thin layer of material and depending on the material can leave a finish with more or less contrast.

How to prepare the file:

- In order to make the cut the laser needs to read vectorized files with a series of characteristics. You can use vector drawing programs (Illustrator, Inkscape) or modeling (AutoCAD, Rhino) you can also create .dxf files in other programs. Some basic characteristics of the file are:
- The units have to be in millimeters (mm)
- The thickness of the lines is 0.001 mm
- The line must be aligned

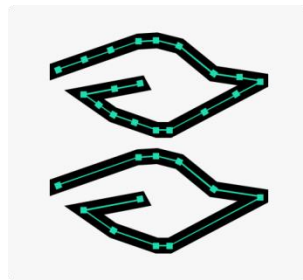
Tips for designing for laser.

A large part of the labor price is calculated based on the cut-off time, so it is important to take it into account when designing.

There are several reasons why cutting time may increase. The more complex the design, the slower the laser will have to go to be able to cut, which will increase the time. The curves produce the same effect, they force the laser to go more slowly,

especialmente cuando se hacen splines compuestos de muchos puntos. Cuanto más puedes simplificar el diseño, menos tiempo usaremos y eso afectará el costo. La mayoría de los diseños pueden dar el mismo acabado con menos puntos y simplificando las curvas.

- El grabado generalmente implica consumir más tiempo y a veces no es absolutamente necesario y se puede hacer un marcado obteniendo un buen acabado.



- Es recomendable dejar 2 milímetros de espaciado dentro del diseño así como no tener partes que tengan dimensiones más pequeñas que el espesor del material puesto que aumenta la fragilidad del producto en esas zonas.
- Para conseguir el mejor grabado es recomendable añadir un marcado en el contorno para que éste quede marcado y resaltar más el resultado final. El grabado y el marcado tienen que ser dos figuras diferentes.



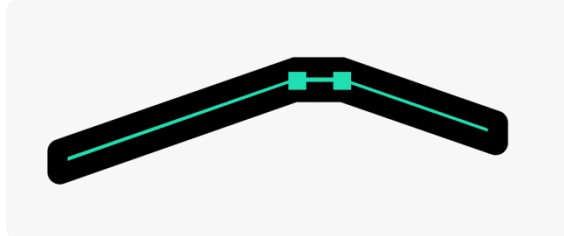
- Las curvas muy cerradas, los ángulos muy pronunciados y las zonas en las que se juntan muchas líneas pueden no terminar de presentar el mejor acabado. Lo mismo pasa si tenemos dos líneas muy juntas, el trazado del láser genera un espesor y es posible que se solapen.

#### Essential for the file

The lines have to go inside a same compound path according to the color they have. All blue in a composite path, all red in another composite path. You have to be very careful with the double contours, the laser passes twice where they are, not only will increase the time but will start more material and the final tolerance will be affected. It is very important to keep the contours of the designs closed. This affects the order of cutting of the lines being the recommended order to go from the inside out to avoid misalignments or falls of material in the bed.

It is advisable to create the file directly in the size in which it is going to cut or scale it correctly beforehand so that it is with the correct measurements.

You cannot place control points less than 1 mm between them, the software does not distinguish them and can even give error and go wrong file (this is to make sure that there is no failure mainly).

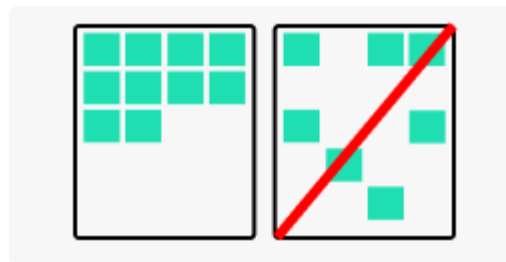


Clipping masks should not be used, they give problems when passing files to the cut because lines disappear and the final design may vary.

Placing on the plate

When taking advantage of the material and optimizing the cutting time, there are certain details to take into account:

The placement of the pieces is important, you can gain a lot of space by taking advantage of the geometry of the pieces to place them in a more optimal way. Putting some pieces inside others, joining straight lines, taking advantage of the holes that leave some pieces to place others there.



Although it is possible to save cutting time by joining straight lines when cutting, it is preferable to leave a minimum of 2mm between pieces so that the material maintains stability as the pieces fall. This is recommended above all in pieces with very thick materials since the bed does not have a fine grid and the pieces fall.

If in the same plate there are going to be several pieces with engravings in them, it is best to group them horizontally to optimize the cutting time. The laser makes a horizontal sweep to record, so it is also recommended that the longest dimension be placed horizontally.

Do not bring the pieces in excess to the margins, although it is checked if the file enters correctly is not advisable to use the margins for various reasons.

#### ASSESSMENT CRITERIA

- Create computer files to cut or burn with laser.
- Store computer files for cutting or laser engraving.

**RESOURCES**

Equipment: Computer with internet connection.

Optional: projector, laser cutting.

**PRODUCTS/OUTPUTS**

- Files with cutting orders in a laser.
- Files for laser cut order files.

**SELF ASSESSMENT TOOL**

Choose between true or false:

1. Currently, there are only three main types of lasers.
2. Laser cutting cannot be used with plastic and paper.
3. The laser allows recording on materials such as glass.
4. Laser Cut requires the use of 3D vector files
5. In the design of images for laser cutting, vector drawing or modeling programs can be used.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.2 CREATION AND USE OF PRINTABLE FILES 3D, NUMERICAL CONTROL SYSTEM AND LASER CUTTING</i>	
<b>Title of Unit</b> <i>C.2.2: Orders in the printable 3D files</i>	(hours) 7
<b>LEARNING OUTCOMES</b> The student must know how to create and convert files to give printing orders to a 3D printer. - Know the type of files for use in 3D printers - Give orders for 3D printing	
<b>CONTENTS</b>  <b>Introduction</b> The possibility of printing solid three-dimensional objects is a technology sought for years by various manufacturers and researchers who tried to implement a method that allows the construction of the most varied objects such as medical implants, pieces of architecture and other elements in a simple and cheap way. <div data-bbox="585 1070 924 1312" data-label="Image"> </div> <b>What are 3D printers? What are they for?</b> Today's 3D printing is a reality that has already escaped from the testing laboratories, and although they have not yet reached the status of presence held by inkjet or laser printers, the truth is that this is the path that They will take this type of device, when its value and operating costs fall at prices that can be paid by the user on foot, surely we will begin to see them next to any PC in any neighborhood of the city. But the field extends far beyond this, because we can also find implementations of 3D printing technology in areas such as automotive, in the construction of prototypes, which means significant savings due to the reduction in modeling times and in materials, in the jewelry industry, footwear, industrial design. 3D printing offers applications that will eventually become a device for everyday use.	



### What is a 3D printer?

To understand what a 3D printer is, we have to think of a device that is capable of generating three-dimensional solid physical bodies by layer-by-layer addition of a material, usually ABS plastic, but it is not the only material that is used. That is to say that it allows us to create, without the need to use any type of mold, an object that we can then take in our hands.

The most important difference that we can find between the traditional forms of construction of objects and 3D printing is that while in the first method the object to be modeled is obtained by removing the remaining material in 3D printing, only the material to be used is used strictly. which produces important savings, in addition to less pollution.

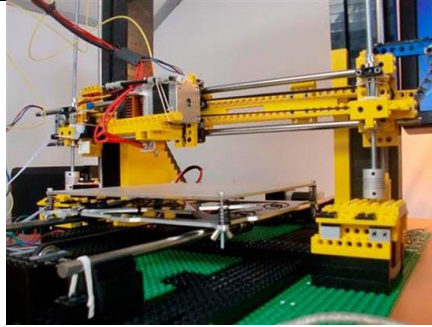


With regard to the materials used by 3D printers to create objects, these are basically divided into PLA or ABS thermoplastics, the most used in the most economical 3D printers on the market, but we can also find printers that model objects in materials such as resins, photopolymers and metal, and their reduction in cost has allowed them to leave the environment of industrial manufacturing.

### How a 3D printer works

With respect to how these 3D printers fulfill their work, in the first instance we will need a file created with some 3D modeling software such as Autodesk Inventor, Solidworks or Catia to "tell" the 3D printer what to model. It should be noted with respect to software that in the Open Source world there are also very ductile alternatives that can handle this type of printers without any difficulty and at zero cost, which will come very well to small businesses and SMEs. In this sense, the Open Source applications that stand out in this matter are OpenSCAD and FreeCAD.

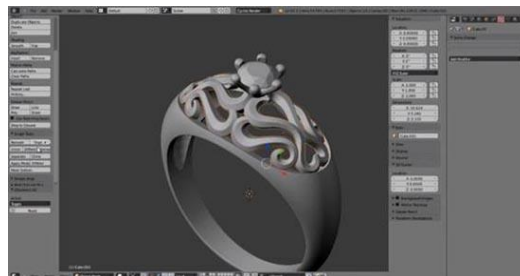




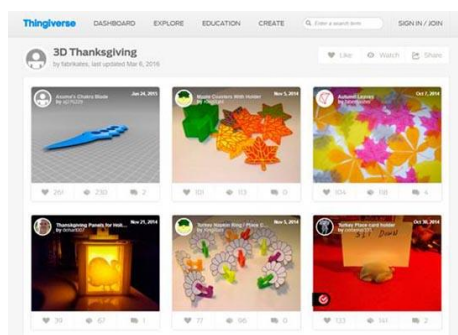
The files needed to feed the 3D printer contain precise instructions about the coordinates that must be followed to create the object and are usually entered into the printer via USB using a flash drive or memory, but there are also models of 3D printers that allow its direct connection to the computer.

#### Types of 3D printers and printing materials

At present, 3D printing technologies are varied, and apparently it will not be possible to achieve a standard, at least in the coming years. This is due to the youth of 3D printing, which encourages each manufacturer to develop their own technology and try to impose it de facto on the industry.



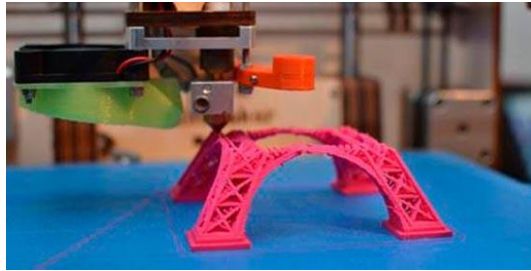
However, understanding this point is not a very complicated task, since the main difference between 3D printing technologies today is given by how the printer deposits the different layers of material to create the piece.



In this sense, the main technologies in use are the so-called Fusion Deposition Modeling (FDM) or plastic material deposition technology, which is a method that allows the modeling of parts in ABS or PLA plastics. This modeling is done by feeding the printer with a roll of this material, which, when passing through the extruder of the equipment, is heated, melted and deposited

layer by layer forming the object. After that, wait until the material cools and can be manipulated. It should be noted that this method is the most used in the field of domestic 3D printers.

Other technologies currently in use are Stereolithography (SLA) and Selective Laser Sintering (SLS), both operate with the help of a laser beam. The first one molds the object layer by layer, but involves the use of a photocurable resin bath. In this case, the molded object with liquid resin is cured by the ultraviolet light laser.



Regarding the technology known as Selective Laser Sintering or Laser Selective Sintering, it is similar to the SLA, but for the molding it can use diverse inputs in powder such as metallic and ceramic materials, nylon, polystyrene and glass, among others. In this case, the laser melts the material and solidifies it. It should be noted that both technologies are highly appreciated thanks to their precision.



Note that the file to print on a 3D printer can come from the Internet from sites such as Thingiverse, or directly created by the user. At this point, it is necessary to clarify that the type of file used to print on 3D printers is the ".STL" format, which contains information of a piece in a single color, or the ".VRML", which stores information of a piece in various colors. After that, the print material is loaded to print the piece, which varies according to the type of 3D printing technology you are using. Finally, the print order is given and the 3D printer begins to do its job.

#### How 3D printing is going to change the world

Some years ago, when the idea was first started and the discussion started about the possibility of creating printers that could reproduce formats in three dimensions, that project seemed a true utopia, only possible to reach through the pages of a science fiction novel. However, the truth is that the development behind 3D printing has come a long way, and after hundreds of tests and errors, it was finally possible to create the first printing equipment capable of reproducing an object in its three dimensions.



Shortly after this breakthrough in technology was reaching the masses, and even though 3D printers have not become an element that we all have in our home, the truth is that thanks to its scheme and its free patent, today anyone You can manufacture your own 3D printer. Due to the almost inexhaustible possibilities offered by 3D printing, not only on a large scale, but also in the field of large and small companies around the world, there are many who say that with 3D printing a new industrial revolution has arrived.

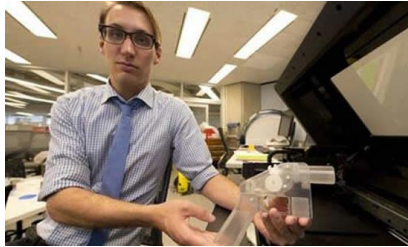


Thanks to the wide variety of materials that can be implemented in the process of 3D printing, which include mainly nylon and polystyrene, among others, with a 3D printer it is possible to print the most diverse three-dimensional objects, ranging from clothes, tools, houses, various parts, medical equipment, food and even organs for the human body.

Therefore, we can imagine how the technology of 3D printing will undoubtedly change the world in a short time, and in this regard there are many experts who say that thanks to 3D food printing, in a few decades it will be possible even to end world hunger, something that of course has generated great controversy.



This is precisely a project that is in full development phase, through the initiative that NASA has had with a series of companies, which seeks to create among other things a 3D printer that allows printing a pizza. Meanwhile, the large food manufacturers have already begun to conduct various tests in this regard.



With the decrease in costs that the inputs for 3D printing will inevitably have over time, 3D printing will also invade the real estate market and over the years houses built with 3D printers will be the cheapest and fastest option, which Without a doubt it could have a significant positive social effect, not only in emerging countries with housing problems, but also in third world nations where, due to the global crisis, increasingly competitive costs are required.



On the other hand, one of the disadvantages indicated by experts with respect to 3D printing is that it will inevitably generate an increase in imitation products, giving rise to new piracy markets of all kinds.



#### ASSESSMENT CRITERIA

- Create computer files for your 3D printing.
- Store 3D printing computer files.

**RESOURCES**

Equipment: Computer with internet connection;  
Optional: projector, 3D printer.

**PRODUCTS/OUTPUTS**

- Files with orders for printing 3D objects on printers.
- Files of files of orders of impression 3D

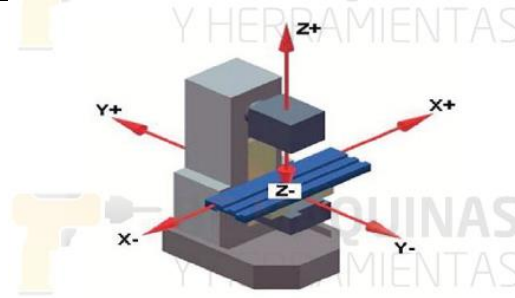
**SELF ASSESSMENT TOOL**

Choose between true or false the following statements:

1. ABS is the only valid material for 3D printing.
2. The open code applications that stand out in this matter are OpenSCAD and FreeCAD.
3. The type of file used to print on 3D printers is the format .STL or the .VRML.
4. Currently, 3D printing technology is standard.
5. The files needed to feed the 3D printer must contain the coordinates that must be followed to create the object
6. The printing format ".VRML", stores information of a piece in various colors

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.2 CREATION AND USE OF PRINTABLE FILES 3D, NUMERICAL CONTROL SYSTEM AND LASER CUTTING</i>	
<b>Title of Unit</b> <i>C.2.3: Orders in the numerical control system archives</i>	(hours) 7
<b>LEARNING OUTCOMES</b> The student must know how to create and convert files to give orders to a numerical control milling machine. - Know the files for numerical control milling machines. - Give milling orders to a numerical control milling machine.	
<b>CONTENTS</b>  <b>Introduction</b>  The introduction of computerized numerical control (CNC) has exponentially expanded the applications of industrial machines through the programmable automation of production and the achievement of movements impossible to perform manually, such as circles, diagonal lines and other more complicated figures that enable the manufacture of pieces with extremely complex profiles. This also translates into the optimization of many essential variables of any manufacturing process: productivity, precision, safety, speed, repeatability, flexibility and waste reduction. Added to this is a significant drop in prices that is allowing many small and micro businesses to access this technology. The multiplicity of milling machines that exist today has expanded comfortably towards the proliferation of types of equipment equipped with CNC. In fact, there are also special kits to transform the old milling machines into a CNC milling machine. Basically, CNC milling machines are very similar to conventional milling machines and have the same moving parts, that is, the table, the cutting head, the spindle and the lateral and transversal movement carts. However, they do not have levers or cranks to operate these moving parts, but a screen inserted in a panel full of controls and a metal box that houses the electrical and electronic components that regulate the operation of motors designed to do the same work they did. the levers and cranks of the old machines. Among these components is the CNC, which is a computer mainly responsible for the movements of the milling machine through the corresponding software. The combination of electronics and drive motors or servomotors is capable of achieving all possible milling operations. To understand the control of movements exercised by the CNC, it is necessary to briefly know how a conventional milling machine works.	





In this type of machines, the cranks activate the moving parts manually so that the cutting tool moves linearly in at least three axes, which are called main axes:

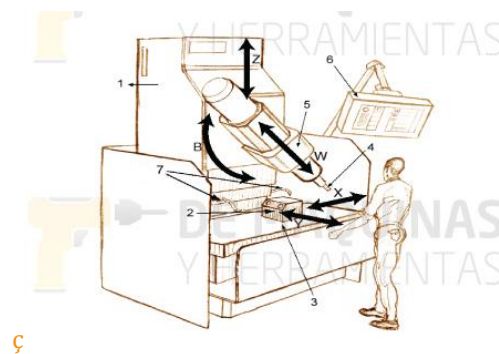
**X axis:** horizontal and parallel to the workpiece clamping surface. It is associated with movement in the longitudinal horizontal plane of the milling table.

**Y axis:** it forms a trihedral of direct direction with the X and Z axes. It is associated with the movement in the transverse horizontal plane of the milling table.

**Z axis:** where the cutter is mounted, it is the one that has the cutting power and can adopt different positions according to the possibilities of the head. It is associated with the vertical movement of the machine head.

If the router has a fixed table, these three movements are executed by the spindle. Now, it is clear that the milling of more complex parts will require a greater number of axes whose trajectory is not only linear, but also rotational. This is where the concept of CNC comes into play, giving rise to a multiplicity of complementary axes controlled independently and determined by the movement of rotating tables and / or steerable heads. This originates a diversity of machine models that make possible the machining of the piece by different planes and approach angles.

In the following figure we see an example of a CNC milling machine with its basic components and main axes (X, Y, Z) and complementary axes (B, W).



Components of a CNC milling machine



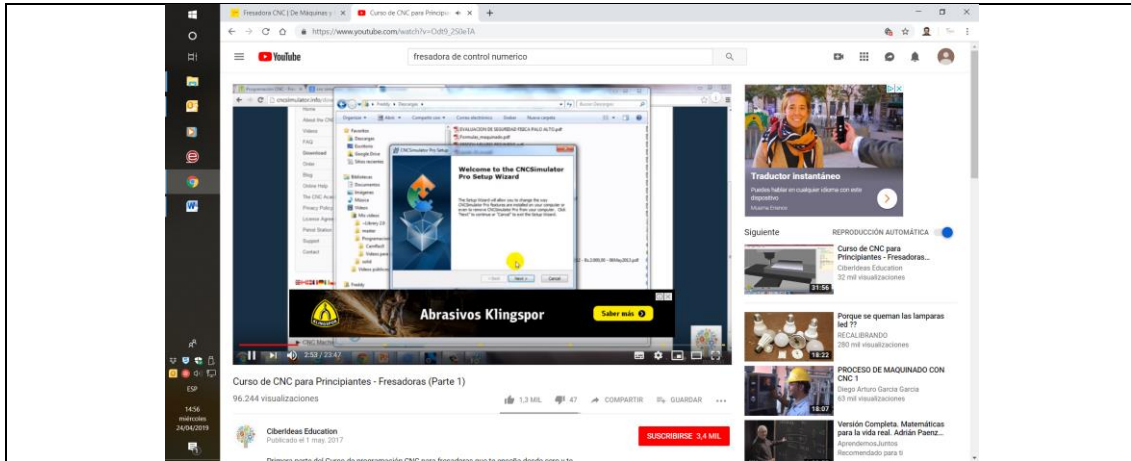
- 1 - Column
- 2 - Work piece
- 3 - Milling table, with movement on the X and Y axes
- 4 - Strawberry
- 5 - Cutting head including the spindle motor
- 6 - CNC control panel
- 7 - Hoses for coolant, if necessary.
- X, Y, Z - Main displacement axes
- B - Complementary axis of rotary movement of the cutting head
- W - Complementary axis of longitudinal movement of the cutting head

The primary function of the CNC is to control the displacements of the table, the transversal and longitudinal carriages and / or the spindle along their respective axes by means of numerical data. However, this is not all, because the control of these displacements to achieve the desired final result requires the perfect adjustment and correct synchronization between different devices and systems that are part of any CNC process. These include the main and complementary axes, the transmission system, the work holding systems of the piece and the tool changers, each of which presents its modalities and variables that must also be stipulated adequately. This rigorous control is carried out by software supplied with the milling machine and based on one of the numerous CNC numerical programming languages, such as ISO, HEIDENHAIN, Fagor, Fanuc, SINUMERIK and Siemens.

This software contains numbers, letters and other symbols-for example, codes G and M-that are encoded in an appropriate format to define a program of instructions capable of developing a specific task. The G codes are functions of machine movement (rapid movements, advances, radial advances, pauses, cycles), while the M codes are the miscellaneous functions that are required for the machining of parts, but are not machine movement (spindle start and stop, tool change, coolant, program stop, etc.). From this it follows that to operate and program this type of machine requires basic knowledge in machining operations in conventional equipment, elementary knowledge of mathematics, technical drawing and handling of measuring instruments. At present, the use of CAD (computer aided design) and CAM (computer aided manufacturing) programs is an almost obligatory complement to any CNC machine, so, generally, the realization of a piece involves the combination of three types of software:

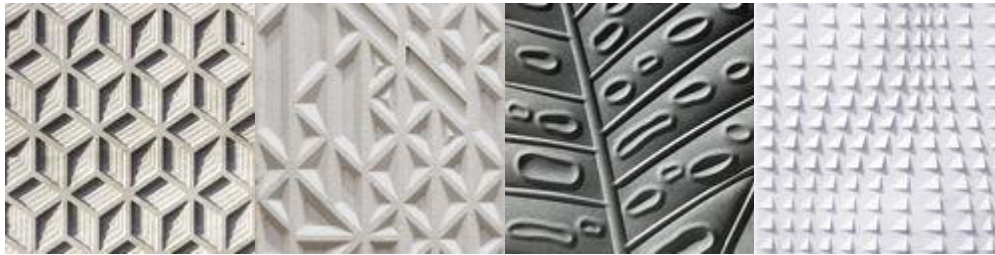
1. CAD: performs the design of the piece.
2. CAM: calculates the displacements of the axes for the machining of the piece and adds the speeds of advance, speeds of turns and different tools of court.
3. Control software (included with the machine): receives instructions from the CAM and executes the commands to move the moving parts of the router according to these instructions.

CNC milling machines are specially adapted for the milling of profiles, cavities, surface contours and die cutting operations, in which two or three axes of the milling table must be controlled simultaneously. Although, depending on the complexity of the machine and the programming carried out, the CNC milling machines can work automatically, normally an operator is needed to change the milling cutters, as well as to assemble and disassemble the work pieces.



[https://www.youtube.com/watch?v=Odt9\\_2S0eTA](https://www.youtube.com/watch?v=Odt9_2S0eTA)

As an example of the use of CNC milling machines, Indian artist Ruchika Grover is a design studio that explores the potential of natural stone. Its surfaces, sculptures and installations are created through a unique process, which combines digital manufacturing and traditional craftsmanship.



Fabrication process. Image Courtesy of Anoma

Generally, Grover begins by illustrating basic concepts on paper, inspired by natural shapes and textures. For example, the "Foliage" surface collection highlights the vein patterns that are normally overlooked in the leaves. During its conceptualization, six species of plants were preselected - the Bodhi, the Maple, the Monstera, the Birch, the Elm and the Lily -, mapping their leaves three-dimensionally in the study. Then, informed by extensive botanical studies, Grover interpreted the natural venous networks in subtle patterns, amplifying them considerably to make them evident.



Foliage / Maple. Image Courtesy of Anoma

Once the two-dimensional drawing takes shape, the process moves to computer-aided modeling where precise measurements are determined and intricate details are added; the lines are extruded and assigned to different heights and depths, and their edges are bevelled. Next, different prototypes are developed in a period of four to six months, according to a range of patterns (depths and variable sizes), materials (limestone, granite and marble, etc.) and tools. This implies that the dimensions are translated into manufacturing directives and sent to a computerized numerical control (CNC) milling machine.



Ishi Kiri / Rokakku. Image Courtesy of Anoma

After locating and holding the base stone on the platform of the CNC machine, a rotating cylindrical tool performs cutting and drilling operations according to the directives entered. The cutting tool, with diamond tip or carbide, can move along multiple axes, while the base stone also moves through the "milling bed", in different directions. Being a process that generates a lot of heat, a certain amount of recycled water circulates to regulate the temperature of the cutting tool and the base stone. This helps to avoid the rapid wear of the tool and the unwanted thermal expansion of the stone.

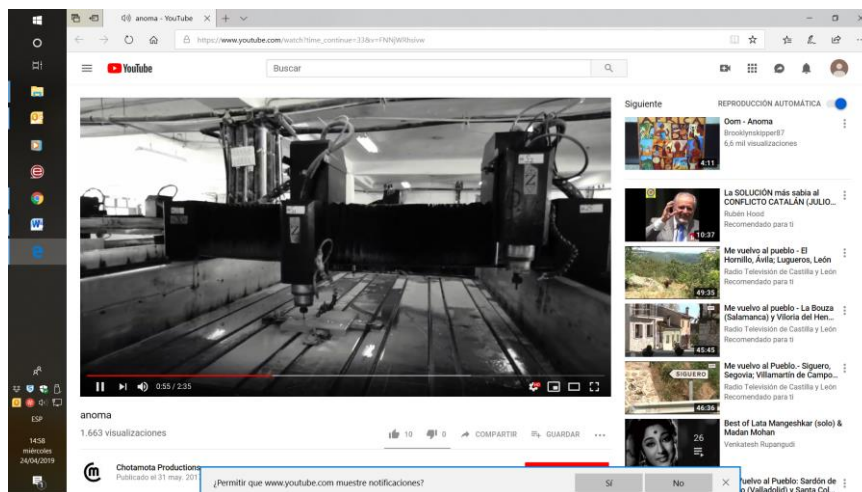


The breathing surfaces / Xylem. Image Courtesy of Anoma

The process, however, does not end there: the surfaces are finally finished by hand. Expert craftsmen carve intricate textures in the stone using a variety of techniques: chipping, sanding and shot blasting. This last step helps to add a "human" touch to a product that is manufactured predominantly digitally.



Foliage / Birch. Image Courtesy of Anoma



[https://www.youtube.com/watch?time\\_continue=33&v=FNNjWRhsivw](https://www.youtube.com/watch?time_continue=33&v=FNNjWRhsivw)

**ASSESSMENT CRITERIA**

- Create computer files for milling with a CNN machine.
- Store computer files for milling with a CNN machine.

**RESOURCES**

Equipment: Computer with internet connection.

Optional: projector, numerical control system.

**PRODUCTS/OUTPUTS**

- Files with orders for the milling of objects by numerical control milling machines.
- File files of milling orders in numerical control milling machines.

**SELF ASSESSMENT TOOL**

Select between true or false:

1. X axis: It is associated with the movement in the longitudinal vertical plane of the milling table.
2. The primary function of the CNC is to control only the movements of the table.
3. The milling machines with CNN only has industrial use.
4. In general, the realization of a piece involves the combination of three types of software: CAD, CAM, Control software.
5. The Control Software receives the instructions and executes the commands to move the moving parts of the router according to these instructions.
6. CNN milling machines only allow movement in 3 axes.



### C.3 DIGITALIZATION OF IMAGES

**C.3.1: Digitalization of objects in 2 dimensions and their file.**

**C.3.2: Digitalization of objects in 2 dimensions and their file.**

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.3 DIGITALIZATION OF IMAGES</i>	
<b>Title of Unit</b> <i>C.3.1: Digitalization of objects in 2 dimensions and their file.</i>	(hours) 5
<b>LEARNING OUTCOMES</b> The student must know how to digitize 2-dimensional objects and create files for storage in a disk drive for later use. - Know the 2D image files. - Digitize images in 2D. - Store 2D files.	
<b>CONTENTS</b> <b>Introduction</b> There are different ways of carrying out image collection works that will be related to the subsequent use of them. For example, it is usually scanned for web, being photos of little weight, but then they do not serve to pass them to paper and it is necessary to return to scan. For this reason it is necessary to act correctly so that the digital files serve for the use that one wants to make with them. For these reasons, a series of basic tips should always be followed: - It is recommended to always scan in color, even if the original image is black and white. This will gather more information about the photograph or graphic documents. - Scan in format: TIFF. Saves all file information, does not lose quality, and serves as a digital negative. (The digital negative is RAW). The drawback is that then you have to know how to fix it using various programs, such as Photoshop. The Tiff format needs special viewers. It is recommended for personal file, as a definitive file. You can always use it again as a basic photograph. JPEG It is the most usual and the easiest to work and transform for the current devices: computers, tablets, telephones ... but it loses part of the scanning quality. It is recommended for the use of photos: for fast printing, web, exchange, etc ... - Scan at least 300 pp. (pixels x inch). If the graphic documents are small, the type of scan will be increased, from 300 pp to 500-700 pp ... until a file that has at least 5 to 10 megabytes in dimension is obtained. The files of many megabytes, allow to work better the documents, facilitating the later enlargement, for panels, printing ... - It is necessary to archive and save the scanned graphic documents in the raw, without retouching, external memories ... Never manipulate scanned originals, only work with copies to avoid loss of original information. With these recommendations you can get a good graphic file, which can be used and improved over time. It is always recommended to lock with original documents and avoid reproductions of intermediate supports (photographs of illustrations or pictures) unless you only look for graphic	

documentation.

One of the biggest difficulties that is found in the digitalization of images is the control of nuances, colors, calibration ... which must be controlled with digital retouching software.

Type of document entry in the scanner:

Flat type. It offers a contact surface facing the work, if you want to scan 3D objects such as coins, flowers, thick books, or materials that can be easily damaged, this is the best option. In general it is the best option to digitize images with an artistic purpose.

Slot type Used to scan large amounts of documents in standard resolution, use a feeder in which the paper is inserted, some will offer you duplex system, to scan both sides of the sheet at the same time, there are also those with ADF system (automatic document feeder) which allows you to make a stack of sheets that will be scanned automatically without the need to put one by one.

Dimensions

A larger scanning area will work in favor, particularly if you plan to scan images larger than A3.

You have to take into account options that allow you to remove the lid of the scanner, move it 180 degrees or modify its position so that it does not interfere with scanning.

Most of the scanners in the market have an area of A4 size or similar, so the most advisable thing is actually to make parts that fit this and scan at a very high resolution.

Resolution

The DPI (dots per inch) or dots per inch is what determines the resolution, the higher the DPI the better the image. The resolution of the scanner is usually written in two numbers (1200 x 2400 for example) referring to the minimum and maximum resolution. You just need to pay attention to the optical resolution of the scanner. A "good" scan quality only needs a resolution of 300 × 600, but a fine lines job and smooth details will require at least 1200, the more detail you can capture the more faithful the result will be.

Depth of Colors

This refers to the number of colors that each pixel can receive, the better the depth of the image quality.

### **Extra needs**

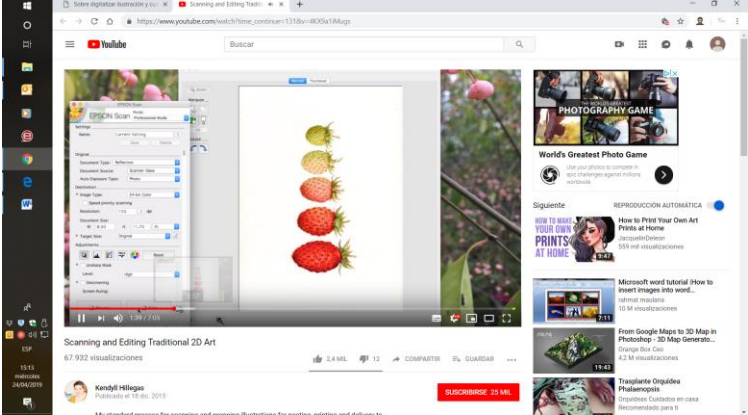
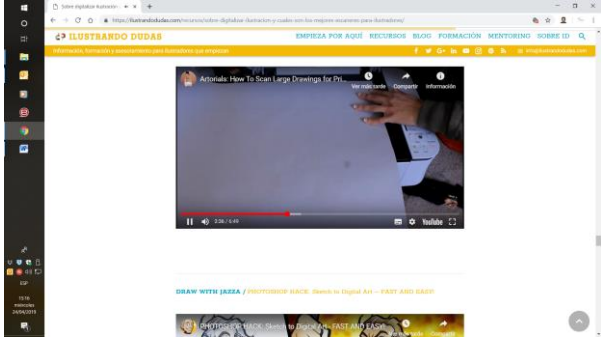
Keep in mind if you plan to scan transparencies or acetates (highly reflective materials) since not all scanner lenses will work properly for this. The film scanners offer certain accessories to ensure that a block of images are not run avoiding defects in animation or transitions. Today it is very fashionable to offer the ease of uploading to the cloud automatically, but the safest thing is that you want to give a few touches to your work before doing this.

The brands Epson, HP and Canon are the ones that lead the market in terms of image quality, obviously they are not the only ones you will find, but they are undoubtedly the most specialized in the subject.

Most scanners on the market offer additional benefits such as automatically removing dust spots and scratches from films and photographs, reducing substrate grain, automatic color correction, digital ICE, tone curve adjustment with histogram, focus mask with noise reduction, fade / RGB color enhancement, backlight correction, color restoration, among others.

In illustration work, many scanners allow the lid to be removed in order to digitize large images more easily.



	 <p><a href="https://www.youtube.com/watch?time_continue=131&amp;v=4KX9a1iMugs">https://www.youtube.com/watch?time_continue=131&amp;v=4KX9a1iMugs</a></p>
	 <p><a href="https://www.youtube.com/watch?time_continue=185&amp;v=fFDNfzZBWo">https://www.youtube.com/watch?time_continue=185&amp;v=fFDNfzZBWo</a></p>
	<p><b>ASSESSMENT CRITERIA</b></p> <ul style="list-style-type: none"> <li>- Create image files by scanning in 2D</li> <li>- Create image files for 2D printing</li> </ul>
	<p><b>RESOURCES</b></p> <p>Equipment: Computer with internet connection; 2D Scanner. Colour printer.</p> <p>Optional: projector.</p>

**PRODUCTS/OUTPUTS**

- 2D image files in different formats.
- File files with 2D images for printing.

**SELF ASSESSMENT TOOL**

Select between true or false:

1. The TIFF files keep all the file information, does not lose quality, and serves as a digital negative.
2. The DPI (dots per inch) or dots per inch is what determines the resolution, the lower the DPI the better the image.
3. The resolution of the scanner is usually written in two numbers (1200 x 2400 for example) referring to the minimum and maximum resolution.
4. The JPEG format is the most usual and the one with the highest scan quality.
5. It is recommended to scan a maximum of 300 pp. (pixels x inch).
6. It is advisable to always scan in the color of the original document and in black and white if it is a document without color.

**Title of Module**

*C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS*

**Title of submodule**

*C.3 DIGITALIZATION OF IMAGES*

**Title of Unit**

*C.3.2: Digitalization of objects in 3 dimensions and their file.*

(hours)

7

**LEARNING OUTCOMES**

The student must know how to digitize 3-dimensional objects and create files for storage in a disk drive for later use.

- Know the files of 3D images.
- Scan images in 3D.
- Store 3D files.

**CONTENTS**
**Introduction**

Scanning a three-dimensional object using an optical reading system allows you to collect and store data of its shape and color. The information obtained can be used to build three-dimensional digital models that are used in a wide variety of applications from the industrial and mechanical area, and also in art and heritage, although every day there are more sectors that benefit from the result of this technique.

**3D digitized techniques:**

- The most common system is the so-called non-contact or optical.

This is the dominant technique currently. It has two clearly differentiated technologies:

- To be. A beam of laser light is thrown, either as a point, beam of a certain length, or a cross. This signal is calibrated and when one or several cameras capture the deformation of this beam, they convert it into XYZ coordinates in space and generate a cloud of 3D points in the computer.
- Light white structured. (The color of the light is not important, the last trend is blue light, although there is also red or green LED technology, but, apart from the color, the technique is the same). The equipment projects a light on the calibrated object and with variable patterns, and some cameras capture the deformation of this light, converting this information into XYZ coordinates in space and generating a 3D point cloud in the computer.

### **Technologies, equipment and software**

#### **Other technologies**

There is software lately, capable of interpreting the information obtained through X-rays, to convert it into a three-dimensional point cloud (tomography). And software has also appeared, capable of converting images taken from the iPhone, or from the Kinect of the Xbox, and convert them into point clouds of more or less precision and resolution.

#### **Digitized equipment**

- 3D Scanners Scanner Structured white light and portable laser
- Portable laser scanner
- Portable white light scanner
- 3D scanned 2
- software

In general, each scanner incorporates its own software to manage the data capture and mallar the point cloud to export it to an STL as a standard file. There are specific software with powerful tools for the treatment of the point cloud, such as Rapidform for example, with tools to perform reverse engineering, and extract a CAD file, as if it had been designed with any 3D CAD in the market.

They also tend to export to almost all standard CAD exchange formats, and often have direct converters to different CAD software. These software are also used to have verification modules to compare the point cloud against CAD, and make a dimensional report.

Lately, standard CAD software tend to offer a module for the treatment of point clouds, but they are not usually as powerful as the specific software.

### **Applications**

The digitized 3D is present in multiple sectors helping to carry out projects of different sizes (from digitizing a five cent coin to a whole building).

The shape of each model is made of polygons and vertices, and the model can be constructed with different textures, illuminations and shading.

The most popular file extensions are: .DWF, .MB, .MAX and .MGF.

Digitizing a model with a 3D scanner and finish processing it, modifying it or modifying it by computer or doing the opposite process, creating a sculpture or piece in the computer and making it a reality thanks to a 3D printer has been a revolution for the sector. This digitalization that the 3D scanner also allows to obtain the geometry of the surface of an object through the use of laser technologies or the use of photogrammetric techniques, which have the ability to compose a three-dimensional model from images. For example, when digitizing sculptures, you can work better on them to correct volumes, sizes and shapes as needed by artists and in a much more agile and quick way than the traditional process.

What do digital processes contribute to artisan and artistic crafts?

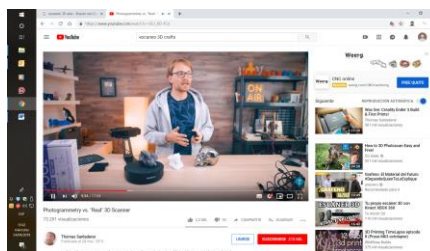
3D scanning technology is also very popular in art and design, giving artists a completely new way of expressing themselves and sharing their talents with the rest of the world, for example, creating individual designs in haute couture, developing personalized elegant furniture or

turning a unique design into a mass-produced product.

- The modeling process is more comfortable and better qualities can be achieved. New technologies facilitate the construction process and modeling.
- It's more practical and saves money. The use of new technologies facilitates the calculation of the necessary material for the construction and the precise time for the carving, which allows a better planning and budget.
- Time saving and process optimization.
- Have digital copies of sculptures in little minutes This would allow to have from the beginning a digital model from which to obtain the sections for the cutting or milling machine.
- Reduction of work space and warehouse. By digitizing each one of them and using the same parameters that we apply in heritage conservation works, they can be documented and archived without having to save them in a physical space, but everything is there. That allows us to preserve old molds or those that need to be destroyed.



<https://www.youtube.com/watch?v=ye-C-00FsX8>



[https://www.youtube.com/watch?v=dGJ\\_XD-fCsI](https://www.youtube.com/watch?v=dGJ_XD-fCsI)

### ASSESSMENT CRITERIA

- Create image files by scanning in 3D
- Create image files for 3D printing

**RESOURCES**

Equipment: Computer with internet connection; 3D Scanner.

Optional: projector.

**PRODUCTS/OUTPUTS**

- Files of 3D images in different formats.
- File files with images in 3D for printing.

**SELF ASSESSMENT TOOL**

Select between true or false:

1. The most common 3D scanning technique is called contactless or optical.
2. Scanning a three-dimensional object through an optical reading system allows you to collect and store data of the shape and never of the color.
3. 3D scanning has hardly any use in non-industrial processes related to art and heritage.
4. The only 3D file format is .MGF.
5. 3D scanning is limited to small objects.
6. With the laser scanner you can obtain information about the shape of objects that are far away in space.
7. You can scan objects with the use of mobile phones.

## C.4 USE OF DIGITAL TOOLS

### C.4.1: Use of a 3D printer

### C.4.2: Use of a numerical control system machine

### C.4.3: Use of laser cutting

### C.4.4: Other Specialist Tools & Software for Crafts Production

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.4 USE OF DIGITAL TOOLS</i>	
<b>Title of Unit</b> <i>C.4.1: Use of a 3D printer</i>	(hours) 9
<b>LEARNING OUTCOMES</b> The learner will be able to discover the potential of using a 3D printer for crafts production. <ul style="list-style-type: none"> <li>- Have knowledge of 2D and 3D production with application in the crafts sector</li> <li>- Compare the most common applications of 3D printing and discover the crafts' sector 3D printing capacities</li> <li>- Produce concepts for the introduction of new digital solutions to the crafts sector</li> </ul>	
<b>CONTENTS</b>  <b>Introduction</b> 3D printing is a new advanced way of producing products for the crafts sector. A 3D printer will layer selected materials such as plastic, ceramics or metal, to result in printing an object.  The type of technology used in 3D printing greatly depends on the state of raw material employed. Examples of dominant solutions for crafts production:  FDM (Fused Deposition Modelling) -- good for low-cost and quick prototyping, i.e. key chains  Stereolithography and Digital Light Processing (SLA & DLP) – high-detail prototyping, i.e. for sculptures and jewellery  Benefits from the application of 3D printing in the crafts sector are numerous: <ul style="list-style-type: none"> <li>✓ Customisation of items</li> <li>✓ Development of creativity and imagination</li> <li>✓ Extended opportunities for the transition of idea to product</li> <li>✓ Infinite amount of complex shape creation</li> <li>✓ Infinite number of modifications</li> <li>✓ Creation by element, part or at random</li> <li>✓ Introduction of own level of complexity</li> <li>✓ Adaptation of products to own settings or requirements</li> <li>✓ Re-creation of already launched products</li> <li>✓ Copyright does not apply</li> <li>✓ Contribution to innovation development</li> <li>✓ Participation in learning-by-doing approach</li> <li>✓ Experience freedom in material choice, product size or peculiarities</li> </ul> <b>Practice</b> A. Distinguish between 2D printing from 3D printing on the example of shoe designing.  B. Visit online communities to explore ideas, download templates or print ready-works by designers and makers using 3D printing solutions for the application in the crafts sector.	

C. Explore Computer-Aided Design (CAD) software

CAD makes use of computer-technology to create three-dimensional (3D) virtual models which are then converted to physical models using a 3D printer. An example of such CAD packages for free is [TinkerCAD15](#) which allows users to draw directly in the internet browser or FreeCAD. With TinkerCAD15 you can import a 2D vector images and convert them into a 3D printable design.

C. Guidelines for beginners to generate a 3D physical model from an existing 3D virtual model with the use of a FDM printer.

**Common applications of 3D printing in crafts**

Jewellery Design, for personalizing items.

Art, to find new expressions or art or introducing new masterpieces.

Furniture & interior design, replaces carving, as well as forming and joining materials, introducing simplification to the production process.

Clothing and accessories, including shoes, head-pieces, hats and bags, promotion for haute couture on catwalks.

**Additional guidelines for teachers of crafts for instructing on 3D printing application**

1) Allow learners to appreciate the potential of 3D printing by providing them with the online communities with a wide spectrum of 3D printing application areas (e.g. medical, mechanical and consumer products).

2) Share an readily available 3D model, give the opportunity for students to create the 3D virtual model preferably from scratch using 3D CAD modelling; students can alter or even come up with their own designs, thus developing creativity and the sense of initiative.

**ASSESSMENT CRITERIA**

Identify examples of 2D and 3D production with application in the crafts sector;

Depict between the types of technology used in 3D printing;

Identify the benefit from 3D printing technology;

Compare the most common applications of 3D printing in crafts;

Determine the application of 3D printing in own craft profession;

Research ideas and prototypes for 3D production available online;

Understand the basics of Computer-Aided Design (CAD) software;

Produce concepts for the introduction of 3D printing solutions in own craft profession;

Draft work plan for producing a product by 3D printing;

Discover the crafts' sector 3D printing capacities for the future.

**RESOURCES**

Equipment: Computer with internet connection; 3D printer; optional: projector.

Additional online resources:

Beginner's Guide to 3D Printing

<https://www.youtube.com/watch?v=3LBTkLsjHGO>

The possibilities of 3D printing on Ted Talks

[https://www.ted.com/talks/avi\\_reichental\\_what\\_s\\_next\\_in\\_3d\\_printing](https://www.ted.com/talks/avi_reichental_what_s_next_in_3d_printing)

33 Best Sites for Free STL Files & 3D Printer Models in 2019

<https://all3dp.com/1/free-stl-files-3d-printer-models-3d-print-files-stl-download/>

40 Easy & Fun Things to 3D Print in an Hour (or Less)

<https://all3dp.com/1/small-quick-easy-fun-things-to-3d-print-when-bored/>



**PRODUCTS/OUTPUTS**

Learners have knowledge and skills on 3D printing technology, materials and application in the crafts sector.

Learners can explore and select between online resources for developing own crafts competences with 3D printing.

Learners can demonstrate basic usage of Computer-Aided Design (CAD) freeware.

Provided availability of a 3D printer – learners print their own-designed product.

**SELF ASSESSMENT TOOL**

1. What materials can be used in 3D printing processes?
2. How can you as a design benefit from 3D printing?
3. What does CAD stand for and what is its purpose?
4. What examples of 3D printing in the crafts sector can you name?

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.4 USE OF DIGITAL TOOLS</i>	
<b>Title of Unit</b> <i>C.4.2: Use of a numerical control system machine</i>	(hours) 9
<b>LEARNING OUTCOMES</b> Use of a numerical control system machine. <ul style="list-style-type: none"> <li>- Have knowledge of the types of numerical control machine operations in the crafts sector</li> <li>- Conclude craft sector programming capacities in respect to numerical control systems</li> <li>- Produce concepts for the introduction of new digital solutions to the crafts sector</li> </ul>	
<b>CONTENTS</b>  <b>Introduction</b> Another form for the creation of digital-file prototypes is Computer Numerical Control (CNC). The solution implies the use of CAD (Computer-aided Design) software for precision in drawing that is not possible with a pencil and paper. CAD is capable of conveying the messages from the computer to the CNC machine that can literally take on any shape or form. With CAD drawing, a code is sent to the CNC machine, so to create complex shapes.  The technique is most frequently used for designing prototypes, since it is less likely to result in errors or imperfections in the final product, as more prone are the techniques of 3D print and laser cutting. This is therefore, a solution for professional craftsmen and large-scale manufacturing process, as it is associated with higher investment and longer period for benefiting from the return on investment.  <b>Common activities performed by numerical control system machines</b> Drilling Milling Turning Assembly Drafting Prototyping  Differences Between CNC Turning and CNC Milling CNC milling machines hold a workpiece in place while their rotating cutting or drilling tools gradually remove material from the piece; applicable in producing a wider range of shapes. Therefore, if you are interested in cutting and drilling material (like wood or metal), this is the solution. The difference between a milling and any other drilling machine is cutting in different angles and along different axes (2-5), guided by a computer. CNC turning machines rotate the workpiece itself while the tools remain stationary; applicable in producing works with a cylindrical profile, but s capable of producing larger volumes of material at a lower cost.  <b>Materials for CNC production</b> Metal Plywood MDF (Medium Density Fiberboard) HDF (High Density Fiberboard) ACP (Aluminum Composite Panel) Corian material, Glasses Acrylic Plastic aluminium	

Nylon  
Stone  
Wood

**Most popular applications of CNC in crafts**

Furniture  
Woodworking  
Instruments  
Aluminum machining  
Sculpture  
Signs

**Additional guidelines for teachers of crafts for introducing the use of a numerical control system machine:**

- 1) Allow learners to search online for examples of crafts made with the CNC machine, to then discuss favoured ideas.
- 2) Share an readily available product by the use of a numerical control system machine, so learners brainstorm on the steps in the production process and what improvements can be made to the product with the use of other techniques (Additive and subtractive manufacturing).

**ASSESSMENT CRITERIA**

Identify examples of numerical control system machine application in the crafts sector;  
Depict between the types of activities performed by numerical control system machines;  
Identify the materials used in CNC production;  
Compare the most common applications of CNC in crafts;  
Determine the application of CNC in own craft profession;  
Research online for ideas on CNC use in different crafts professions;  
Explain the steps in CNC production of a presented or own researched crafts example;  
Produce concepts for the introduction of CNC in the crafts sector;  
Conclude craft sector programming capacities in respect to numerical control systems.

**RESOURCES**

Equipment: Computer with internet connection; examples of products produced by the CNC method; optional: projector.

Additional online resources:

Top 5 CNC Machines for your creativity

<https://www.youtube.com/watch?v=o6g9eTP5H1Q>

How to CNC Without a CNC – instructions how to create a product with alternative materials and equipment, resembling a final product created with a CNC machinery

<https://www.instructables.com/id/How-to-CNC-Without-a-CNC/>

**PRODUCTS/OUTPUTS**

Learners have knowledge on examples of numerical control system machine application in the crafts sector.

Learners can explore and select between online resources for developing crafts competences with CNC.

Learners can explain the steps in craft production with the CNC solution based on a selected example.

**SELF ASSESSMENT TOOL**

1. What is the principle behind numerical control system machines?
2. What are the common activities performed by numerical control system machines?
3. What materials are used for CNC production?
4. What are the most popular applications of CNC in crafts?

<b>Title of Module</b> <b>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</b>	
<b>Title of submodule</b> <b>C.4 USE OF DIGITAL TOOLS</b>	
<b>Title of Unit</b> <b>C.4.3: Use of laser cutting</b>	(hours) 9
<b>LEARNING OUTCOMES</b> The learner will be able to discover the potential of using laser cutting for crafts products. <ul style="list-style-type: none"> <li>- Have knowledge of laser cutting application in the crafts sector</li> <li>- Compare different methods of laser cutting solutions and present crafts' sector laser cutting capacities</li> <li>- Produce concepts for the introduction of new digital solutions to the crafts sector</li> </ul>	
<b>CONTENTS</b>  <b>Introduction</b> Laser cutting are among one of the most demanding, yet most impressive solutions for the presentation of crafts products. However, much more demanding than in comparison to 3D printing, as the time needed to complete a work will be longer. The application of this solution in crafts can be chiefly demonstrated in jewellery, architecture and art. With this technology it is easier to visualize how a 2D concept has the capacity to become a 3D piece of art. The technique also enables for the creation of abstract patterns, play with geometry without restrictions, flexible choice of materials and exact precision.  <b>Examples of the application of laser engraving in crafts</b> Greeting cards and gift vouchers Decorative items Home and garden accessories Pottery Clothing Gift items Glass beads Wood or acrylic pendants Wooden houses Wooden figurines Candle holders Decorative garden stakes Felt accessories Ceramics Decorations Gold and silver jewellery Tools Watches Glass art  <b>Laser cutting techniques</b> For the production of products by laser cutting you need a laser engraving machine. Laser types will depend on the scope and span of your work - the material you will be working with and the type of activity you are most interested in.  Activities to perform by the laser cutting technique: <ul style="list-style-type: none"> <li>✓ Engraving</li> <li>✓ Cutting</li> <li>✓ Marking</li> </ul>	

Materials for laser engraving and cutting:

TroGlass, Acrylic and Plexiglas

Wood

Felt

Textiles

Paper

Wax

Glass

Stone

Card and cardboard

Ceramic

Leather

Base metals

Plastics

Stainless steel

### **Examples of laser cutting in the crafts sector by material used**

- 1) Laser cutting in wood
- 2) Laser cutting in paper
- 3) Laser cutting in recycled materials
- 4) Laser cutting in steel
- 5) Laser cutting in plastic

### **Practice**

- 1) Browse examples of different products produced by laser cutting.
- 2) Produce own step by step instructions on a crafts production with laser cutting.
- 3) Discover the process behind creating Laser-Cut Book Covers in wood.

### **Additional guidelines for teachers introducing laser cutting technology:**

- 1) Discuss some case studies with learners, with student self-reflection:  
<https://www.troteclaser.com/en-gb/knowledge/case-studies/>
- 2) Learners browse examples of different products produced by laser cutting:  
<https://www.instructables.com/id/Laser-Cutting-Projects/>  
<https://lasercutcrafter.com.au/>

### **ASSESSMENT CRITERIA**

Identify examples of the application of the laser cutting method in the crafts sector;  
Depict between the types materials for laser engraving and cutting;  
Compare products produced by laser cutting and other methods;  
Determine the application of laser cutting in own craft profession;  
Research online for ideas on laser cutting application in the production of various crafts;  
Explain the steps in laser cutting for crafts production on a own developed concept;  
Produce concepts for the introduction of CNC in the crafts sector;  
Conclude craft sector laser cutting capacities.

### **RESOURCES**

Equipment: Computer with internet connection; examples of products produced with laser cutting;  
optional: projector.

Additional online resources:

Tips and tricks for laser engraving and laser cutting

<https://www.troteclaser.com/en-gb/knowledge/tips-for-laser-users/>

**PRODUCTS/OUTPUTS**

Learners have knowledge on examples of the application of laser cutting in crafts by material to be used.

Learners can explore and select between online resources for developing crafts competences with laser cutting.

Learners can explain the steps in craft production with the laser cutting solution based on a selected example.

Learners can draft own instructions on a crafts production with laser cutting.

**SELF ASSESSMENT TOOL**

1. What activities can you perform by the laser cutting technique?
2. What materials can be used for producing crafts by the laser cutting technique?
3. What examples of the application of laser cutting in crafts can you name?
4. What are the steps in creating a crafts by the laser cutting technique?



<b>Title of Module</b> <b>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</b>	
<b>Title of submodule</b> <b>C.4 USE OF DIGITAL TOOLS</b>	
<b>Title of Unit</b> <b>C.4.4: Other Specialist Tools &amp; Software for Crafts Production</b>	(hours) 9
<b>LEARNING OUTCOMES</b> The learner will be able to discover the potential of other specialist tools and software for crafts production. <ul style="list-style-type: none"> <li>- Express tool modernization in the crafts sector and outline future concepts for producing crafts</li> <li>- Shape decisions with the use of digitally-controlled innovative tools</li> <li>- Adapt innovative ICT tools to the craft production</li> </ul>	
<b>CONTENTS</b> <b>Introduction</b> Tool modernization assists the production of crafts, speeding up tasks and improving the quality of the final product. In the context of 20th century, customisation and individuality were a novelty in crafts production, affordable in mass production. In the 21 <sup>st</sup> century, with the advancements in information communication technologies, more individuals can afford to produce own customised products. Nowadays with Computer Aided Design (CAD) software and Computer Aided Manufacturing Hardware, prototyping is approachable. Thus, the relationships between craft and technology benefits the development of new objects and design production. It also implies the creation of new professions.  <b>Future concepts for producing crafts</b> Additive and subtractive manufacturing are the most innovative approaches to crafts production. As <b>additive manufacturing</b> known is any process resulting in the production of objects by depositing material to create desired shape. As <b>subtractive manufacturing</b> known is any process resulting in the production of objects by removing material from a solid block to create desired shape. Quite often, the two processes, additive and subtractive manufacturing are combined to become a hybrid process, to result in the production of higher quality of the final object. An example may be printing a prototype template in 3D (additive manufacturing) and then laser cutting holes (subtractive manufacturing), additionally using milling to polish the final product (subtractive manufacturing).  As 3D printing will be the most popular type of additive manufacturing, other examples are: welding or sculpture molding (by adding clay or similar materials). <b>Injection molding</b> refers to the process in which the material to be molded is injected under pressure into a mold. Thus method is used for producing plastic objects, including toys, pocket combs, part of musical instruments or bottle caps.  Similar to the above process is <b>casting</b> , when the material to be molded is poured into the mold.  Apart from laser cutting or computer numerical control (CNC) machines, known as subtractive manufacturing is also <b>Electrical discharge machining</b> (EDM). Electrical discharge machining refers to a manufacturing process resulting in obtaining a desired shape by using electrical discharges (sparks). This method is used for materials difficult to machine with traditional techniques, including hard metals, metal alloy (i.e. titanium, hastelloy, kovar or Inconel) and ceramics.  Digital tools and manufacturing are facilitating new ways of utilising more and more materials for making and distributing products.  <b>4 key trends in crafts</b> linked with modernization in <b>technology</b> from interview of 2016 with Annie Warburton, creative director at the Crafts Council:	

1. increasing access to new materials and processes, i.e. graphene, recycled materials, plants or Pinatex (an innovative, natural and sustainable non-woven textile made out of pineapple leaves).
2. social change, i.e. freedom in experimenting, open exchange of skills, knowledge & competence, as well participation in creativity for self-development and the development of society.
3. mass customisation, with designers interested in new materials and developing new production systems or models.
4. sustainability, resulting in new ways to utilise by-products and manufacturing waste, predominate in bio-design, makers adopting sustainable patterns and structures to create a new group of sustainable products.

Moreover, in 2016 innovative in crafts were among others already considered:

- clothing made from mushroom mycelium,
- liquid lighting.

This leads to the affirmation on the trend for **eco-friendly**, **re-usable** or **resource saving** materials for the future. Thus, the technologies applied now will be developing, with easier access to them, including 3D print, laser cutting or CNC, the type of material though seems to be infinite.

To find out how technology will affect crafts product, this is an instance that will be more common in the future - machines assisting humans and making digitalization more approachable.

Explore a case study how digital technology can create an embroidered textile without the requirement to have the knowledge or skills on textile processes.

<https://www.wgsn.com/blogs/future-craft-digital-age-re-master-sabina-weiss/>

#### **Additional software for crafts makers**

- ✓ Software that can create 2D vector graphics (i.e. DXF, SVG, EPS, PDF and others).
- ✓ CAD programs for making precise, complex designs (i.e. AutoCAD, SolidWorks or Fusion 360).
- ✓ Software for artistic and decorative designs (i.e. Adobe Illustrator or Inkscape).
- ✓ Software for product presentation, creating high-quality graphics or introducing improvements before advertising the product (i.e. Photoshop)

#### **Additional guidelines for teachers of crafts for discussing digital tools for crafts:**

- 1) Provide a platform for learners to share feedback on tools they are already familiar with, before discussing solutions for the future.
- 2) Instruct learners on other content within the course approaching digital tools, i.e. on collaboration in *A.2.2 Online storage (Quick and easy access of information)*.

#### **ASSESSMENT CRITERIA**

Identify examples of tool modernization in the crafts sector;  
 Depict between the types of additive and subtractive manufacturing methods;  
 Compare products produced by advancement digital solutions and own production methods;  
 Outline future concepts for producing crafts;  
 Shape decisions of own crafts production with the use of digitally-controlled innovative tools;  
 Research online for ideas on adapting innovative ICT tools to the craft sector;  
 Conclude craft sector capacities for future development.

#### **RESOURCES**

Equipment: Computer with internet connection, projector.

Additional online resources:

Networked Production and Industry 4.0 – factory of the future

<https://www.homag.com/en/your-solution/networked-production-industry-40/>

Future of technology timeline

<https://futurism.com/images/things-to-come-a-timeline-of-future-technology-infographic>

7 Ways Technology is Changing How Art is Made

<https://www.smithsonianmag.com/arts-culture/7-ways-technology-is-changing-how-art-is-made-180952472/>

Video tutorial on Photoshop:

<https://www.youtube.com/user/Photoshop/videos>

### **PRODUCTS/OUTPUTS**

Learners have knowledge and skills on current and future concepts for producing crafts.

Learners can select tools & software for crafts production or presentation of their works.

Learners can conceptualize how the development of technology will be reflecting in craft production.

### **SELF ASSESSMENT TOOL**

1. How does tool modernization affect the crafts sector?
2. What are the future concepts for producing crafts?
3. What types of additive and subtractive manufacturing methods do you have knowledge about?
4. Is there any software that you can use for presenting or advertising your product?

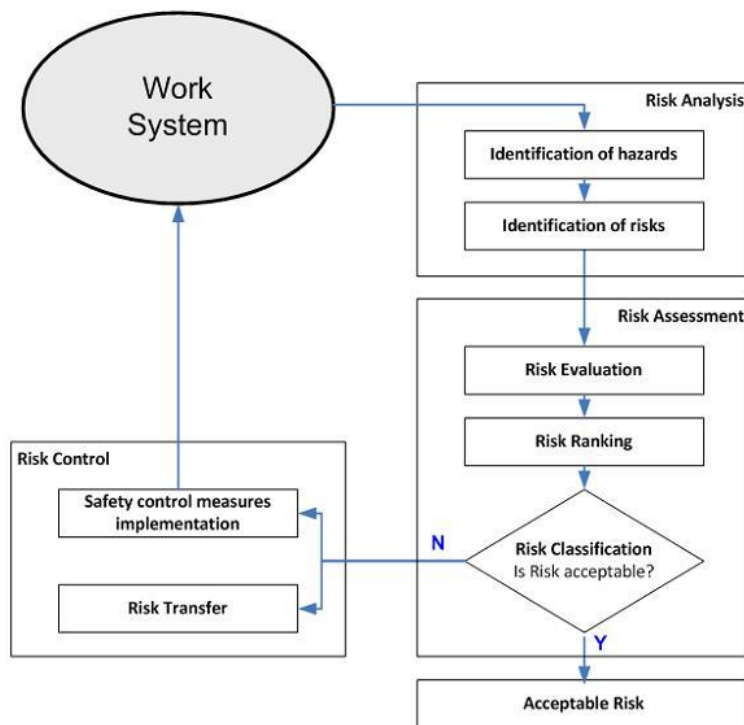
## C.5 MEASURES TO PREVENT OCCUPATIONAL AND ENVIRONMENTAL RISK

### C5.1. Individual elements of protection risk

### C5.2. Safe use of materials

### C5.3. Elements of environmental protection risk

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.5. Measures to prevent occupational and environmental risk</i>	
<b>Title of Unit</b> <i>C5.1. Individual elements of protection risk</i>	(hours) 19
<b>LEARNING OUTCOMES</b> The learner will be able to plan and promote environment and Safety management system. <ul style="list-style-type: none"> <li>- Explain concepts related to safety, hygiene and health at work as danger, accident, damage occupational disease and risk</li> <li>- Use Individual and collective elements of protection</li> <li>- Plan and promote the implementation stages of Individual protection, Environment and Safety management system.</li> <li>- Implement procedures to act in emergency situations.</li> </ul>	
<b>CONTENTS</b>  <b>Introduction</b> “Workers should be protected from occupational risks they could be exposed to. This could be achieved through a risk management process, which involves risk analysis, risk assessment and risk control practices. In order to carry out an effective risk management process, it is necessary to have a clear understanding of the legal context, concepts, risk analysis, assessment and control processes and the role played by all involved in the process. It is also desirable to base risk management on solid and tested methodologies.” (Isabel L. Nunes, 2010)	

**Figure 1: Risk management**

Source: Nunes, 2010

Diagram retrieved from

[https://oshwiki.eu/wiki/Occupational\\_safety\\_and\\_health\\_risk\\_assessment\\_methodologies](https://oshwiki.eu/wiki/Occupational_safety_and_health_risk_assessment_methodologies)

Risk assessment

4. - methods to perform risk assessment
5. . Evaluating, ranking, and classifying risks.
  - a. Risk evaluation

**Table 1: A simple risk estimator**

Likelihood of harm	Severity of harm		
	Slight harm	Moderate harm	Extreme harm
Very unlikely	Very low risk	Very low risk	High risk
Unlikely	Very low risk	Medium risk	Very high risk
Likely	Low risk	High risk	Very high risk
Very likely	Low risk	Very high risk	Very high risk

Source: BSI, 2004

Table 1: A simple risk estimator retrieved from

[https://oshwiki.eu/wiki/Occupational\\_safety\\_and\\_health\\_risk\\_assessment\\_methodologies](https://oshwiki.eu/wiki/Occupational_safety_and_health_risk_assessment_methodologies)

Determination of a quantitative or qualitative value for the risk.

Quantitative risk evaluation:

- probability of occurrence risk;
- severity of the potential consequences.

Qualitative risk evaluation

- Matrix Evaluation: design and size suite to needs

## Ranking of the evaluated risks

### Classify risk acceptability

Risk value:

- Reference values – legislation
- knowledge sources, /equipment specifications,
- recommendations from advisory bodies.

**Table 2: Risk categorization**

Category of risk	Evaluation of tolerability	Guidance on necessary action and timescale
Very low	Acceptable	These risks are considered acceptable. No further action is necessary other than to ensure that the controls are maintained.
Low	Risks that should be reduced so that they are tolerable or acceptable.	No additional controls are required unless they can be implemented at very low cost (in terms of time, money and effort). Actions to further reduce these risks are assigned low priority. Arrangements should be made to ensure that the controls are maintained.
Medium		Consideration should be given as to whether the risks can be lowered, where applicable, to an acceptable level, but the costs of additional risk reduction measures should be taken into account. The risk reduction measures should be implemented within a defined time period. Arrangements should be made to ensure that the controls are maintained, particularly if the risk levels are associated with harmful consequences.
High		Substantial efforts should be made to reduce the risk. Risk reduction measures should be implemented urgently within a defined time period and it might be necessary to consider suspending or restricting the activity, or to apply interim risk control measures, until this has been completed. Considerable resources might have to be allocated to additional control measures. Arrangements should be made to ensure that the controls are maintained, particularly if the risk levels are associated with extremely harmful consequences and very harmful consequences.
Very high	Unacceptable	These risks are unacceptable. Substantial improvements in risk controls are necessary, so that the risk is reduced to a tolerable or acceptable level. The work activity should be halted until risk controls are implemented that reduces the risk so that it is no longer very high. If it is not possible to reduce risk the work should remain prohibited.

Source: BSI, 2004

Table2 – Risk categorization retrieved from

[https://oshwiki.eu/wiki/Occupational\\_safety\\_and\\_health\\_risk\\_assessment\\_methodologies](https://oshwiki.eu/wiki/Occupational_safety_and_health_risk_assessment_methodologies)

### Basic OSH concepts



Image retrieved from <https://portalcfo.com/how-to-reduce-operational-risk/#.XKYcrJhKiUk>

- Hazard
- Risk
- Risk assessment
  - o what could cause injury or harm
  - o whether the hazards could be eliminated and, if not,
  - o what preventive or protective measures are, or should be, in place to control the risks
- Safety
- Health
- Occupational disease
- Work accident
- Prevention

### Prevention as key concept in OSH Management

- Personal protective equipment (PPE)
- Protecting Employees from Workplace Hazards
- Eye and Face Protection
- Head Protection
- Foot and Leg Protection
- Hand and Arm Protection
- Body Protection
- Hearing Protection
- Assessing the Need for Personal Protective Equipment (PPE)
- Protecting Employees from Workplace Hazards
  - Steps taken to assess potential hazards in every employee's work space and in workplace operating procedures.
  - Appropriate PPE selection criteria.
  - How to train handicraft trainers on the use of PPE, including
  - What PPE is necessary
  - When PPE is necessary
  - How to properly inspect PPE for wear or damage
  - How to properly put on and adjust the fit of PPE
  - How to properly take off PPE
  - The limitations of the PPE
  - How to properly care for and store PPE



Videos from Personal Protective Equipment (PPE):

<https://www.youtube.com/watch?v=KgkvxUtczLA>

<https://www.youtube.com/watch?v=XVNMj0ZxZsI>

[https://www.youtube.com/watch?v=NV2cNmFK8\\_Y](https://www.youtube.com/watch?v=NV2cNmFK8_Y)

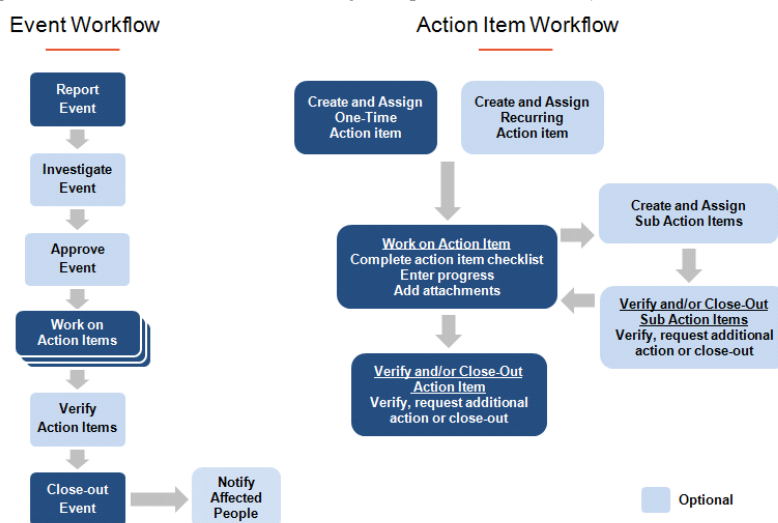
Collective Protective Equipment (CPE) - Collectively protect workers equipment from one or more risks to their health or safety at work.

Samples of collective protection equipment:

- Fire Extinguishers
- Acoustic enclosure of sound sources;
- Ventilation of workplaces;
- Protection of moving machine parts;
- Gas and steam exhausters;
- Plate flags;
- Machine sensors;
- Non-slip stair treads;
- Fans;
- Lighting;
- Non-slip Flooring.
- Protection against light and radiation;
- Body guards;
- Fire alarm siren;
- Paint booths;
- Air / water purifiers;
- Emergency shower and eyewash.

### Emergency response plan

The first step when developing an emergency response plan is to conduct a risk assessment to identify potential emergency scenarios. An understanding of what can happen will enable you to determine resource requirements and to develop plans and procedures to prepare your business. The emergency plan should be consistent with your performance objectives.



Retrieved from <https://www.fldata.com/products/action-tracking-software-act>

Protective actions for life safety

Resources for Protective actions for life safety

- Incident Management Software

### Developing the emergency plan

- Review performance objectives for the program.
- Review hazard or threat scenarios identified during the risk assessment.
- Assess the availability and capabilities of resources for incident stabilization including people, systems and equipment available within your business and from external sources.
- Talk with public emergency services (e.g., fire, police and emergency medical services) to determine their response time to your facility, knowledge of your facility and its hazards and their capabilities to stabilize an emergency at your facility.
- Determine if there are any regulations pertaining to emergency planning at your facility; address applicable regulations in the plan.
- Develop protective actions for life safety (evacuation, shelter, shelter-in-place, lockdown).
- Develop hazard and threat-specific emergency procedures using guidance from the resource links on this page. Write your emergency response plan using this template
- Coordinate emergency planning with public emergency services to stabilize incidents involving the hazards at your facility.
- Train personnel so they can fulfill their roles and responsibilities.
- Facilitate exercises to practice your plan.

### Practice

- Activity 1: *Identifying hazards in the workplace*. Using chat group as Facebook Messenger ou skype, discuss which hazards workers face in the workplace (or occupational sector) under consideration. They can think of the hazards from your own workplace or workplace visits. List the hazards. Write down everyone's proposals – each person's ideas are as valid as those of the next person. There does not need to be a consensus. When the group has compiled a list of hazards, you should choose what you believe to be the four most important issues. For each hazard, think about who is most at risk .Reflect upon who you think could also be at risk. Think about other workers or groups of people such as family members, the public, or anyone else who may be exposed to the hazard. and about people who may be particularly vulnerable (such as children and pregnant women). Why should they be more vulnerable? Reflect upon what you think may be the consequences of exposure to the hazard. Collect and summarize everyone's proposals – each person's ideas are as valid as those of the next person. There does not need to be a consensus.
- Try to find Web tools for Assessing the Need for Personal Protective Equipment (PPE).
- Create a checklist on need for PPE.
- Create a checklist on need for CPE.

### Further readings

European Agency for safety and health work. Workplaces, equipment, signs, personal protective equipment in <https://osha.europa.eu/en/legislation/guidelines/workplaces>

ILO (1996) Recording and notification of occupational accidents and diseases. An ILO code of practice Geneva, International Labour Office, 1996 [https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---safework/documents/normativeinstrument/wcms\\_107800.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_107800.pdf)

### ASSESSMENT CRITERIA

- 1 – For your own activity did you identify Identifying hazards in the workplace?
- 2 – Can you tell what are your needs for CPE and CPE?
- 3 – Did you try to determine resource requirements and to develop plans and procedures on your workplace?

4- Can you tell a few Protective actions for life safety on your workplace?

**RESOURCES****Equipment:**

Computer with Internet connection; optional: projector.

**PRODUCTS/OUTPUTS**

Learners have knowledge and skills on OSH

Learners can plan and promote Plan and promote the implementation stages of Individual protection, Environment and Safety management system.

**SELF ASSESSMENT TOOL**

Explain concepts related to safety, hygiene and health at work as danger, accident, damage occupational disease and risk

Create a checklist on need for PPE and CPE

Draw an emergency plan for your workplace.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.5. Measures to prevent occupational and environmental risk</i>	
<b>Title of Unit</b> <i>C5.2. Safe use of materials</i>	(hours) 9
<b>LEARNING OUTCOMES</b> The learner should be able to assess risk and safety conditions for safe use of materials. <ul style="list-style-type: none"> <li>- Rules of personal hygiene, safety and health at work</li> <li>- Product Handling Precautions</li> <li>- Obligations of the employer and the employee in accordance with the legislation in force.</li> <li>- Research and applying the legislation, regulations and standards of intervention in craft sector.</li> <li>- Preparing technical and specific documentation for safe use of materials</li> <li>- Assessing risk and safety conditions</li> </ul>	
<b>CONTENTS</b>  <b>Introduction</b> Currently, there is legislation that allows the effective protection of those who integrate craft activities; its application safeguards aspects related to the environmental and safety conditions of artisans' work.  According to the O.M.S.-World Health Organization, the assessment of Hygiene and Safety conditions consists of " <i>a state of physical, mental and social well-being and not only the absence of disease and infirmity</i> ".  <b>Safe handling of products</b> <ul style="list-style-type: none"> <li>- Ground rules to ensure safe handling of products</li> <li>- - Taking inventory of which products being used in the business</li> <li>- - Current safety data sheets</li> <li>- - Responsibility, authority and training</li> <li>- - Risk analysis of the product</li> <li>- - Procedures in Purchasing chemical substances</li> <li>-</li> <li>- Storing, labelling, handling and personal hygiene</li> <li>- Storage</li> <li>- Labelling</li> <li>- Handling of chemicals</li> <li>- Personal hygiene</li> <li>- Rules concerning handling chemicals</li> <li>-</li> </ul> <b>European legislative framework on occupational safety and health</b> Employers Obligations  <b>Risk Management tools</b> <b>Legislation, regulations and standards of intervention: the case of craft sector.</b>  <b>Further readings</b> <ul style="list-style-type: none"> <li>- EU-OSHA - European Agency for Safety and Health at Work (no date). Risk assessment. Retrieved 1 March 2013,</li> <li>- HSE - Health and Safety Executive (no date), Risk management.</li> <li>- Bergman D., Davis C. &amp; Rigby B. 'International comparison of health and safety responsibilities of company directors', HSE Research report 535, 2007. Available at: <a href="http://www.hse.gov.uk/research/rrpdf/rr535.pdf">http://www.hse.gov.uk/research/rrpdf/rr535.pdf</a></li> <li>- Directgov, 'Employers' health and safety responsibilities' (undated). Retrieved on 15 June 2011, from: <a href="http://www.direct.gov.uk/en/Employment/HealthAndSafetyAtWork/DG_4016686">http://www.direct.gov.uk/en/Employment/HealthAndSafetyAtWork/DG_4016686</a></li> </ul>	

- EU-OSHA – European Agency for Safety and Health at Work, Common errors in the risk assessment process, 2008. Available at: <http://osha.europa.eu/en/publications/e-facts/efact32>
- EU-OSHA – European Agency for Safety and Health at Work, European Safety and Health Legislation, web portal [undated]. Retrieved on 15 June 2011, from at: <http://osha.europa.eu/en/legislation> Gallagher, C., Underhill E. and Rimmer M.: 'Occupational health and safety management systems: A review of their effectiveness in securing healthy and safe workplaces', 2001. Available at: [http://www.safeworkaustralia.gov.au/AboutSafeWorkAustralia/WhatWeDo/Publications/Documents/127/OHSManagementSystems\\_ReviewOfEffectiveness\\_NOHSC\\_2001\\_ArchivePDF.pdf](http://www.safeworkaustralia.gov.au/AboutSafeWorkAustralia/WhatWeDo/Publications/Documents/127/OHSManagementSystems_ReviewOfEffectiveness_NOHSC_2001_ArchivePDF.pdf)

3.

#### ASSESSMENT CRITERIA

- 1 Number of Rules of personal hygiene, safety and health at work you use in your workplace
- 2 Number of Product Handling Precautions adopted
- 3 Number of Obligations of the employer and the employee in accordance with the legislation in force.
- 4 Number of Risk Management tools

#### RESOURCES

##### Equipment:

Computer with Internet connection; optional: projector.

#### PRODUCTS/OUTPUTS

Learners have knowledge of the rules of personal hygiene, safety and health at work

Learners have knowledge of with the legislation in force.

Learners are able to assess risk and safety conditions.

#### SELF ASSESSMENT TOOL

1. List the principal rules of personal hygiene, safety and health at work;
2. Describe Product Handling Precautions adopted in your work place
3. Try to use one digital tool to management the risks.

<b>Title of Module</b> <i>C. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</i>	
<b>Title of submodule</b> <i>C.5. Measures to prevent occupational and environmental risk</i>	
<b>Title of Unit</b> <i>C5.3. Elements of environmental protection risk</i>	(hours) 16
<b>LEARNING OUTCOMES</b> The learner should be able to apply good practices and norms of security, hygiene, health and environmental protection <ul style="list-style-type: none"> <li>- Recognizing today's major environmental problems</li> <li>- Identifying the Management entities of specific waste streams</li> <li>- Planning good practices for the environment;</li> <li>- Developing and implementing Waste Management strategies of action</li> </ul>	
<b>CONTENTS</b> Introduction Environmental risk assessment aims at identifying all possible types of environmental hazards to which crft workers are exposed, and assessing the risk in terms of probable ecological, human, property losses associated with these hazards. Environmental risk management involves examining, implementing & evaluating the options available for effectively management of these risks.  The ecological risk assessment process <ul style="list-style-type: none"> <li>- Hazard assessment</li> <li>- Comparative risk assessment</li> <li>- Cumulative ecological risk assessment</li> <li>- Environmental impact statement</li> </ul>	
<pre> graph TD     subgraph ERA [ECOLOGICAL RISK ASSESSMENT]         P1[PROBLEM FORMULATION PHASE 1]         P2[ANALYSIS PHASE 2]         subgraph P2_Box [ ]             CE[Characterization of Exposure]             CEE[Characterization of Ecological Effects]         end         P3[RISK CHARACTERIZATION PHASE 3]         P1 --&gt; P2_Box         P2_Box --&gt; P3     end     D1[Discussion Between the Risk Assessor and Risk Manager (Planning)] &lt;--&gt; P1     P3 &lt;--&gt; D2[Discussion Between the Risk Assessor and Risk Manager (Results)]     D1 --&gt; P2_Box     P2_Box --&gt; P3     P3 --&gt; D2     D2 --&gt; RA[Risk Assessment]     D1 -.-&gt; RA     D2 -.-&gt; RA     D3[Data Acquisition, Verification and Monitoring] -.-&gt; RA     </pre>	
Figure 1 – Framework for ecological Risk assessment retrieved from <a href="https://www.epa.gov/sites/production/files/2014-11/documents/eco_risk_assessment1998.pdf">https://www.epa.gov/sites/production/files/2014-11/documents/eco_risk_assessment1998.pdf</a>	
<b>Hazard Assessment vs Ecological Risk Assessment</b> Ecological risk assessment in a management context <ul style="list-style-type: none"> <li>- Contributions of Ecological Risk Assessment to Environmental Decision Making;</li> <li>- Factors Affecting the Value of Ecological Risk Assessment for Environmental Decision Making;</li> </ul>	

### Planning the risk assessment

- Products of planning
- Selecting Measures

### Recycling - specific waste streams

### Legislative Framework for Waste Management

### Comprehensive Integrated Solid Waste Management Planning Process



Figure 2 – Comprehensive Integrated Solid Waste Management Planning Process retrieved from <https://www.epa.gov/sites/production/files/2015-10/documents/dmg-2.pdf>

### Further readings

EPA (1998). **Guidelines for Ecological Risk Assessment**. U.S. Environmental Protection Agency: Washington, DC at [https://www.epa.gov/sites/production/files/2014-11/documents/eco\\_risk\\_assessment1998.pdf](https://www.epa.gov/sites/production/files/2014-11/documents/eco_risk_assessment1998.pdf)

EPA (2015) **Chapter 2. Developing Solid Waste Management Plans** at <https://www.epa.gov/sites/production/files/2015-10/documents/dmg-2.pdf>

### ASSESSMENT CRITERIA

- 7- Diversity of Contributions of Ecological Risk Assessment to Environmental Decision Making
- 8- Existence of Recycling - specific waste streams
- 9- Existence of a movie created as a combination of other video and audio files
- 10- Existence of a plan risk assessment

### RESOURCES

#### Equipment:

Computer with Internet connection; optional: projector.

### PRODUCTS/OUTPUTS

Learners apply good practices and norms of security, hygiene, health and environmental protection

- Recognizing today's major environmental problems
- Identifying the Management entities of specific waste streams
- Planning good practices for the environment;

Learners implement good practices of Waste Management strategies of action

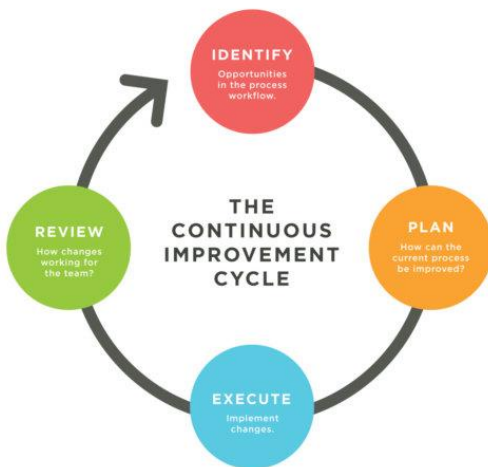


**SELF ASSESSMENT TOOL**

1. Explain the ecological risk assessment process according to EPA 2.
2. What's the difference between Hazard Assessment and Ecological Risk Assessment3.
3. Draw the plan of your ecological risk assessment place
4. Which waste is it possible to Recycle from your workplace

## D.DIGITAL TOOLS FOR CRAFT BUSINESSES

### D.1 BUSINESS DEVELOPMENT, FROM THE IDEA TO THE SCALE UP

<b>Title of Module</b>	
<i>D. DIGITAL TOOLS FOR CRAFT BUSINESSES</i>	
<b>Title of submodule</b>	
<i>D.1. BUSINESS DEVELOPMENT, FROM THE IDEA TO THE SCALE UP</i>	
<b>Title of Unit:</b>	(hours) 10
<b>LEARNING OUTCOMES</b> The learner should be able to: <ul style="list-style-type: none"> <li>- be aware of the business needs and be able to apply and follow Lean Methodologies</li> <li>- to use a sufficient range of Digital tools for business development ,management &amp; Productivity Tools.</li> </ul>	
<b>CONTENTS</b>  <p><b>Lean Methodologies:</b>          Innovation depends on ideas generated through creativity and the knowledge and research that make it possible to put ideas to work. However, these two activities are very dependent on the people who perform them.</p> <p>Over the past ten 10 years has occurred a change of paradigms in the way business are approached , opening the scope of applications to include disruptive and fast innovation which has also touch deeply the creative and Cultural sector.</p> <p>The most current and extended approach comes from the Lean Methodologies, originally established and used in the manufacturing industry it rapidly expanded as a concept framework for other industries.</p> <p>Jim Benson of Modus Cooperandi defines Lean methodology in this way: "Lean is both a philosophy and a discipline which, at its core, increases access to information to ensure responsible decision making in the service of creating customer value."</p> <p>The key operational concept of this methodology is related with the gather of this information, the needs analysis, for both customer value, and opportunities:</p>	
	

When some people think of Lean, they equate it with the elimination of waste. While it's true that Lean organizations aim to eliminate waste (defined as anything that does not deliver value to the customer), the goal is not elimination -- it's value creation.

So how do we create value? We become learning organizations. We set out to learn what our customers want and need -- and how to eliminate what they don't. We work to continuously improve so that our value stream, from end to end, is continuously optimizing to create more value for the customer.

How do we learn what is valuable? We deliver quickly. When we deliver quickly, based on what we know about the customer, we are able to get feedback quickly. And whether what we deliver is a failure or a success (or somewhere in between), we gain valuable insight into how to improve. This is how we achieve business agility -- this is how we, through the process of creating value, eliminate waste.

The continuous improvement cycle helps Lean organizations differentiate themselves from our competitors. Lean organizations are nimble, humble, and methodical. We encourage employees to foster a learning mindset, and more specifically, a testing mindset. We test ideas with our target market before we throw dollars at them. In this way, Lean methodology is as much of a path toward innovation as it is a form of risk management.

From: <https://leankit.com/learn/lean/lean-methodology/>

Lean Methodologies and approach are based in iterative frameworks of Learn/discover+ Execute/prototype/experiment/ + Analyses/GatherCustomer Data/ Validation.

The tool that comes out of this line of thinking and has become almost a standard is the Business model canvas, which is being constantly updated and adapted to different specific sectors and activities.

The Business Model Canvas is a strategic management and lean startup template for developing new or documenting existing business models. It is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and finances. It assists firms in aligning their activities by illustrating potential trade-offs.

<https://www.creativeprojectcanvas.com/tool/>

<https://www.creativeprojectcanvas.com/>

<https://leanbusinessplatform.com/>

<https://canvanizer.com/>

#### Business Management & Productivity Tools:

For the craft practitioner, when it comes to business, team work and productions, the use of Management and productivity tools will save time, improve the client communication, the communication inside the team. Most of them might be already familiar for any smartphone user.

In this Unit the candidate will need to be familiar with a range of categories and examples of software applications for this purposes, always from the perspective of being able to search and understand

new tools, as this technology is in constant change and industry standards change nowadays given many factors.

- Important tip: everything can be done on pen and paper.

This means, software helps in the organization, availability everywhere, organized storage and share of content, but the underlying structures and ways to use the tools are personal or specific for each activity and each project, there is no fixed rules.

*"The ecosystem of tools": Set of software tools to cover The wide traversal tasks in an organization.*

This 4 standardized tools, cover a range of approach and has been curated for the craft practitioners, we encourage both candidates and mentors to extend/reduce and change this set as per the specific settings they are in. Create their own ecosystem

This is a final exercise proposal:

<https://www.google.com/search?q=the+innovation+cycle&tbm=isch>

Based on the several Innovation cycles developed for several industries and topics. Discuss and develop the innovation cycle for your CRAFT 3.0 setting.

#### ASSESSMENT CRITERIA

- The candidate is able to explain, deliver and help to develop a Business Model Canvas with the participants of a training session or program.
- The candidate is proficient in the use of productivity software tools for business.

#### RESOURCES

Extra resources and Curated Readings:

- <https://designabetterbusiness.com/2017/11/02/how-to-use-the-business-model-canvas-for-innovation/>

#### PRODUCTS/OUTPUTS

- Completed Business model Canvas
- Built ecosystem of Productivity tools, relevant to a given Craft business example.
- Create a custom innovation cycle for a specific CRAFT activity.

#### SELF ASSESSMENT TOOL

## D.2 ONLINE DIGITAL MARKETING SKILLS FOR CRAFTS PROFESSIONALS

### D2.1 E-commerce

<b>Title of Module</b> <i>D. DIGITAL TOOLS FOR CRAFT BUSINESSES</i>	
<b>Title of SubModule</b> <i>D.2 ONLINE DIGITAL MARKETING SKILLS FOR CRAFTS PROFESSIONALS</i>	(hours) 30
<b>Title of Unit</b> <i>D2.1 E-commerce</i>	
<b>LEARNING OUTCOMES</b> The learner should be able to use e-commerce for the Crafts Sector <ul style="list-style-type: none"> <li>- Describe what ecommerce is about</li> <li>- List the common types of e-commerce</li> <li>- Provide examples of ecommerce platforms</li> <li>- Willingness to use the e-commerce platforms</li> </ul>	
<b>CONTENTS</b>  <b>What is Ecommerce?</b> Ecommerce, also known as electronic commerce or internet commerce, refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions. Ecommerce is often used to refer to the sale of physical products online, but it can also describe any kind of commercial transaction that is facilitated through the internet. Whereas e-business refers to all aspects of operating an online business, ecommerce refers specifically to the transaction of goods and services. The history of ecommerce begins with the first ever online sale: on the August 11, 1994 a man sold a CD by the band Sting to his friend through his website NetMarket, an American retail platform. This is the first example of a consumer purchasing a product from a business through the World Wide Web—or “ecommerce” as we commonly know it today. Since then, ecommerce has evolved to make products easier to discover and purchase through online retailers and marketplaces. Independent freelancers, small businesses, and large corporations have all benefited from ecommerce, which enables them to sell their goods and services at a scale that was not possible with traditional offline retail.  <b>Types of Ecommerce Models</b> There are four main types of ecommerce models that can describe almost every transaction that takes place between consumers and businesses. <ol style="list-style-type: none"> <li><b>1. Business to Consumer (B2C):</b> When a business sells a good or service to an individual consumer (e.g. You buy a pair of shoes from an online retailer).</li> <li><b>2. Business to Business (B2B):</b> When a business sells a good or service to another business (e.g. A business sells software-as-a-service for other businesses to use). e-commerce refers to the electronic exchange of products, services or information between businesses rather than between businesses and consumers. Examples include online directories and product and supply exchange websites that allow businesses to search for products, services and information and to initiate transactions through e-procurement interfaces.</li> <li><b>3. Consumer to Consumer (C2C):</b> When a consumer sells a good or service to another consumer (e.g. You sell your old furniture on eBay to another consumer). C2C is a type of e-commerce in which consumers trade products, services and information with each other online. These transactions are generally conducted through a third party that provides an online platform on which the transactions are carried out. Online auctions and classified advertisements are two examples of C2C platforms, with eBay and Craigslist being two of the most popular of these platforms. Because eBay is a business, this form of e-commerce could also be called C2B2C -- consumer-to-business-to-consumer.</li> </ol>	

#### 4. Consumer to Business (C2B):

When a consumer sells their own products or services to a business or organization (e.g. An influencer offers exposure to their online audience in exchange for a fee, or a photographer licenses their photo for a business to use).

C2B is a type of e-commerce in which consumers make their products and services available online for companies to bid on and purchase. This is the opposite of the traditional commerce model of B2C.

A popular example of a C2B platform is a market that sells royalty-free photographs, images, media and design elements, such as iStock. Another example would be a job board.

#### Examples of Ecommerce

Ecommerce can take on a variety of forms involving different transactional relationships between businesses and consumers, as well as different objects being exchanged as part of these transactions.

1. **Retail:** The sale of a product by a business directly to a customer without any intermediary.
2. **Wholesale:** The sale of products in bulk, often to a retailer that then sells them directly to consumers.
3. **Dropshipping:** The sale of a product, which is manufactured and shipped to the consumer by a third party.
4. **Crowdfunding:** The collection of money from consumers in advance of a product being available in order to raise the startup capital necessary to bring it to market.
5. **Subscription:** The automatic recurring purchase of a product or service on a regular basis until the subscriber chooses to cancel.
6. **Physical products:** Any tangible good that requires inventory to be replenished and orders to be physically shipped to customers as sales are made.
7. **Digital products:** Downloadable digital goods, templates, and courses, or media that must be purchased for consumption or licensed for use.
8. **Services:** A skill or set of skills provided in exchange for compensation. The service provider's time can be purchased for a fee.

#### Mobile e-commerce (m-commerce)

M-commerce is a type of e-commerce on the rise that features online sales transactions made via mobile devices, such as smartphones and tablets. M-commerce includes mobile shopping, mobile banking and mobile payments. Mobile chatbots also provide e-commerce opportunities to businesses, allowing consumers to complete transactions with companies via voice or text conversations.

#### E-commerce applications

E-commerce is conducted using a variety of applications, such as email, online catalogs and shopping carts, EDI, the File Transfer Protocol, web services, and mobile devices. This includes business-to-business activities and outreach, such as using email for unsolicited ads, usually viewed as spam, to consumers and other business prospects, as well as sending out e-newsletters to subscribers and SMS texts to mobile devices. More companies now try to entice consumers directly online, using tools such as digital coupons, social media marketing and targeted advertisements.

The benefits of e-commerce include its around-the-clock availability, the speed of access, the wide availability of goods and services for the consumer, easy accessibility and international reach. Its perceived downsides include sometimes limited customer service, consumers not being able to see or touch a product prior to purchase and the wait time for product shipping.

The rise of e-commerce has forced IT personnel to move beyond infrastructure design and maintenance to consider numerous customer-facing aspects, such as consumer data privacy and security. When developing IT systems and applications to accommodate e-commerce activities, data governance-related regulatory compliance mandates, personally identifiable information privacy rules and information protection protocols must be considered.

#### Examples of E-commerce platforms

##### *Wix Stores*

Wix is originally a website builder that allows you to create websites via drag and drop. On top of that, it also has features that allow you to build an online store.

Like Shopify, the e-commerce platform is simple to use and quick to set up. There is no coding required, you can literally drag content anywhere on your site with the user-friendly editor.

### **SiteBuilder**

SiteBuilder is the best website builder we've reviewed so far. Now we have investigated its e-commerce options, which seem decent enough. You have to get the highest plan to start with an online shop.

### **BigCommerce**

BigCommerce provides a hosted e-commerce solution both as a full SaaS platform as well as a shopping cart for other types of websites. It's probably most similar to Shopify. The two of them are often mentioned in the same breath.

The e-commerce platform comes with great store management capabilities. It offers a large number of tools and features, e.g. promotions, unlimited product variants, options to handle returns, coupons and discounts. Another highlight is the flexible shipping options that allow live quotes and rate calculation. Additionally, BigCommerce integrates with Amazon, eBay and social networks. This enables you to sell across many different sales channels. It also has a lot of marketing tools with very granular controls, such as full control over the URL format.

### **Shopify**

Shopify has become one of the most well-known names in the e-commerce sphere. It's a fully featured hosted solution with hundreds of thousands of users. We also have a full article about it, if the information below is not enough for you.

The commerce platform is super easy to use and quick to set up. Just sign up with your email address and you can start building your shop and selling right away. The intuitive interface also makes it easy to create products and includes SEO features such as title tag and meta description.

### **ASSESSMENT CRITERIA**

- Describe e-commerce
- List the common types of e-commerce
- Name certain examples of e-commerce platforms

### **RESOURCES**

Introduction to e-commerce (<https://irp-cdn.multiscreensite.com/1c74f035/files/uploaded/introduction-to-e-commerce.pdf>)

[http://ocw.metu.edu.tr/pluginfile.php/352/mod\\_resource/content/0/Lecture\\_3.pdf](http://ocw.metu.edu.tr/pluginfile.php/352/mod_resource/content/0/Lecture_3.pdf)

<http://www.dartmouth.edu/~cushman/courses/IE-at-UNG/eCommerceConsequences.pdf>

### **PRODUCTS/OUTPUTS**

Learners have knowledge and skills on e-commerce

Learners can illustrate by examples e-commerce platforms

Learners are willing to use e-commerce platforms



### D.3: DIGITAL COMMUNICATION FOR CRAFT PRACTITIONERS. COMMUNITY AND PARTICIPATION

#### D.3.2.: Recognize the importance of identifying and using the adequate channels for customers

<b>Title of Module D. DIGITAL TOOLS FOR CRAFT PRACTITIONERS</b>	
<b>Title of SubModule D.3: DIGITAL COMMUNICATION FOR CRAFT PRACTITIONERS. COMMUNITY AND PARTICIPATION</b>	
<b>Title of Unit:</b>	(hours) 20
<b>LEARNING OBJECTIVES</b>  The unit aim to focus on the digital Landscape of the craft practitioners considering very important <ul style="list-style-type: none"> <li>• to recognise the benefits of the online presence,</li> <li>• the possible clients and customers of this Landscape,</li> <li>• the orientation, the planning and the positioning on the online market</li> <li>• the targeted online communication</li> <li>• the use of social media in this context</li> </ul>	
<b>CONTENTS</b>  The digital Landscape have an important impact to crafts practitioners, to crafts businesses now and in the near future too. Businesses today are exposed to an extremely broad range of technologies, from simple websites to the emergence of a 'sharing economy' based on new emerging platforms. <ul style="list-style-type: none"> <li>- in the digital era, the online communication always must be taken in consideration when the crafts practitioners planning their practice</li> <li>- the crafts practitioners should start by identifying the structure of their digital landscape such us clients, markets and competitors</li> <li>- the analyse of the online competitors and markets help positioning on the market</li> <li>- development of the market should be a community based process which should start by learning willingness to adapt the practice to the digital communication tools</li> </ul> The unit focuses on the concept of digital landscape and the aim of this educational content is to increase the willingness of the crafts practitioners to use the digital landscape and adapt the practice to clients, competitors and market. The aspects of Digital Landscape in the competition process which must be taken into account are: <ul style="list-style-type: none"> <li>• Products and services</li> <li>• Their strengths, weaknesses</li> <li>• customers</li> <li>• strategies</li> <li>• messaging and marketing strategy</li> </ul> It will be necessary to familiarise the trainees with these aspects explaining the significance and importance of these terms theoretically, and through exercises in the offline and online space for identification of it. For example: Mapping of the Digital Landscape <ul style="list-style-type: none"> <li>- identify boundaries of the market in which you're interested</li> <li>- identify the consumer needs</li> <li>- limit the geographic scope of the analysis</li> <li>- simple statistical analysis of the price-benefit</li> <li>- identify competitors</li> </ul> Competitor profiles are by nature tailor-made, although models such as Porter's 5 Forces (see Figure below) can be used as a basis for a high level assessment of the overall competitive environment in any	

markets. (<https://www.b2binternational.com/research/methods/research-techniques/competitive->



[news-feed-analysis/](https://www.dmnews.com/customer-experience/news/13057979/rival-iq-allows-clients-to-analyze-market-landscapes)

<https://www.dmnews.com/customer-experience/news/13057979/rival-iq-allows-clients-to-analyze-market-landscapes>

## EVALUATION CRITERIA

### Questionnaires:

- For mapping digital landscape, it is important to
  - have an appropriate message
  - collect contact details
  - analyse the competitors
- For elaborate a marketing strategy must be taken in consideration
  - the craft skills
  - the products of the market
  - the strong and weak point of the competitors
- The new media
  - takes itself very seriously
  - constantly tells everyone how good and successful it is
  - is having a conversation
  - is open to all
- A website serves for
  - an exclusive club
  - promoting personal portfolios
  - analyses the market
- A newsletter must contain
  - headings
  - logos
  - interactivity
- The use of social media in the crafts sector must be
  - offline

- b. targeted  
c. ignored

**RESOURCES**

<https://www.coursehero.com/file/12855459/Tehnici-de-promovare-in-afaceri-curs-ZBUCHEA-Alexandra/>

Zbucnea, A., & Bem Neamu, R. 2015. Storytelling și branding cultural, în Pînzaru, F. (coord.), *Business storytelling: Branduri și povești* (pp. 221-248). București: Tritonic.

<https://www.tandfonline.com/doi/abs/10.1080/10580530.2017.1329997>

<https://learndigital.withgoogle.com/atelieruldigital/topic-library>

[https://www.craftscouncil.org.uk/content/files/social\\_media\\_briefing\\_note.pdf](https://www.craftscouncil.org.uk/content/files/social_media_briefing_note.pdf)

<https://www.b2binternational.com/research/methods/research-techniques/competitive-news-feed-analysis/>

<https://www.dmnews.com/customer-experience/news/13057979/rival-iq-allows-clients-to-analyze-market-landscapes>

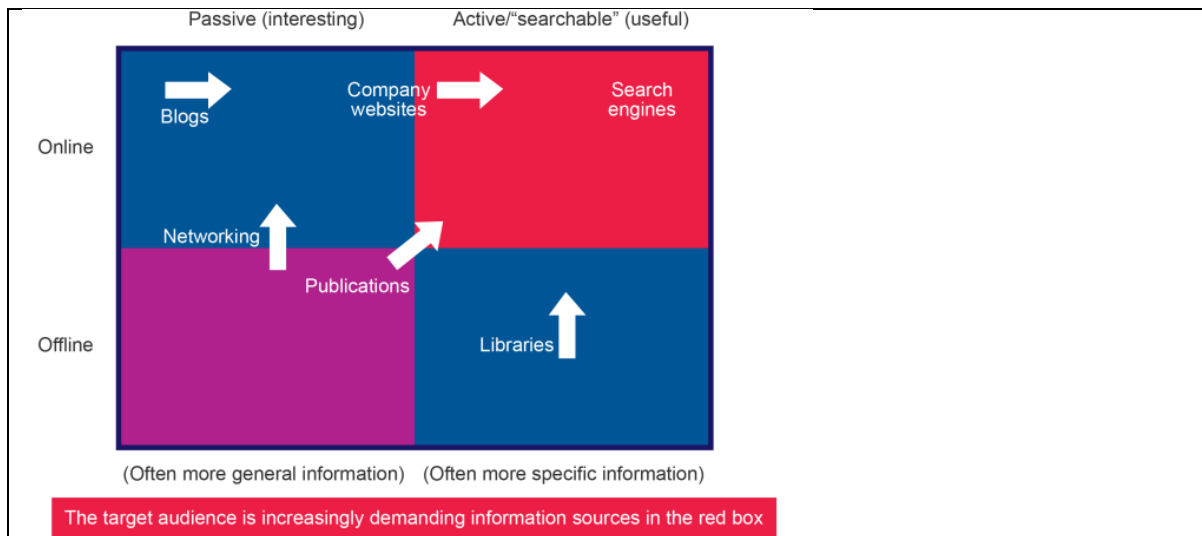
<https://www.omicsonline.org/open-access/changing-paradigms-of-media-landscape-in-the-digital-age-2165-7912.1000110.php?aid=4210>

<https://blog.chamaileon.io/how-to-write-a-newsletter-in-13-simple-steps/>

**PRODUCTS/OUTPUTS**

- Willingness to adapt the practice facing the challenges of the digital Landscape
- Compare and analyse competitors, markets
- Orientation, planning and positioning on the online market

<b>Title of Module</b> D. DIGITAL TOOLS FOR CRAFT PRACTITIONERS	
<b>Title of Submodule:</b> D.3. DIGITAL COMMUNICATION FOR CRAFT PRACTITIONERS. COMMUNITY AND PARTICIPATION	
<b>Title of Unit:</b>	(hours) 20
<b>LEARNING OBJECTIVES</b>  The learner should be able to <ul style="list-style-type: none"> <li>Identify adequate channels for customers</li> <li>Make use of customers channel</li> <li>use available channels in relation with the community, customers, etc</li> </ul>	
<b>CONTENTS</b>  <b>Recognize and use of the adequate Customer Channel</b> <ul style="list-style-type: none"> <li>- need of a database with offline and online contact details of the competitors and potential clients too</li> <li>- new relations with audiences (Interactivity), new languages (Multimedia) and a new grammar (Hypertext)</li> <li>- recognize the difference between old and new media for finding the adequate channel (<a href="https://www.omicsonline.org/open-access/changing-paradigms-of-media-landscape-in-the-digital-age-2165-7912.1000110.php?aid=4210">https://www.omicsonline.org/open-access/changing-paradigms-of-media-landscape-in-the-digital-age-2165-7912.1000110.php?aid=4210</a>)</li> </ul> <ul style="list-style-type: none"> <li>New media is having a conversation; old media is delivering a lecture</li> <li>Old media takes itself very seriously; new media has a sense of fun</li> <li>New media welcomes criticism and attempts to learn from it, getting involved in the discussion; old media sees it as an attack, goes on the defensive, and even tries to exact revenge</li> <li>Old media is establishment; new media is counter-culture</li> <li>Old media refuses to acknowledge peer publications; new media shares the link love</li> <li>Old media is an exclusive club; new media is open to all</li> <li>Old media thinks twitter is a frivolous waste of time; new media doesn't know how it managed before twitter came along</li> <li>Old media constantly tells everyone how good and successful it is; new media leaves that job to others</li> <li>Old media plays it safe and seldom gets it wrong; new media frequently gets it wrong, but apologises and carries on, regarding this to be the price paid for working closer to the edge</li> <li>Old media is so competitive about its search engine ranking that it uses underhand tactics such as 'rel=no_follow' tags on outward links, to avoid bleeding page rank; new media recognizes that sharing and collaboration are the way forward</li> <li>Old media has 10 000 twitter followers but follows just 12; new media has 10 000 twitter followers but follows 2500</li> <li>Old media are what you're accustomed to: television, radio, newspapers, magazines, etc. New media are most often associated with content that's accessible "online," which simply means that the information is available via a virtual network, the Internet being the most obvious.</li> </ul> <p>The importance of targeted messages in differentiating customer channel.</p>	



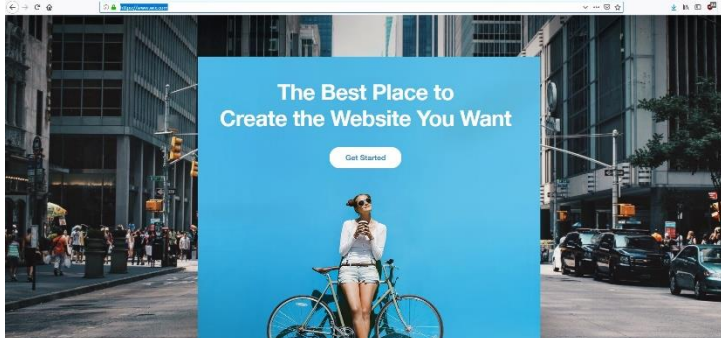
### Website

- has a definitory role in positioning on the digital landscape. The essential information which must be presented: mission – profile, portfolio, feed-back from the clients, contacts, photo and media gallery
- designing website-content
- formulating messages
- selecting works/references for portfolios

### Blog

- for a more intensive online presence,
- for sharing tips and tricks

Exercises on: <https://www.wix.com/>



### Newsletters

## EVALUATION CRITERIA

### Questionnaires:

1. For mapping digital landscape, it is important to
  - a. have an appropriate message
  - b. collect contact details
  - c. analyse the competitors
2. For elaborate a marketing strategy must be taken in consideration
  - a. the craft skills
  - b. the products of the market
  - c. the strong and week point of the competitors
3. The new media
  - a. takes itself very seriously
  - b. constantly tells everyone how good and successful it is
  - c. is having a conversation
  - d. is open to all

4. A website serves for
  - a. an exclusive club
  - b. promoting personal portfolios
  - c. analyses the market
5. A newsletter must contain
  - a. headings
  - b. logos
  - c. interactivity
6. The use of social media in the crafts sector must be
  - a. offline
  - b. targeted
  - c. ignored

#### RESOURCES

<https://www.coursehero.com/file/12855459/Tehnici-de-promovare-in-afaceri-curs-ZBUCHEA-Alexandra/>

Zbucnea, A., & Bem Neamu, R. 2015. Storytelling și branding cultural, în Pînzaru, F. (coord.), *Business storytelling: Branduri și povești* (pp. 221-248). București: Tritonic.

<https://www.tandfonline.com/doi/abs/10.1080/10580530.2017.1329997>

<https://learndigital.withgoogle.com/atelieruldigital/topic-library>

[https://www.craftscouncil.org.uk/content/files/social\\_media\\_briefing\\_note.pdf](https://www.craftscouncil.org.uk/content/files/social_media_briefing_note.pdf)

<https://www.b2binternational.com/research/methods/research-techniques/competitive-news-feed-analysis/>

<https://www.dmnews.com/customer-experience/news/13057979/rival-iq-allows-clients-to-analyze-market-landscapes>

<https://www.omicsonline.org/open-access/changing-paradigms-of-media-landscape-in-the-digital-age-2165-7912.1000110.php?aid=4210>

<https://blog.chamaileon.io/how-to-write-a-newsletter-in-13-simple-steps/>

#### PRODUCTS/OUTPUTS

- Willingness to use available channels in relation with the community, customers, etc.
  - Make use of customers channel
  - knowledge of targeted online communication
  - change in the attitude of the use of social media of crafts practitioners

#### References:

Dabbagh, N. (2005). Pedagogical models for E-Learning: A theory-based design framework. *International Journal of Technology in Teaching and Learning*, 1(1), 25-44.

Dave, R. H. (1970), *Developing and Writing Behavioural Objectives*. (R J Armstrong, ed.) Tucson, Arizona: Educational Innovators Press

Fields, P. J., Baxter, A., & Seawright, L. (2006). A constructivist approach to course design in a graduate statistics course. In *ICOTS-7 Conference Proceedings*.

Lameira, S. Curado, C. Silva, M. Duarte, T.(2015 ) *Methodological guidebook – concept of qualifications based on learning outcomes* Lisboa, Agência Nacional para a Qualificação e o Ensino Profissional, I.P.

Kennedy, D. (2006) *Writing and using learning outcomes: a practical guide*, Cork, University College Cork.

Koohang, Alex. Liz Riley, and Terry Smith. (2009). E-Learning and Constructivism: From Theory to Application. *Interdisciplinary Journal of ELearning and Learning Objects* Volume 5, 2009. Editor; Janice Whatley. Macon State College; Macon, Georgia, USA. Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into practice*, 41(4), 212-218