The Museum Digital Devices Function

Version 1.0 - July 2018

Julien Recouvreur

About the function

I have realized this Museum Digital Devices Function thanks to my expertise, to several meeting with digital and museum experts, and analyzing several digital devices from museums across the world.

The Museum Digital Devices Function is a tool detailing the necessary and importants elements in order to design an innovative - or not - digital device for a museum and its visitors. The elements listed in the function do not constitute an exhaustive list, but this tool give an insight of the most common and essential aspects for a museum digital device. The function is a very useful tool for the digital design work and for writing the design brief.

Each element of this function is named a **component**, and the digital device is made up of several components, like the global image of a mosaic and its fragments forming an harmonious work.

The components are added one to another in order to design the digital device. The components which are related to the same field/aspect of the digital device are gathered in components families or subfamilies called **units**.

The museum digital device function is applied on a « set » containing: the museum, its publics, its partners/stakeholders. Indeed, a museum digital device, even a small one, is always influenced by the museum ecosystem where it is created.

Also, the function allows to build a solid and an efficient communication process between some senders and some receivers. It is important to remind that a digital device set up in a museum space is a communication tool which delivers - and sometimes receives - , information.

The limits of this tool are the fact that it tries to categorize things and reality. When we want to design an innovative digital device, the innovative approach means going against the rules, against the common categorizations. In order to erase those limits linked to the categorization, I have added a component group named « creativity x inspiration (design components) ». As a mathematical function, this components group is applied on the design aspects of the digital device project. It details the creative approach the designers should have, and it reminds them that they have to call the components of the function into question when they feel the need.

Why did I name this tool a « function »?

Naming this tool *function* is a quite random choice. I could have called it « outline », or « method ».

The word « function », is maybe the better term that reflects the logical aspect of this tool. Indeed, the components are linked together, and have an influence on each other, as in a mathematical function.

The Museum Digital Devices Function is a really useful and helpful tool in order to create digital devices without forgetting an important aspect of the design process.

Most of all, it is an helpful tool to prepare the specifications documents: each important part is detailed, each need is analyzed thanks to the function. The main part of the components described in the function will be integrated in the specifications.

Designing a digital device for a museum thanks to this function assure to create a unique and a personalized digital tool. Indeed, even if it is universal, this tool allows to explore all the specificities of the digital project and of the museum. The function offers a refined and a complete design, and thus a unique and personalized digital device.

Description of The Museum Digital Devices Function

Design a digital device for the museum visitors and prepare the writting of the specifications.

Set: Museum x, its collections, its publics, its network and its partners/stakeholders.

Sender: Museum x ⟷ Digital device ⟷ Receiver: public x

Strategic unit

1 analysis + strategy (strategic objectives + exhibition communications objectives + digital objectives + strategic lines)

Museum-visitor communication unit

2 topic + target + message + focus + artifact-object$^{\text{object utility}}$ + scientific contents + museum-visitor communication goal + complexity + memory + contributors + playful function

Design Unit

3
- creativity x inspirations
- creative approach/concept + scenario + narration + guidance
- testing + evolution
- digital device type + multimedia contents + device + technology + software + contents structure + statistics + data + storage + copies
- emotion + communication + narration + sense + posture + movement + audience + attention level + usage time + number + accessibility + space
- style + scenography
- linking factors
- human code + digital code + instructions + help + interoperability + credits

Adjustment unit

4
- safety + usage
- economy + time + human resources + context + partners + subcontracting + maintenance + legislation + environmentalism + environment + interferences

Reflection Unit

5 impact + communications + training

Museology

evaluation

Strategic unit p.8

Direction components p.8

Museum-visitor communication unit p.9

Museum-visitor communication components p.9

Design unit p.11

Creativity and inspiration p.11

Narrative components p.11

Possibilities components p.12

Technical components p.12

Psycho-ergonomic components p. 13

Style components p. 14

Linking factors p. 15

Communications components p. 15

Adjustment unit p. 16

Usage components p. 16

Constraint components p. 16

Reflection unit p. 17

Reflection components p.17

Evaluation p. 18

Evaluation p. 18

Strategic unit

This unit describes the strategic elements that are necessary to any digital project. If a museum feels the need to develop digital devices, it is always because he has previously proceeded to a strategic analysis, even a superficial one, that has leaded to a smart approach (« I need to develop a digital device because … »).

This unit contains the direction components. Those components allow to design the strategic direction of the digital project. The direction components must be defined in first place, in order to be able to define the components of the following units.

Direction components

- **analysis:** the theoretical, economical, structural etc. observations that allow to do a state of play of the museum situation and to determine the strengths, the opportunities, the weaknesses and the threats of the institution.
- **strategy:** the corporate/global strategy which has leaded to a digital project, the strategy which influence all the museum's actions. Usually, a digital project is linked to a global strategy. E.g.: My global strategy is to become the main and the most complete Automobile Museum of France. Thus, I am gonna create a digital strategy in order to develop this global strategy. The strategy component includes the following subcomponents:
    - » ***strategic objectives:*** the political and strategic objectives of the global strategy. Often, those objectives include figures. E.g.: Increase the visits by 20% in 2019.
    - » ***exhibition communication objectives:*** the objectives regarding the way the museum communicates with the visitors within the exhibitions. They are influenced by the strategic objectives. E.g.: Communicate in an innovative way about Automobile History during 20th century.
    - » ***digital objectives:*** the global objectives of the digital project. They are influenced by the strategic objectives. E.g.: The exhibition communications objective Communicate about Automobile History during 20th century in a playful way can lead to the digital objective Develop gaming tools for my permanent exhibition about Automobile History during 20th century.
- **strategic lines:** if the global strategy is based on strategic lines, the strategic lines that are related to the digital device design.

Museum-visitor communication unit

This unit details the necessary elements related to the communicational approach between the museum and its visitors. Those elements are named *museum-visitor communication components*. The components of this unit have to be defined after the strategic unit or at the same time, but never in the first place and alone.

Museum-visitor communication components

- **topic:** the topic, the approach of the exhibition space within which the digital device is installed.
- **target:** the publics/visitors associated to the exhibition communications objectives, and to the digital device. A digital device cannot be designed if we do not know whom are its users. Indeed, the digital device must be adapted to its users, especially its contents and its ergonomic design. Thus, the target is a component which has an influence on all the following components of the function.

  It exists several tools in order to categorize museums visitors. The most common way - in France - is to categorize the visitors regarding their age and their social group (children, teenagers, young adults, adults, older persons, families etc.). Among the other tools, we can quote the visitors categorization from the American researcher John H. Falk[1]. His tool is focused on how visitors learn in a museum regarding their choices and their interests.
- **message:** the message that we want to send thanks to the digital device.
- **focus :** the precision of the topic approach:
  - » ***opening tool:*** allows to introduce the topic.s of an exhibition space, of a museum etc..
  - » ***zoom tool:*** allows to focus on an object or on a specific aspect of the topic presented in the exhibition.
  - » ***junction tool:*** allows to make a connection between two subtopics or two topics. The junction tool brings an easier and a flowing transition between two groups of information.
  - » ***ending tool:*** allows to « close » or to end an exhibition or an exhibition space. Thanks to the ending tool, the visitor can get a conclusion and can end his/her experience within the space.
- **object/artifact:** the object.s highlighted by the digital device. Is the digital device associated to one object or to several objects? Is the object in the same space than the digital device? Is the object absent? Is the real object present or is it a digital reproduction?
- **object utility:** the reason why the object is associated to the digital device. Is the object associated to the digital device in order to allow a better understanding? Is the object here in order to sanctify the interaction between the visitor.s and the digital device?
- **scientific contents:** the scientific contents/the scientific approach communicated thanks to the digital device. The scientific contents are really important. Without those contents, the device has nothing to share and to communicate.
- **museum-visitor communication goals:** the communicational approach that the museum

1. Falk, J. H., Understanding Museum Visitors Motivations and Learning.

adopts in order to realize its exhibition communications objectives.

» Get the visitor to understand a phenomenon/a process/a method.
» Get the visitor to understand a context.
» Get the visitor to understand an idea, a reflection.
» Present a topic

» Place oneself within a context.
» Detect a connection between two things (comparison, scale, link, interaction etc.).

» Interpret the topic regarding his/her vision, make the topic his/her own.
» Explore the world/the space.

» Inform the visitors about an object features.
» Inform the visitors about the museum.

» Reproduce a world/a time/an atmosphere.
» View an evolution/a change.
» View a the current state of affairs.
» Contemplate an artistic work.

» Relate a story.
» Relate the History.
» Pass down the collective memory, the remembrance of an event/a time.

» Share his/her experience as a visitor within the exhibition/the museum.

- **complexity:** the information and the message complexities. The complexity must be adapted to the visitors targeted. The complexity may be:

» ***very easy:*** a really simple information that the visitor can understand without any other knowledge about the topic and which is understandable from 3 years old.

» ***easy:*** an information that the visitor can understand without any other knowledge about the topic and which is understandable from 7 years old.

» ***medium:*** an information including some technical terms and with more details than the easy level. Understandable from 12 years old.

» ***high:*** a detailed information with accurate contextual elements. Understandable from 15 years old.

» ***expert:*** an information that requires accurate knowledges about the topic.

Understandable only by an expert or by a person passionate about the topic.

- **memory:** the remembrance/collective memory effect/function that we want to create thanks to the digital device.
- **contributors:**
  - » ***documentary contributors:*** people who bring their knowledges and their expertise in the message and contents designs, when it is necessary (e.g.: involve former fishermen in the design of a digital device related to fishing boats).
  - » ***non-documentary contributors:*** people who bring their knowledges and their expertise in the digital device design, its ergonomic design and its usages (e.g.: involve a university lab in order to design an innovative digital device).
- **playful function:** has the digital device playful functions? If yes, what kind of games are an inspiration (board games, video games etc.)? Do the digital device include easter eggs as in video games?

Design unit

This unit details all the elements directly related to the digital device design and to its usages. This unit must be completed after the two previous units. The unit contains six components families which can be completed with a random order, the components must be adjusted to each other.

Creativity and inspiration

The following component families have to be define with a creative approach. The creativity may come from specific inspirations. In the function, the creative influence is named creativity function and is written *creativity x inspiration (design unit components)*.

Narrative components

- **creative approach/concept:** the approach that we adopt in order to reach the objectives and the visitors targeted. This approach is a creative and a rational approach. It is possible to create several creative approaches or concepts, but create a lot of approaches is not recommended. The art of the strategic work is to make choices, and having a strategic approach means to give some ideas up. E.g.: The digital objective *Develop gaming tools for my permanent exhibition about Automobile History during 20th century* can lead to the creative approach *Learn by playing*.
- **scenario:** the scenario is the expected behavior of the visitor when he/she visits the museum space where the digital device is set up.
- **narration:** the narrative aspects of the message that will be delivered thanks to the digital device. The narration can be tell by a fictive character.
- **guidance:** does the digital device interface has automatic explanations or invitations to do some actions? E.g.: pop-up windows in an interface in order to entertain the user and to avoid him to leave the digital device.

Possibilities components

- **testing:** the experimental aspects of the digital device. Is the digital device designed in the scope of a testing? Is the digital device a prototype or is it a permanent installation? If the digital device is a testing, it is possible to associate several variables to all the other components.

- **evolution:** the upgradable aspects of the digital device. Will the digital be improved later? Is the digital device designed in order to stay as it is forever? Some factors can lead to design the digital device as une upgradable tool (a financing to come, new technologies or new versions of softwares to come etc.). Thus, the digital device should be designed in order to adapt to the future changes of the museum.

Technical components

- **digital device type:** the type of the digital as descrpibed in the *Topology Of Digital Devices For Museums* (**julienr.pro/typology-digital-museums**). It is possible to mix several digital device types in oder to create hybrids.

- **multimedia contents:** the digital contents stored in the digital device (photographs, videos, text, games, usage instructions etc.). Two categories can be defined:

  » possessed contents;

  » contents that have to be created.

- **device:** the required devices in order to design the digital device. Those devices may be:

  » ***sensors:*** camera, thermal imaging camera, eye-tracking technology, indoor geographical localization, microphone…

  » ***sending/receiving devices:*** wifi antennas, ethernet cables, connectors…

  » ***return devices:*** screen, hologram, virtual reality headset, headphone, speaker, sonar shower, scent diffuser, samples to smell, motor/animated installation, surface to touch, substance diffuser (air, water etc.)…

  » ***control devices:*** touch screen terminal, buttons, typer, lever, stick, joystick, gamepad, virtual reality control accessories, EEG headset (electroencephalography), motion sensors…

  » ***operation devices:*** processor (the processor power should be adapted to the contents size and quality), graphics board, players etc..

  » ***furniture:*** the furniture included to the digital device (board, bench etc.).

- **technology:** the specific technologies which are necessary or which are expected for the digital device (e.g.: Ultra HD, facial recognition, processor type etc.).

- **software:** the specific softwares that are necessary or that are expected for the digital device (operating system, application, facial recognition software etc.).

- **contents structure:**

  » ***depth (vertical structure):*** as for a website, the digital device interface may have an

architecture with several levels of depth (e.g.: a museum tab interface can present only one page with all the information, or it may have several pages/sections with different levels for the information n, n+1…).

» ***sections (horizontal structure):*** within a level (e.g.: level n+1), the different sections of information (e.g.: level n+1 > tab A, tab B, tab C etc.).

- **statistics:** the statistical functions and tools that allow to get statistics about the digital device usage (number of users per day etc.). The statistical tool can be a simple traffic counter or a more complex software.
- **data:** the data used and generated by the digital device. Those date have to be physically saved somewhere.
- **storage:** the devices/places where the digital device data are saved. The more complex is a digital device, the bigger are the data to save. It is sometime necessary to rent an online hosting in oder to get a lot of space. Thus, the museum and the digital device designers have to measure precisely the necessary space for the data.
- **copies:** is there only one version of the digital device within the museum or are there several copies of it? Sometimes, it is useful to set different copies of a same digital device in order to avoid visitors to wait too long for use the device.

Psycho-ergonomic component

- **emotion :** the emotion.s that the museum wants the visitor to feel when he/she uses the digital device.
- **communication:**

  » ***one-way communication:*** the user get an information from the digital device, but he/she does not interact with it (no buttons, no monitoring tools). Also, the visitor cannot edit or explore the information presented.

  » ***two-ways communication (interaction):*** the user get an information from the digital device, he/she can interact with it (buttons, touch screen, monitoring tools). The user can edit or explore the information presented. Two kind of two-ways interaction are possible:

    ◊ ***closed interaction:*** the user has limited possibilities in its choices in order to interact with the digital device (e.g.: « Next » button, go right/left etc.). The user cannot use his/her own words for interact with the device.

    ◊ ***open interaction:*** the user is not limited to several formats or choices in order to interact with the digital device. He/she is free to use his/her own words or his/her own format when he/she interacts with the device (e.g.: feedback testimony, comment, creation, photographs sharing, tags adding etc.).

- **sense:** sight, hearing, taste, touch, smell.
- **posture:** the visitor posture when he/she uses the digital device : standing, seated, crouching, lying, leaning etc..
- **movement :** the expected movings of the user when he/she is around the digital device. For example, people tend to turn around a rounding installation.

- **audience :** the people around the digital device and its user. The device may be installed in a closed space, out of sight from the other visitors or with a limited audience (little room etc.). Or the device may be installed in a place where all the visitors of the space can see the user using the digital device. Also, the contents explored by the user may not be visible for the audience whereas the digital device is visible for everybody (e.g.: virtual reality headsets contents).

- **niveau d'attention :** the expected level of attention of the visitor when he/she uses the digital device.

  » ***level 1 - wander:*** the visitor slowly walks through the space looking at the things around him/her. He/she is looking for an anchor point for his/her attention.

  » ***level 2 - observation:*** the visitor pays attention to an element in the museum space (object, artifact, sign etc.). He observes this element, he/she handles/touches it but he/she does not read the information associated to the element. If the element is a digital device, at level 2, the visitor observes the device or a user of the device but does not use it.

  » ***level 3 - in-depth look:*** the user reads and explores the information associated to the element/digital device (presentation, instructions, plate etc.).

  » ***niveau 4 - action/interaction :*** the visitor interacts with the device (if there is a device in the museum space).

  Note: the attention level is really linked to the posture. For example, a seated person will generally reach the levels 3 or 4 quicker than a standing person.

- **usage time:** the average usage time expected concerning the digital device usage. Generally, short usage times and usage times less than 10 minutes are recommended.

- **number:** the number of visitor simultaneously using the digital device:

  » ***one user.***

  » ***a group of users:***

    ◊ separated usage (separated individual actions) ;

    ◊ collective usage (collective action).

  » **guide accompanying:** separated or collective usage assisted by a guide or a device operator.

- **accessibility:** the publics accessibility (handicapped persons, partially sighted and blind persons, hard of hearing persons, colour-blind persons, children etc.) and the digital services accessibly (downloading on-site kiosks, off-line accessibility etc.)

- **space :** the allocated space for the digital device and its location within the visit tour. Is this space small or big? Is the device location between two different spaces of the exhibition, two topics? etc..

Style components

- **style:** the digital device style.

  » device style: shape, colour etc..

  - » contents style: shape, colour, style inspirations, typography etc..
- **scenography:** the set of the museum space where the digital device is located. Does the set nudge to a specific usage? What are the style specificities of the space, the ambiance?

Linking factors

Those components are optional, their are options, « plug-ins » that we can add to the digital device.

- **interactive:** an interaction is a reciprocal action or influence between two things. If the museum chose a two-ways interactions for the interaction component (psycho-ergonomic components), then the digital device become an interactive digital device.
- **participative:** participative means to take part, to be involved in something. The participative linking factor is defined here as all the elements of the device which allow the user/visitor to take part in the exhibition, to let his/her own print on the museum contents, the digital device contents, the exhibition or the artifacts.
- **collaborative:** the collaborative aspect refers to a phenomenon of collaboration and to a collaborative action. This linking factor is different from the participative factor which only refers to take part in something. Thus, a collaborative digital device allows the visitor to collaborate to the past or ongoing action of other persons (visitors, museum staff) or of a software. A collaborative digital device can be participative (e.g.: co-created drawing on a tab by several visitors) or cannot be participative (e.g.: several visitors actioning several sticks/buttons in order to display - and not produce - contents). The collaborative and the participative aspects can be included in the same device or not.
- **appropriation/engagement:** all the features that allow the visitor to reinterpret the museum contents, to give is own vision, to share the contents and to show them as a part of his/her identity, his/her values. The collaborative and the participative factors contribute to the appropriation process. Also, some features are efficient and easy to implement for create an appropriation by the visitors: social networks share buttons, creations tool (digital draw, digital art tools etc.).

Communications components

- **human code[2]:** the language, the tone, the jargon.
- **digital code**: files and IT formats, IT languages that code the read/received/sent data.
- **instructions**: the explanations to the user about how to use the digital device.
- **help:** the help sections of the digital device interface.
- **interoperability:** the digital codes compatibly with other devices or softwares, and the features that allow the digital device to work with other devices (e.g.: OS compatibly, possibility to communicate with other kind of devices, possibility to connect on several wifi frequencies etc.).
- **credits:** copyrights, when they are required.

2. Roman Jacobson, « Closing statements : Linguistics and Poetics », Style in langage, T.A. Sebeok, New-York, 1960.

Adjustement unit

This unit allows to adjust the Design unit components regarding to usage and context constraints. This unit must be completed after the design unit. Once this unit is completed, all the components of the Design unit have to be updated when it is necessary, this step is a feedback loop. After the feedback loop, the Reflection unit can be completed.

Usage components

- **security:** the protocols and the features implemented in order to secure the device usage.
  - » **physical safety:** secure the digital device usage (e.g.: install gates to protect a part of the device, install shock absorbers, chose shockproof materials, reinforce the endurance of a screen or a device part case etc.).
  - » **digital safety:** secure the contents and the interface of the digital device (e.g.: avoid the user to exit the application, install a parental control software etc.).

Note : the security component is linked to the usage component.

- **usage:** an object designed for humans always has several usages:
  - » **compliant:** the usage respects the designer instructions and the expected usage;
  - » **non-compliant:** the usage does not respect the designer instructions and the expected usage (e.g.: use a tab in a museum in order to go on online shop websites, use a digital screen off as a mirror). The non-compliant usages may be anticipated in order to offer a better design for the digital device. The non-compliant usages anticipation can also lead to create playful features/contents that are only visible by non-compliant users. However, it is impossible to predict all the non-compliant usages of an object.

Constraint components

- **economy:** the money available in order to create and to design the digital device (financing, sponsorship…).
- **time:** the time dictated to the work on the digital project. The shorter is this time, the less complex will be the components of the function.
- **human ressources:** the number of person assigned to work on the project. A balanced approach requires to adapt time and human ressources. The fewer will be the human ressources, the longer will be the necessary time to achieve the digital project.
- **context:** strategic, politic and administrative constraints related to the digital project (e.g.: obligation to collaborate with specific partners, obligation to highlight specific objects/artefacts/topics etc.)
- **subcontracting:**
  - » ***direct subcontracting:*** the services delivered by a subcontractor and directly linked to the digital device design (contents, devices, made to measure furniture, photo shot etc.).

  - » ***indirect subcontracting:*** the services delivered by a subcontractor and indirectly linked to the digital device design (contents translation, move collections in order to prepare the space of the digital device, paint walls in order to create a specific ambiance etc.).

- **maintenance:** the necessary maintenance in order to keep the digital device working thorough the years following its setting up.

- **legislation:** the legal constraints and laws related to the digital device design (copyrights, data collect and safety, administratives forms/statements etc.).

- **environmentalism:** the environmental duties included in some certifications possessed by the museum. This component have an influence on other components like the components related to the materials.

- **environment:** constraints related the environment where the digital device is set up (humidity, temperature, available space etc.).

- **interferences:** all the elements that can disrupt the digital device usage or disrupt the message/information comprehension (e.g.: noisy environment, sun reflection on the device screen, cultural differences/perceptions that can create a misunderstanding about an information etc.).

Reflection unit

This unit details the indirect consequences related to the digital device set up in the museum.

Reflection components

- **impact:** set up a digital device in a museum constitutes a change situation. This action changes the scenography and the appearance of the museum space, and the digital project associated to the device constitues a strategic change. Those changes have an impact on the museum employees, because their workplace and their work tools change. Thus, it is necessary to measure the impact of any digital project in order to design change management tools..

- **training:** the required training for the employees who will use or likely use the digital device.

- **communications:** the museum has to communicate about its digital project and its digital device to its publics (external and internal publics). The digital project brings a positive aspect to the museum influence and it is really important to communicate about the new digital services of the museum in order to increase the visits and the museum fame. Thus, the digital project communications has to be added to the museum communications strategy.

Evaluation

- **evaluation:** the digital device can generate qualitative and quantitative data about its usage by visitors. Those data and observations help to measure the device efficiency and allow to see if it responds to the strategic objectives. A museum always has to proceed to an evaluation of its digital device.s and then has to readjust the units of the function regarding this evaluation. The evaluation allows a continuous improvement, and it is based on key performance indicators (KPI's) that have to be defined by the museum.

The museology: a transunit field

The museology is defined as « the science or practice of organizing, arranging, and managing museums »[3].

Thus, a digital project and a digital device design are part of the museology process. Those digital works cannot be accomplished without the non-digital experts of the museum.

The strategic, museum-visitor communication and adjustment unit are related to the museology process. The reflection unit is related to communications and management fields.

3. Definition of museology in English by Oxford Dictionaries. (n.d.). Retrieved from https://en.oxforddictionaries.com/definition/museology.

The autor

Julien RECOUVREUR

E-mail: julien.recouvreur@gmx.com

Website: julienr.pro

Download *The Museum Digital Devices Function* at:
julienr.pro/museum-digital-devices-function/