

CQFD: *CoronaQuest* Forever Documented

**Case study of preservation and
archiving strategies for a Swiss
browser-based video game**

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Introduction

*"Finally, cultural policies will also need to address the archiving of video games, as an entirely digital cultural product, for the purposes of study, cultural heritage conservation and transmission."*¹

*Les jeux vidéo. Un domaine de la création culturelle en développement. Rapport du Conseil fédéral en réponse au postulat 15.3114 Jacqueline Fehr du 12.03.2015, 21 mars, 2018*²

The Federal Council's report of March 21, 2018 fully recognizes the cultural importance of video games - an everyday practice and a major industry both economically and culturally. This "cultural product", as recognized at the political level through the above-mentioned report, is supported in Switzerland by public funding in the same way as cinema or radio. However, it neither is subject to similar preservation efforts, nor has institutions whose mission is to safeguard its memory.

But time is of the essence. This digital heritage is by its very nature extremely fragile, as it is highly exposed to the obsolescence of both the devices used to operate it and the storage media³. Dematerialized games are no better protected from the passage of time, since they require the implementation of complex, long-term preservation strategies⁴. In the absence of international consensus and well-established resources for their archiving, it is necessary to reflect, sometimes experimentally, on the possibilities for preserving these objects. The *Pixelvetica* report (2021-2022), surveyed dozens of institutions, showed a clear interest among professionals in the Swiss cultural sector in the creation of specialized guides or training courses in this field. These fragile works need to be the focus of special attention and concrete case studies to develop appropriate preservation processes, in the wake of the various projects and initiatives currently being developed around the world⁵.

¹ Original quote: « Enfin, les politiques culturelles devront aussi aborder l'archivage des jeux vidéo, en tant que produit culturel entièrement numérique, à des fins d'étude, de conservation du patrimoine culturel et de transmission. »

² Federal Council, "Video games. A developing field of cultural creation. Report of the Federal Council in response to postulate 15.3114 Jacqueline Fehr of 12.03.2015," March 21, 2018, at <https://www.news.admin.ch/news/message/attachments/51747.pdf>.

³ These include both "physically" distributed game media - such as diskettes, optical disks, cartridges etc. - and servers and other storage infrastructures containing games distributed exclusively in digital form. - as well as servers and other storage infrastructures containing games distributed exclusively in digital form.

⁴ Indeed, video game creators are now in the habit of regularly updating their games, without this being synonymous with a new release.

⁵ See among other examples, the recent https://figshare.swinburne.edu.au/articles/report/Collecting_Curating_Preserving_and_Researching_Media_Arts_A_good_practice_report/26255072?file=47592206.

The present project, the first attempt at archiving a Swiss browser game, is part of this effort. This report is not intended as an academic article, but rather as an account and preservation tool, drawing on the reflections that have surrounded this work. At Memoriav's instigation, we have set ourselves the goal of producing several tools for reflection and practice - which will evolve over time and in response to feedback from the community - aimed at preservation professionals and cultural institutions.

In this report, we propose two different paths, broken down into several approaches, for preserving a video game over the long term: one based on documenting the game - in the event that a copy of it becomes inaccessible or disappears - and the other based on preserving the playability of the game itself.

We have tried to make the result as quick and easy to use as possible, but also to explore as many avenues as possible - even mentioning when it was not possible to explore them in depth, due to lack of time, so that they might inspire others.

Here are the main ideas contained in this report:

- **Documenting the game without the game:**
 - **Gathering archives:** by contacting the people who took part in the creation of the game, to obtain - whenever possible - sources that document directly (source code etc.) and indirectly (receipt of the game, emails etc.) the game's life cycle.
 - **Building up oral sources:** by meeting the key people involved in creating the game.
 - **Documentation of the game's operation and playability:** by describing the rules and flow of a game, recording a game, and making game captures.
- **Document the game with the game:**
 - **Source code preservation:** by keeping the source code in as intelligible a form as possible.
 - **Preserving the ability to recompile the game from source code:** by having various additional elements, which present their own preservation challenges.
 - **Preserving the ability to play the game:** by exploring strategies that enable long-term play.
- **Creation of a "heritage edition":** by bringing together the various documents collected and produced on a physical medium, deposited in institutions specializing in heritage issues - and ideally associated with a strategy of redundancy (multiple copies of content on different media and infrastructures) within these institutions.

We hope that these first milestones will soon lead to the implementation of a genuine strategy for the conservation of video games in Switzerland.

1. Project overview of CQFD: *CoronaQuest* Forever Documented

1.1 Origin of the project

By commissioning the [Pixelvetica pilot project \(2021-2022\)](#)⁶, the association for the preservation of Swiss audiovisual memory - Memoriav⁷ - has made it possible to produce an inventory of the presence of video games in the collections of Swiss cultural institutions and of preservation practices, as well as a series of recommendations for heritage professionals. However, the project's initial deliverables also included :

"The concrete archiving within a Swiss heritage institution of two Swiss video games of different natures."

This objective was partially achieved with the case study devoted to *Aldebaran*⁸ (1992; Paolo Baerlocher, Marc Andreoli, Fred Schaerlig), a Swiss video game rediscovered during the project. After presenting the initiatives to be undertaken to improve video game preservation, the next logical step was to implement these recommendations. Given the issues involved in video game archiving, Memoriav wanted to see a practical project in the wake of *Pixelvetica*. This is why the present project was initiated in 2024. It was completed in 2025.

1.2. Stakeholders

1.2.1. Memoriav, Association for the Preservation of Swiss Audiovisual Heritage

The Memoriav association⁹, based in Bern and founded in 1995, is a competence center for analog and digital audiovisual heritage.

Largely financed by the Swiss Confederation, "Memoriav works in a proactive, sustainable manner to preserve, valorize and ensure broad use of Switzerland's audiovisual cultural heritage". To this end, the association "network of all institutions and individuals involved and interested in this task.", and promotes audiovisual preservation skills in Switzerland through training courses and events. It is also committed to promoting access to audiovisual heritage via its memobase.ch portal.

⁶ See <https://rapport.pixelvetica.ch>.

⁷ See point 1.2.1.

⁸ See <https://swissgames.garden/games/aldebaran>.

⁹ See <https://memoriav.ch/en>.

Among other advisory and support activities, Memoriav provides financial support for various preservation projects, and explores new audiovisual preservation issues. This is how the *Pixelvetica* project¹⁰ came about, and now this *CQFD CoronaQuest Forever Documented* project led by the Swiss Video Game Archivists (SVGA) association.

1.2.2. Swiss Video Game Archivists (SVGA)

Following the findings of the *Pixelvetica* pilot project commissioned by Memoriav and published in 2022, it emerged, among other things, that "the constitution of a network of interdisciplinary skills, at the interface of archivistics, computer science, video game studies and historical sciences, seems to be necessary in order to be able to pursue the design effort - and then, where appropriate, implementation - for the preservation of video games in Switzerland"¹¹. The SVGA (Swiss Video Game Archivists) association was founded on December 17, 2022. It is made up of some former members of the *Pixelvetica* project, as well as new members from other backgrounds and institutions.

The aim of this professional association is to be open to all individuals and professionals interested in the preservation of video games in Switzerland, as well as to bring together professionals involved in video game archiving and to promote its preservation. These missions take the form of collaborations with Swiss cultural institutions and support for the development of useful resources.¹²

The project team consists of : Bastien Baumgartner (HES specialist in documentary information), Robin François (IT engineer and digital archiving), Aurore Lüscher (historian specializing in the history and aesthetics of cinema), Mathijs Roelofsen (Doctor of History, archivist and records manager) and Magalie Vetter (digital humanities and data archiving).

¹⁰ See <https://rapport.pixelvetica.ch>.

¹¹ *Sauvegarder le jeu vidéo suisse. État des lieux de la préservation du jeu vidéo en Suisse et dans le monde*, E. Bernard, R. François, S. Krichane, A. Lüscher, Y. Rochat, L. Taddei, M. Vetter, 2022, report on Memoriav's *Pixelvetica* pilot project, p.65.

¹² See <https://svga.ch/fr/>.

1.3 Project objectives

The *CQFD CoronaQuest Forever Documented* project consists of 3 deliverables, which are detailed here:

1. A heritage edition including the game archives, its documentation and an executable version of the game on optical media, in particular :
 - Collection of development archives and code.
 - Gathering of oral sources through interviews.
 - Different documentation strategies: keeping the game playable, and describing its contents in the event that it is no longer playable.
 - Documentation of the game's dependencies and execution environment.
 - The implementation of several strategies to maintain game execution.
 - Data copying onto permanent media and submission for permanent archiving.
2. This practical guide, detailing the process for archiving and documenting the game, intended for cultural institutions and heritage professionals.
3. A quick guide to good documentation practices for video game creators, based on Myriam Jouhar's HEG 2022 Master's thesis *Archivage des jeux vidéo suisses: suivi et enjeux lors de la création d'un jeu vidéo (Lausanne 1830: Histoires de registres, 2022)*¹³ . This guide is the subject of a separate publication.

¹³ See <https://sonar.rero.ch/global/documents/323062>.

2. *CoronaQuest* (2020, DNA Studios)

2.1. Game presentation

CoronaQuest was developed in the midst of the Covid-19 pandemic, over a period of ten days, to provide students in the Canton of Vaud with a fun, educational tool for learning protective measures and debriefing the period of lockdown when classes reopened in late spring 2020. The game was commissioned by the State of Vaud, and developed by DNA Studios, based in Bulle (Canton of Fribourg). It is a browser-based game, developed primarily for the official languages of the State of Vaud. However, it is available in 12 languages, some translations having been made spontaneously by teachers abroad and subsequently integrated by the developers¹⁴.

CoronaQuest is a one-person versus computer card game inspired by the free-to-play card video game *Hearthstone* (2014, Blizzard Entertainment). The player must fight against the SARS-CoV-2 virus ("Corona"), according to the cards he or she and the opponent have available, which are dealt in turn¹⁵. The game is divided into 4 leagues (difficulty levels), which define the cards available and the number of "courage points"¹⁶ of the player and Corona; the last major update including the fourth league took place on August 18, 2020.

The idea for the game was proposed on April 24, and development of the game stretched to May 11, 2020, marked by the difficulties and urgency of the period. The following tools were used to develop the game: Matomo¹⁷ for statistics, Google Drive¹⁸ for file storage, PhpStorm¹⁹ for code, and Adobe Photoshop²⁰ as a graphics tool; the source documents we received also mention the use of Affinity Designer²¹. David Hofer coded the game, while Martin Charrière was in charge of graphic design. In order to reach a wide audience, the game is distributed exclusively online, and can be played free of charge on a web browser²².

¹⁴ See our interview with David Hofer, developer and co-founder at DNA Studios, reproduced on the Heritage Edition.

¹⁵ See Appendix A, section A2.1.

¹⁶ Equivalent to normal life points.

¹⁷ Free and open source web analytics software, see <https://matomo.org/>. Source: Wikipedia, Matomo (software), [https://fr.wikipedia.org/wiki/Matomo_\(logiciel\)](https://fr.wikipedia.org/wiki/Matomo_(logiciel)).

¹⁸ Proprietary online file hosting service. In particular, it enables file sharing, see <https://drive.google.com/>. Source: Wikipedia, Google Drive, https://fr.wikipedia.org/wiki/Google_Drive.

¹⁹ Proprietary integrated development environment; editor for PHP, HTML, CSS and JavaScript, see <https://www.jetbrains.com/phpstorm/>. Source: Wikipedia, PhpStorm, <https://fr.wikipedia.org/wiki/PhpStorm>.

²⁰ Proprietary raster image editor. Computer-assisted retouching, processing and drawing software, see <https://www.adobe.com/products/photoshop.html>. Source: Wikipedia, Adobe Photoshop https://fr.wikipedia.org/wiki/Adobe_Photoshop.

²¹ We have received several documents in Affinity Designer's proprietary format. However, these may be exports from another tool. This is a graphic editor for vector images, see <https://affinity.serif.com/designer/>. Source: Wikipedia, Affinity Designer, https://fr.wikipedia.org/wiki/Affinity_Designer.

²² It can still be played at the time of writing at <https://coronaquest.game/>.

The link to the game and its presentation were to be on the desks of schoolchildren aged 6 to 15 at the start of the new school year, along with a note from State Councillor Cesla Amarelle²³ and a special card featuring the game's graphics.

The game was designed as a tool for learning and sharing experiences and fears in the face of the situation: it helped young people to learn how to take precautions (while playfully de-dramatizing the situation without provoking additional anxiety), provided an opportunity to discuss difficult topical issues or the question of "fake news"²⁴. It also reminded them of the resources they could bring to people around them²⁵ to help them deal with any difficulties they might encounter. The game was developed in close collaboration with the cantonal health authorities and validated by them. It has also been adapted to changes in directives over time²⁶.

CoronaQuest won several awards and was recommended by the WHO²⁷. Translations have been made by other teachers, notably in Brazil and Romania, to provide a pedagogical tool for their classes. The game has been re-appropriated in a variety of ways, with some teachers printing out the game to play with younger children, while one class has even produced new cards.

Preservation of this game presents challenges specific to software and audiovisual heritage (born-digital documents, intellectual property issues, preservation of source code and playability), all the more so in the case of a game requiring access to a remote server in order to be played. The limited number of places with the skills to handle the deposit and archiving of this type of object is an additional problem. There is also the question of the preservation of publicly-funded videogame works - which is not currently part of the mission of any Swiss cultural institution - particularly in view of the social and historical importance of the event to which documents.

²³ Cesla Amarelle was head of the DFJC (Département de la formation, de la jeunesse et de la culture de l'État de Vaud - currently named DEF, Département de l'enseignement et de la formation, source <https://www.irdp.ch/institut/d-1637.html>) from 2017 to 2022. This is the department from which the *CoronaQuest* game was commissioned.

²⁴ False or misleading information

²⁵ See our interview with Julien Schekter, Head of Communications, DFJC, Canton de Vaud, and his LinkedIn page as of September 21, 2024.

²⁶ https://cdn.who.int/media/docs/default-source/science-translation/case-studies-1/cs17_coronaquest.pdf?sfvrsn=fc68ce9b_4, p.2, and our interviews with Julien Schekter and David Hofer.

²⁷ "Case Study. Innovative concepts to communicate science. CoronaQuest: Using a serious game to engage schoolchildren and their families in the prevention of the disease", https://cdn.who.int/media/docs/default-source/science-translation/case-studies-1/cs17_coronaquest.pdf?sfvrsn=fc68ce9b_4.

2.2. The client: the State of Vaud

2.2.1. The State of Vaud in short

The Canton of Vaud is one of Switzerland's 26 cantons and half-cantons. The State of Vaud is made up of three authorities²⁸ :

- The Grand Council embodies the legislative power of the canton's parliament.
- The Council of State embodies the executive power of the canton.
- The Ordre Judiciaire embodies judicial power.

The State Council is made up of 7 departments, including in 2020 the DFJC²⁹, Department of Education, Youth and Culture.

2.2.2. Department of Education, Youth and Culture (DFJC)

From 2017 to 2022, the DFJC comprised the following 6 departments and directorates: compulsory education (DGEO), post-compulsory education (DGEP) and higher education (DGES), as well as cultural affairs (SERAC), specialized education and training support (SESAF) and youth protection (SPJ)³⁰.

Cesla Amarelle was the State Councilor in charge of the DFJC of the State of Vaud from 2017 to 2022³¹. It was her department that commissioned *CoronaQuest* in 2020 to accompany the reopening of classes in May.

This commission was carried out under the impetus and supervision of **Julien Schekter**, the department's Communications Delegate, who had already collaborated with DNA Studios³² in his previous job at RTS (Radio Télévision Suisse), in particular on the game *Datak*³³ (2016, DNA Studios).

Since 2018, he has been working for the State of Vaud as Head of Communications, advising the Head of Department in the fields of Digital Education, Media Education, MITIC (Media, Images, Technologies, Information, Communication) and Social Networks; at the same time, he teaches a course at the University of Fribourg on the staging of television news. He was project manager for the production of

²⁸ See <https://www.vd.ch/autorites>.

²⁹ Currently and since 2022 called DEF, Département de l'enseignement et de la formation, its services have been reorganized.

³⁰ See https://www.vd.ch/fileadmin/user_upload/organigramme_simplifie_mai_2019.pdf.

³¹ See <https://www.rts.ch/info/regions/vaud/13189726-le-grand-conseil-vaudois-prend-conge-de-quatre-conseillers-detat.html>.

³² Julien Schekter is still Head of Communications for the State of Vaud, but now for DEF.

³³ See <https://swissgames.garden/games/datak> et <https://www.dna-studios.ch/projects/Datak/>.

CoronaQuest, categorized as a "serious game"³⁴, and was kind enough to grant us an interview as part of the present CQFD project³⁵.

2.3. The development studio: DNA Studios

2.3.1. Studio history

DNA Studios was founded in Bulle (Canton of Fribourg) in 2013 by four friends wanting to create not only video games, but more broadly digital projects³⁶. The studio was formed to make the game *Antyz*³⁷ (2015, DNA Studios).

The studio currently consists of :

- **David Hofer**, who was kind enough to grant us an interview as part of this work³⁸. He is co-founder of the studio and has been a developer and game designer since completing his Bachelor's degree at the Fribourg School of Management (HEG).
- **Martin Charrière**, co-founder of the studio, designer and animator; he is a graduate electrical engineer from the École des Métiers de Fribourg.
- **Nathanaël Monney**, co-founder of the studio, technical artist in charge of concept art and 3D.
- **Ludovic Tornare**, developer and the studio's Scrum Master, holds a Swiss Federal Certificate of Competence (CFC) in electronics and a Bachelor's degree in computer engineering.
- **Antoine Débois**, in charge of content creation and communications at DNA Studios since 2017, after a Bachelor's and then a Master's degree in Literature between the Universities of Fribourg and Lausanne.

A former member and co-founder of the studio:

- **Nicolas Gachoud**, co-founder of the studio, has been a developer since his training at the École des Métiers in Fribourg and has specialized in project and business management since his training at the HEG in Fribourg. He left the studio in 2023.

2.3.2. List of works

At the time of writing, the studio has completed various projects, detailed in Appendix B, based on information available on the studio's website up to September 2024³⁹.

³⁴ See our interview with Julien Schekter, and his LinkedIn page on September 21, 2024.

³⁵ See Reproduced on the heritage edition.

³⁶ See <https://www.dna-studios.ch/le-studio/le-studio>, as well as our interviews with David Hofer, developer at and co-founder of DNA Studios, and the LinkedIn pages of those concerned on September 21, 2024. See also <https://www.lemessager.ch/2023/06/dix-bougies-pour-dna-studios.html>.

³⁷ See <https://swissgames.garden/games/antyz>.

³⁸ See Reproduced on the heritage edition.

³⁹ The DNA Studios website underwent a major update in January 2025.

3. Approaches

3.1 Thoughts on strategies

Our approach to preserving the *CoronaQuest* game is based on two main methods:

- **Document the game "without the game"**, i.e. consider documenting the game in the event that the copy disappears completely, or becomes inaccessible. Indeed, video game heritage, by its very nature, is particularly fragile and difficult to preserve over time⁴⁰. That is why we wanted to explore additional avenues of documentation adapted to this particularly delicate heritage. So we set out to gather as many contextual sources as possible from the people who worked on the creation of *CoronaQuest*, and produced documentation about the game.
- **Document the game "with the game"**, i.e. consider different strategies for keeping the game executable, and playable, for years to come.

All these documents are available in the Heritage Edition.

3.2. Documenting the game without the game

3.2.1. Archives and oral sources

3.2.1.1. Archives

Several contextual documents were collected to document the production, release and reception of the game, and even its re-appropriation:

- DNA Studios was still in possession of the game's source code files, final design files and promotional files.
- For his part, Julien Schekter sent us the pedagogical sheet, the explanatory documents distributed to classes at the start of the school year, documents and e-mail exchanges relating to the development of the game and its reception, including productions received from students. Photographs and screenshots also accompany these documents.

⁴⁰ See, for example, the *Pixelvetica* project report: <https://rapport.pixelvetica.ch>.

3.2.1.1.1. DNA Studios archives

David Hofer provided us with two sets of documents: one comprising the graphics of the game and the communication around it, and the other comprising the game's source code.

The *CoronaQuest* file supplied by David Hofer is detailed extensively in a spreadsheet contained in the Heritage Edition. Here we present the main structure and general contents.

The first set, comprising the graphics and communication elements for the game, is structured as follows:

- The "Design" master file, including game design documents, mainly visual assets, is made up of:
 - A "Board" folder, containing more than 80 .png files, as well as 2 .afdesign documents⁴¹.
 - A "Cards" folder, containing over 110 .png files⁴², sometimes redundant, 2 thumbs.db files⁴³, as well as 3 .afdesign documents.
 - A "Concepts" folder, containing 7 .jpg files, 1 .afdesign file, 1 .psd file and 1 .png file.
 - A "Menu" folder, containing about 40 .png files, 4 .jpg files, 2 .afdesign files and 1 thumbs.db file.
- The "Promotion" master folder, including documents for game communication and social networks, is made up of two subfolders:
 - A "Maps" folder, containing 6 .png files.
 - An "RS" folder, containing 7 .jpg files and 1 .afdesign file.

The second set includes the game's source code and design documents:

- A folder containing 1 .bmpr file and 1 Balsamiq mockup.
- A series of 3 PDF files which are design documents.
- A .zip file exported from their Git version management system. This constitutes the "sources" of the *CoronaQuest* game.

⁴¹ Affinity Designer, a vector graphics tool, see note 20.

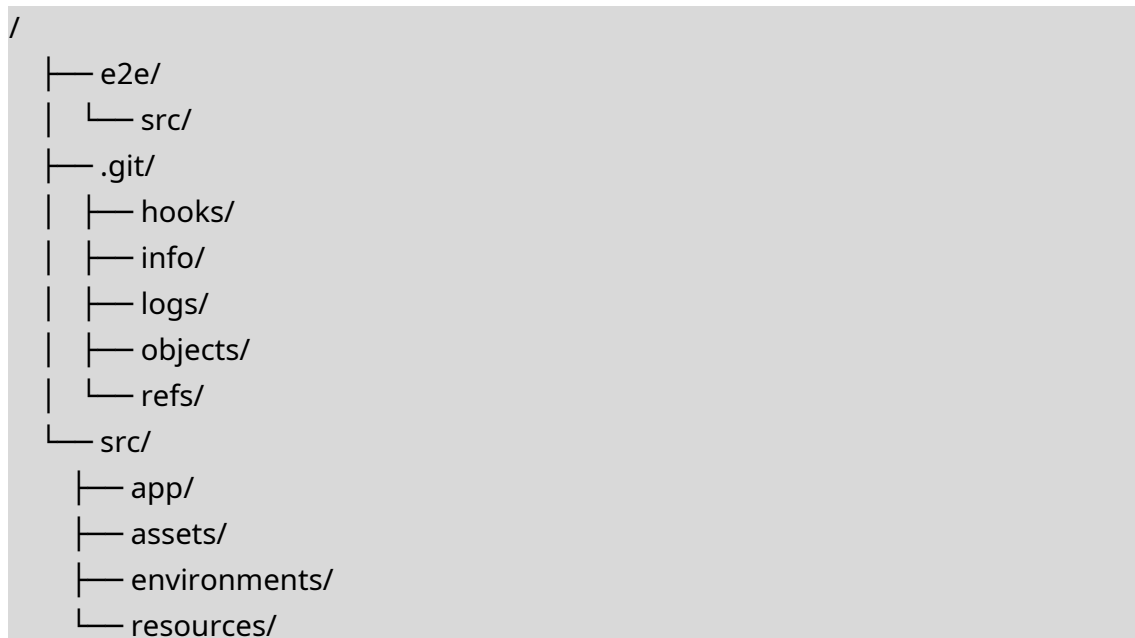
⁴² This is the enhanced version, as can be seen by the presence of the document "corona-offensive-seconde_vague.png".

⁴³ These are usually files, automatically generated by operating systems, which contain thumbnails of other image files in the same folder - in order to have thumbnails to display to users.

For more information on the amount and type of files that need to be processed to preserve the game, some statistics about these sources may be more enlightening⁴⁴:

- 342 files for a total weight of around 44 MB.
- For formats:
 - Mostly image files, which make up the game's graphic resources: PNG, JPG...
 - Text formats, which constitute the source code of the programmatic part: Typescript, JSON, Javascript, CSS.
 - Audio files that make up the game's sound resources: MP3.
 - Font files.
- None of the formats detected are proprietary or particularly difficult to open.

Here is a summary of the folder and sub-folder structure (depth limited to 3, only showing folders, not files). It gives an overview of the composition of the game's source code.



- At the root of the received folder, there is also a multitude of files, including :
 - The "angular.json" file, which is the main configuration file for an Angular project.
 - The "package.json" and "package-lock.json" files, which are mainly used to list the third-party libraries and their versions on which the Angular project depends.
 - The "tsconfig.json" and "tsconfig.app.json" files, which are TypeScript configuration files for the project that determine how the TypeScript compiler handles the files.
- The ".git" folder is the folder containing version management information related to Git software. It provides access to each development version and to the

⁴⁴ For further information, see Appendix C.

metadata of each commit⁴⁵. We will not go into detail about the structure of Git folders

- The "src" folder, which contains
 - An "app" folder containing the source code for the Angular application.
 - An "assets" folder containing all resources that are not specific to the game code, such as graphics (images) and sound resources, but also interface text resources.
- An "e2e" folder containing configuration files for end-to-end application testing.

3.2.1.1.2. Julien Schekter's archives (State of Vaud)

Julien Schekter was also kind enough to provide a series of documents testifying to the game's conception. In particular, he drew on his conversation history (WhatsApp) to extract photos, screenshots and conversations about *CoronaQuest*, as well as documents testifying to the promotion and reception of the game in the classroom. We were able to process 212 files in 8 folders and sub-folders.

The parent folder "ARCHIVES pour SVGA" contains 7 folders and 16 files:

- A "Whatsapp Julien Schekter - David Hofer" folder containing :
 - 89 files documenting exchanges between Julien Schekter and David Hofer on WhatsApp (export of the conversation, intermediate images of the game, photos, etc.) in .jpg, .txt, .mp4 and .db format.
- A folder "Fichiers partagées google de création de jeu et mails clés" containing :
 - 14 files, comprising mainly work documents and internal communications, in .msg, .txt and .docx format.
- A "Archives mail CoronaQuest" folder containing :
 - 74 files, extracted from Julien Schekter's e-mails as .msg files.
- A "Photos en classe de Coppet" folder containing :
 - 6 files showing the use of the game in the classroom, in .png and .db format.
- An "ITSEC 2021" folder containing :
 - 3 files - photos - of the event, in .jpg format.
- An "Vieille images de cartes" folder containing :
 - an "Old concepts" folder containing :
 - 7 files representing older versions of the maps, in .jpg and .db formats.
- An "ECGBL 2021" folder containing :
 - 3 files showing the event (European Conference on Games Based Learning), in .png, .jpg and .exe format.
- 16 files containing game presentation texts, associated teaching sheets, a few statistics and some working documents, divided between .docx and .pdf.

⁴⁵ Action of registering a new version of a file on a version control system.

A complete inventory of all documents supplied is included in the heritage edition of the project. The original versions of the files are also included in the edition, along with a converted version in a format compatible with archiving standards if required.

3.2.1.2. Oral sources

To document the development and reception of the game, we conducted two semi-structured interviews:

- one with David Hofer, *CoronaQuest* developer and co-founder of DNA Studios,
- the other with Julien Schekter, who initiated the project for the State of Vaud.

Questions focused on the background of the speakers, the history of the game's development and its reception. The audio of the interviews was recorded, then transcribed using Corv⁴⁶, the University of Lausanne's institutional tool for document transcription. These interviews are available in the heritage edition of this project.

3.2.2. Game description

We have opted here for two ways of documenting the game through its description: textual documentation of the game's playability and rules, followed by video documentation of a played game and screenshots of the game's graphical elements.

All this documentation is available on the heritage edition produced as part of this project, and is summarized in the following two sub-chapters.

3.2.2.1. Gameplay and rules documentation

This detailed work, presented in Appendix A, is structured as follows: firstly, it introduces *CoronaQuest*'s menus and functions, both on the home screen and during a game, then explains the game rules and how a game is played. The various cards are then described in detail, with graphs showing attack points, courage points, energy costs and card-specific effects. Finally, a chart summarizing the effectiveness of each player card against each Corona card rounds off the documentation.

⁴⁶ See <https://corv.unil.ch/>.

3.2.2.2. Documentation of a game played and its graphics

Interactions between the player and the game environment are fundamentally visual. To facilitate their visualization by readers, the addition of video and screen captures to written descriptions is essential. The aim of this part of the project is not simply to provide illustrative images of the game, but to offer documents that enable the reader to understand how the game mechanics work from start to finish. The focus was on defining game sequences in advance and establishing metadata.

The package consists of 8 videos, 8 screenshots, 2 metadata files and a Python script, for a total weight of around 7.3 GB. Formats suitable for long-term preservation, .png for images and .mkv⁴⁷ for videos, provide lossless recording quality. Videos were captured using OBS software⁴⁸ directly in .mkv format. The game sequences were categorized as follows:

- Videos
 - A video of a typical game and 3 videos of variations in game mechanics.
 - A whole game: choose a card from your hand and place it in the playing arena; play, play a defense, play an improvement, give up a defense, win the game.
 - Playing for the first time.
 - Losing a match.
 - Opening the menu during the match.
 - 4 interaction videos from the main menu.
 - Consulting the cards in the deck.
 - Activating and deactivating game sound.
 - Seeing the game's "About" page.
 - Changing the language of the game.

⁴⁷ FFv1 (v3) codec, FLAC sound.

⁴⁸ Open Broadcaster Software, Version 30.1.2 (64 bits). See <https://obsproject.com/>.

- Screenshots
 - 4 screenshots of the main menu, "About" page, language selection and deck details respectively.
 - 1 screenshot of the league selection menu.
 - 3 screenshots of the game arena and internal menus (main and options).

Metadata relating to screenshots (document title, creator, contributor, date, description, format, type) are based on the Dublin Core standard and stored in a .csv file to guarantee their assimilation by other archiving or bibliographic systems. The Python script used converts the .csv file into a .ttl format⁴⁹. This choice is primarily an example, as other formats (JSON, XML, etc.) may also be chosen.

The time required to capture the various elements is around ten hours, and does not require any specialized hardware (apart from the computer to run the game). Configuring OBS and converting formats requires basic computer skills. This approach makes it possible to produce documents that are essential to understanding how the game works, without requiring significant resources.

3.3. Documenting the game with the game

3.3.1. General considerations

The future ability to run a video game does not depend solely on access to its source code or to a compiled version of it. In fact, the software and hardware environment has a major impact on executability - the ability to run the game - notably through :

- For interpreted languages, the interpreter⁵⁰. As *CoronaQuest* is a browser game, its executability depends on several interpreters brought together in the **web browser**, which is made up of the following elements:
 - An HTTP client, used to converse with the HTTP server to obtain the various resources to be interpreted.
 - An HTML interpreter
 - A CSS interpreter
 - A JavaScript compiler/interpreter⁵¹.

⁴⁹ The .ttl format contains information in RDF templates for export to databases. See <https://www.w3.org/TR/turtle/>.

⁵⁰ "An interpreter is a tool whose task is to analyze, translate and execute programs written in a computer language. [...] An interpreter differs from a compiler in that it performs the analysis and translation required to execute a given program not once and for all, but each time the program is executed. Execution thus requires not only the program, but also the corresponding interpreter." Source: Wikipedia, Interprète (informatique), see. [https://fr.wikipedia.org/wiki/Interpr%C3%A8te_\(informatique\)](https://fr.wikipedia.org/wiki/Interpr%C3%A8te_(informatique)).

⁵¹ "In computing, a compiler is a program that transforms source code into object code. Generally, source code is written in a programming language (the source language), which has a high level of abstraction and is easily understood by humans. Object code is generally written in a lower-level language (called the target language), such as an assembly or machine language, to create a machine-executable program." Source: Wikipedia, Compiler, see <https://fr.wikipedia.org/wiki/Compilateur>.

In the case of the CQFD project, we have a complete dependency on the web browser. And the variability between the different existing browsers is well known, but also the temporal variability and evolution of the fundamental web languages.

- For games with online components or web games, the server-side software is an important dependency. It is often not an accessible or shared component, unlike the client code, which is in the shared game. This is what makes the preservation of games with this type of component so complex.

In the case of *CoronaQuest*, the server part is very limited: it is in charge of supplying the files requested by the client (web browser) and is a classic HTTP server.

- **The operating system:** video games are generally compiled for the Windows operating system and for proprietary systems specific to the various game consoles of the moment. However, emulation layers such as Wine⁵² make it increasingly possible to run games on other operating systems such as Linux.

In the case of CQFD, the game is not actually compiled. *CoronaQuest* is therefore not so much dependent on the operating system as on the HTTP server and the browser. However, these two elements are themselves dependent on the operating system. Therefore, we offer an Electron version⁵³ ("all-in-one" package, which includes the distribution version of the game code, a Chrome browser and a nodejs HTTP server) which is highly dependent on the operating system.

- **Hardware:** several hardware elements can have a significant impact on the ability to run a video game or interact with it. There are, of course, the components of the computing machine that will run the game, such as the computer or console, but also the various input peripherals (e.g. joysticks, buttons, touch screen...) or output peripherals (e.g. screens, VR headsets...). It can also include certain elements of the machine, such as a graphics card or processor architecture. Most video games today are distributed for the various current consoles, for the PC platform (i.e., x64 architecture) or for mobile platforms (iOS/Android with ARM architecture).

In the case of *CoronaQuest*, we are dealing with an in-browser game, which allows for broad compatibility, as browsers are software packages present on many architectures. In fact, as soon as it was released, the game could be played both with a browser on a computer (most certainly on x64 architecture) and on iOS or Android mobile devices (generally on ARM architecture). Furthermore, the architecture of the server side (most certainly x64) has no impact on the ability of client browsers to load and launch the game, as long as the HTTP server and browser use a common version of the protocol.

⁵² See <https://www.winehq.org/>. "Wine is free software that allows software designed natively for Windows to be used with other operating systems (OS) such as Linux, FreeBSD or macOS." Source: Wikipedia, Wine, see <https://fr.wikipedia.org/wiki/Wine>.

⁵³ See Section 3.3.2.5 Strategy 5.

3.3.2. Preservation strategies

The version delivered contained only the source code, with no dependencies⁵⁴. The source code is not directly "distributable" or playable. It is necessary to create a distribution version. This process, although technically different, is similar to compilation (the process of creating binary files from source code).

In the case of a web application, the distribution version remains non-binary (except for graphics and sound resources), but certain optimization and "minification"⁵⁵ processes sometimes make the result difficult to read.

So it is a good idea to keep both the source code before compilation, to simplify reading and analysis, and a version after compilation, as this is the version that we will be able to make playable.

It should also be noted that the digital archives deposited by DNA Studios do not contain the dependencies, i.e. the various libraries required for compilation. Nor do they include the tools required for compilation. Fortunately, these elements are documented and still available online at the time of writing (October 2024).

We were therefore able to download both the dependencies and the compilation tools, enabling us to compile a version of the game. We also consider that these elements, which are essential for compilation, should be part of one of the packages to be archived.

In the light of this information, we can see 7 different strategies, which we describe in more detail below.

Within these 7 strategies, we can already distinguish three main categories:

- **Preservation of source code:** the aim here is to keep the source code in as intelligible a form as possible, so that it can be studied and understood, and eventually reused.
- **Preserving the ability to recompile the game from source code:** successfully recompiling the game requires various additional elements, which present their own preservation challenges.
- **Preserving the ability to play the game:** here, we are looking at strategies to enable people to play the game in the long term.

For the strategies we were able to explore during this project, details of the operations are documented in Appendix C.

⁵⁴ A software dependency is another program, library or module required for the software to function properly. When software uses external functionality or resources that it does not directly contain, it depends on these components to perform certain tasks. If a dependency is missing or incompatible, this can lead to errors or prevent the software from working properly.

⁵⁵ "In programming, minify means to reduce the size of code. It is a process widely used in web programming to reduce the size of a program to be downloaded from a server and thus reduce network congestion." Source: Wikipedia, Minification, see <https://fr.wikipedia.org/wiki/Minification>.

3.3.2.1. Strategy 1: Source code preservation

Here, we are talking about the strategy of keeping what we have received unaltered, i.e. the game's "uncompiled" source code, without its dependencies and without any compilation tools.

In order to obtain a playable version of the game, it will be necessary in the future to retrieve the dependencies and compilation tools, then compile the game and find a compatible HTTP server and browser. All these elements may prove difficult to obtain in the future, so this strategy does not seem sufficient to us.

Note that the game uses resources that are not present here:

- A call is made to the URL "https://stats.toutes1histoire.ch/" to generate statistics with the Matomo/Piwik tool⁵⁶;
- A call is made to a resource which must be located at "/assets/stats.json" when the game is running. This JSON file contains statistics on the number of games won and lost. This file is not present in the source code, and its absence from the game could cause problems. We specify its format in the appendix⁵⁷.

It is also possible to port a game (adapting it from one system to another) to other platforms in the future, thanks to this source code.

Thanks to the .git folder from the version management system, we can access the entire version history, enabling us to see the evolution of code and resources, including any deletions that may have been made. Further details can be found in the appendices.

In heritage edition that accompanies this report, there is a 310_Strategie-1 folder:

- The original zip file from DNA Studios ;
- A "CoronaQuest_Sources" folder, the result of decompressing the zip file above.
- A "commits"⁵⁸ folder, which contains one folder for each version of the source code (details in the appendix).
- An md5sum.md5 file to check the integrity of all files in folder S1, corresponding to strategy 1.

This batch of data corresponding to strategy 1 is of course much larger than the initial delivery, mostly because we have recreated one version per commit from the information in the .git folder.

⁵⁶ Matomo is Piwik's successor.

⁵⁷ See Appendix C.

⁵⁸ Action of registering a new version of a file on a version control system.

3.3.2.2. Strategy 2: Preservation of source code and necessary libraries

We add here, to strategy 1, the dependencies required by the source code to be compiled. A list of dependencies is often included in source files, but this will depend on the development tools and language used.

In the case of this project, which is based on the Angular framework⁵⁹ and Typescript language, as well as the Node.js language development tools, in particular the npm package and dependency management tool, the package.json and package-lock.json files provide us with a list of the names and versions of the required libraries.

We installed the npm tool on our Linux machine, then used this tool to download the 873 dependencies of the latest version of the source code. When we analyzed the package.json file, we found 4 versions of the file, indicating that the dependencies or their versions had changed during the game's development. We have only downloaded the dependencies for the latest version of the code.

In the heritage edition that accompanies this report, there is a 320_Strategie-2 folder:

- A "CoronaQuest_Sources" folder, containing the sources and which, compared with strategy 1, contains a "node_modules" folder with all the dependencies.
- An md5sum.md5 file to check the integrity of all files in folder S2, corresponding to strategy 2

3.3.2.3. Strategy 3: Preserving the compilation environment

We are adding compilation tools to strategy 2 here. As compilation tools are themselves software, they are also dependent on the operating system and platform, so their durability is not really guaranteed.

More concretely, we installed Node.js v18 using the nvm tool and the Angular CLI command-line tool using npm on our Linux machine. As we had to recreate a build environment for strategy 4, we detail the steps we followed in the appendix.

Although we did not create it, preserving the build environment would require preserving the operating system through a virtual machine image or a customized LiveCD.

⁵⁹ "In computer programming, a framework (also called software infrastructure, development infrastructure, development environment, application foundation, application framework or framework) is a coherent set of structural software components that is used to create the foundation as well as the outline of all or part of a piece of software, i.e. a software architecture." Source: Wikipedia, Framework, see <https://fr.wikipedia.org/wiki/Framework>.

3.3.2.4. Strategy 4: Preserving a compiled version of the game

For this strategy, we are concentrating on a compiled version of the game, which is directly usable by a compatible HTTP server and browser. For this strategy, the CQFD project team had to obtain all the dependencies and tools needed to compile the source code. It should also be noted that reading the code becomes more complex after compilation.

With the game's source code and resources, dependencies and compilation tools in our possession, we were able to use the "ng build" command to create a folder with the game's distribution version. Details of these operations can be found in the appendices.

In the heritage edition that accompanies this report, there is a 340_Strategie-4 folder:

- A "CoronaQuest_Sources" folder, which corresponds to what we already had for strategy 2.
- A "dist" folder of around 36 MB containing the distribution version of the game, which requires an HTTP server to be accessible via a web browser.
- A md5sum.md5 file to check the integrity of all files in the S4 folder corresponding to strategy 4.

Note that at the root of the "dist" folder, we provide a file called "HTTPServerCQFD.py", which is a small HTTP server configured to host the distribution version.

3.3.2.5. Strategy 5: All-in-one Electron application

Since there is no guarantee that it will be easy to find a compatible HTTP server and browser in the future, the approach here is to combine the browser, HTTP server and source code in a single package. The result depends on the operating system and architecture. To apply this strategy to the project, we decided to transform the game into an Electron⁶⁰ application, thus creating an "all-in-one" application. Indeed, the distribution version of the game is combined with a Chrome browser and a node.js HTTP server (as well as all the necessary dependencies).

Nevertheless, in order to make *CoronaQuest* work as an Electron application, we had to make a number of minor adaptations to the source code, mainly path modifications to access resources (images, sounds), as the way of accessing them seems to be different for Electron applications. Of course, we also had to add the necessary dependencies to generate the Electron application.

⁶⁰"Electron is an environment for developing cross-platform desktop applications using web technologies (JavaScript, HTML and CSS)." Source: Wikipedia, Electron (framework), see [https://fr.wikipedia.org/wiki/Electron_\(framework\)](https://fr.wikipedia.org/wiki/Electron_(framework)).

In the heritage edition that accompanies this report, there is a 350_Strategie-5 folder:

- A "CoronaQuest_Sources" folder, which corresponds to what we already had for strategy 4.
- Several files corresponding to Electron versions of CoronaQuest, for various platforms and processor architectures.
- A md5sum.md5 file to check the integrity of all files in the S4 folder corresponding to strategy 4.

3.3.2.6. Strategy 6: LiveCD or x64 virtual machine

Given that many elements can depend on the operating system to function, we believe that a strategy that integrates an operating system can enable longer-term playability.

For this strategy, the vision would be :

- Integrate an operating system, probably derived from Linux because it is more practical for us to create this kind of strategy;
- Inside this Linux operating system, we could place all the compilation tools, source code and dependencies, as well as an HTTP server and web browser. This approach would provide almost everything needed to explore, compile and run the game.
- This strategy would depend on the processor architecture⁶¹ we choose. At the time of writing (October 2024), the dominant microcomputer architecture is still x64.

There are several approaches to creating this type of device:

- Customize a disk image (e.g. ISO) of a LiveCD⁶² Linux to include the elements we need. This image could then be burned to optical media or written to other removable media. This medium could then be used to boot a computer with the entire environment. The disk image could also be distributed in this form for other uses. This approach can be a little complex, especially as the software drivers for the hardware are likely to become partly obsolete and render the approach partly obsolete.

⁶¹ "An external processor architecture or instruction set architecture (ISA), or simply (processor) architecture is the functional specification of a processor, from the point of view of the machine language programmer." Source: Wikipedia, Processor architecture, see https://fr.wikipedia.org/wiki/Architecture_de_processeur.

⁶² "A Live CD is a CD that contains an executable operating system without installation, which is launched when the computer starts up. By extension, live CD refers to an operating system present on an external bootable medium. Typical storage media are CD, DVD and USB stick." Source: Wikipedia, Live CD, see https://fr.wikipedia.org/wiki/Live_CD.

- Set up a x64 virtual machine⁶³ in which we would install everything we want, then create an image of this virtual machine so that it can be reused in the future with a hypervisor⁶⁴. This approach is potentially simpler to do than the LiveCD disk image customization approach, especially as virtual machine hardware is more stable over time.

Time constraints prevented us from exploring this strategy in detail.

3.3.2.7. Strategy 7: Non-x64 virtual machine

In order to be as free as possible from x86/x64 architecture and specific hardware, it would be possible to image a VM for another architecture (ARM, RISC-V). ARM is an increasingly popular architecture, as it is now used in almost all smartphones and the latest generations of Apple microcomputers. To achieve a strategy compatible with future architecture evolutions, it may be advisable not to focus solely on the current dominant architecture.

As with strategy 6, it is possible to consider the possibility of customizing a LiveCD disk image, or moving towards a virtual machine image.

Time constraints prevented us from exploring this strategy in detail.

⁶³ "In computing, a virtual machine (VM) is a virtualization or emulation of a computing device created by emulation software or instantiated on a hypervisor. Emulation software simulates the presence of hardware and software resources such as memory, processor, hard disk and even operating system and drivers, enabling programs to be run under the same conditions as those on the simulated machine." Source: Wikipedia, Virtual machine, see https://fr.wikipedia.org/wiki/Machine_virtuelle.

⁶⁴ "A hypervisor is a virtualization platform that allows multiple operating systems to run in parallel in a single physical machine." Source: Wikipedia, Hypervisor, see <https://fr.wikipedia.org/wiki/Hyperviseur>.

4. Heritage Edition

4.1. Contents

The heritage edition is intended to be deposited in Swiss cultural institutions specializing in heritage preservation issues. The definitive list of deposit locations has not yet been finalized, as discussions are still in progress with the institutions contacted.

The tree structure of the files contained in the Heritage Edition includes a naming convention consisting of a prefix, in the form of numbers. This prefix reflects the position of the document, or folder, in the tree structure, so that it can be quickly located among all the documents. For example, folder 200 has two sub-folders (210 and 220), with folder 221 corresponding to the third level of depth in the branch.

The tree structure is presented as follows:

```
├─ 100_Archives
|   ├── 110_Archives-DNA
|   |   ├── 111_Versement-1_DOCS DAVID HOFER 13 fev 2024
|   |   └─ 112_Versement-2_Sources_Swisstransfer_DNA
|   ├── 120-Archives-Schekter
|   |   └─ 121_ARCHIVES pour SVGA
|   └─ 130_Conversions
├─ 200_Documentation
|   ├── 210_Entretiens
|   └─ 220_Videos-Images
├─ 300_Jeu
|   ├── 310_Strategie-1
|   ├── 320_Strategie-2
|   ├── 330_Strategie-3
|   ├── 340_Strategie-4
|   ├── 350_Strategie-5
|   ├── 360_Strategie-6
|   └─ 370_Strategie-7
└─ 400_Rapport-Livrables
```

4.2 Realization

4.2.1. Choice of medium

To produce the heritage edition, we considered the most sustainable ways of transmitting the data collected and produced during the project.

Although we can transmit these data via the Internet to institutions that might be interested, we also wanted to publish them on a physical medium, in order to explore different ways of preserving the data.

When considering the medium, we opted for the following criteria:

- Substrate stability ;
- Current accessibility of recorders for support ;
- Current and near-future availability of readers for the medium.

The media available to us were as follows:

- Blu-ray optical discs ;
- SSD/USB key/memory card ;
- Mechanical hard disk, LTO magnetic tape.

We excluded flash memories (SSDs, USB sticks, memory cards), as it has now been established that when powered down, data is at risk for as little as 5 years. This did not meet our stability criteria.

The mechanical hard disk seemed to us to be a solution that was both more expensive and less accessible than other alternatives.

We have also excluded LTO tapes, which require professional equipment. Although present in many heritage institutions, LTO drives and tapes are niche and not mainstream equipment. Their long-term availability depends heavily on institutions' ability to maintain functional drives, as well as having the necessary software, procedures and skills.

In view of its wide distribution, which means we can expect to have better access to a player in the near future, and its stability and accessibility, we have chosen to distribute our physical heritage edition on BD-R Blu-ray M-Discs, which we will burn ourselves using a commercially available burner.

We are well aware that this mass-market medium, used in particular for the physical distribution of video games and films, is losing ground. The recent announcement by SONY's Japanese branch⁶⁵ that it will no longer be selling recordable optical media is a cause for concern. This announcement only concerns recordable media, and not "pressed" media such as those used to distribute video games and films. Blu-ray players will continue to be manufactured and made available to the general public.

⁶⁵ See <https://www.sony.jp/rec-media/info2/20250123.html> (content in Japanese).

Nevertheless, both Blu-ray and LTO media need to be monitored by institutions and digital archiving professionals, to ensure the readability of these media or their successors in the future.

4.2.2. Redundancy strategy

To guarantee the best possible readability of data in the future, we have chosen to implement data redundancy at several levels:

- **Several identical media:** our physical edition will be burned onto several Blu-rays, which will be delivered at the same time. This will enable the institution to own several supports and to consider, in the event of one of the supports being unreadable, to use another one. It will also offer the possibility, in the event of certain parts of a disc being unreadable, of hoping to be able to read those parts on another medium.
- **Multiple copies on the same media:** the total size of the data allows us to put multiple copies of the same data on the optical media. This redundancy means that, in the event of unreadable sectors, one of the multiple copies can be read on the same medium.
- **Error correction files:** using the Parchive tool⁶⁶, we generate .par2 files for each file. These par2 files are used to check file integrity and correct any errors.

Through these three redundancy mechanisms, we provide multiple ways of preventing data corruption that could occur in the event of damage or natural degradation of physical media.

Nevertheless, it should be noted that the risk of not having a reader to read these media is significant. We therefore insist on the follow-up that institutions should give to this repository and others of a similar nature to come, by rapidly equipping themselves with numerous readers before the end of their production. We need to guarantee the readability of heritage publishing over time, as well as that of the many audiovisual productions currently distributed on these media.

This is why we also insist on the need for in-house duplication of our work wherever possible. All the precautions we have taken to guarantee the readability and integrity of the data on our heritage publishing media are no substitute for long-term digital archiving, whether to guarantee readability on new storage media (hard disk, LTO) or the intelligibility of digital files. This process of planning digital preservation will be part of the implementation of the OAIS model, which will enable us to monitor the life cycle of IT technologies and infrastructures, as well as file formats.

As far as equipment is concerned, we call for the establishment of a Swiss national network to guarantee access to reading equipment for current and past computer media, as well as the development of skills and procedures for the use and maintenance of these devices.

⁶⁶ File format for rebuilding damaged files, see <https://parchive.github.io/>.

Conclusion

The success of this project - and the creation of the Swiss Video Game Archivists association - are in line with the conclusions of the *Pixelvetica* report. The SVGA association was formed in response to the desire for a network of multi-disciplinary skills to address the many technical challenges and lack of resources in the field of video game preservation. The present report is therefore a first attempt at multidisciplinary exploration in this field, aimed at strengthening the foundations of future processes.

The *Pixelvetica* report concluded that Switzerland has all the resources it needs to take on the preservation of this type of object, and the present project is proof of this. Preservation initiatives do not necessarily require complex infrastructures or substantial resources. There are many ways of doing this - from documenting the object to preserving its playability. We hope that this project will highlight the variety of possible solutions, some of which are already part of the range of skills - archiving, documentary information, conservation - and missions of various cultural institutions in the country.

To take up the categorization of recommendations made by *Pixelvetica* members, it is clear that the situation is evolving positively at the level of professionals and cantonal institutions. However, a gap remains at the level of federal institutions. A consistent national heritage policy could raise the stakes and multiply concrete results. This lack of positioning with regard to these new audiovisual objects is all the more striking given that the cultural importance of video games and their preservation are no longer debated since the conclusions of the report *Les jeux vidéo. Un domaine de la création culturelle en développement* of 2018⁶⁷. To date, video game creation is financially supported by public funds⁶⁸, like its counterparts in cinema or photography, without a national preservation policy having been defined.

The memory of Swiss creation within one of the world's largest cultural industries is doomed to oblivion if all efforts are based on non-systemic initiatives. However, we have observed that players in the field (video game creators and heritage professionals) are taking an interest in this issue. The time is right to support this awareness with larger-scale initiatives. These issues are all the more pressing given the many challenges involved in developing preservation strategies adapted to all the complexities of the video game object.

The case study chosen for this project remains relatively modest. It is a short game, with a reduced number of components, designed for the general public. As this is a game financed by public funds, created for educational mediation and public utility purposes, we have received a positive and enthusiastic response to our project from the authorities, and from those involved in the game's development. These

⁶⁷ Federal Council, "Les jeux vidéo. Un domaine de la création culturelle en développement. Rapport du Conseil fédéral en réponse au postulat 15.3114 Jacqueline Fehr du 12.03.2015" March 21, 2018, at <https://www.news.admin.ch/news/message/attachments/51747.pdf>.

⁶⁸ By the Swiss public foundation Pro Helvetia, for example.

characteristics are rare in the vast majority of commercially-oriented production, with the challenges this represents for their archiving.

The difficulties, at every stage, would have been even greater had we chosen a "AAA" game⁶⁹. Indeed, the legal framework surrounding intellectual property and video game distribution rights remains at best vague, and at worst inimical to preservation initiatives - with the exception of the case where a restrictive patrimonial policy is in force⁷⁰. In most cases, there are no legal constraints to circumvent this. On the technical side, these games are very long and contain thousands of components to be documented. We were able to carry out a relatively exhaustive study of *CoronaQuest*, due to its more modest scale. It is a sort of reduced model of the overall task still to be accomplished. Other measures and processes are needed to deal with the preservation of a game as a whole, and in all its forms.

In the future, therefore, it will be necessary to continue exploring the avenues opened up by this report, particularly with regard to more complex games, for which this exhaustive approach should be questioned. How can we organize the sorting and creation of an archive and documentation for such a game? How can resource- and time-efficient processes be put in place? How can we reconcile the various legal issues, and put in place a systemic preservation policy for such a varied object? We still have a long way to go. We hope and pray that a national structure and financial resources will be put in place to support this effort on a long-term, collective basis.

⁶⁹ "In the video game industry, AAA [...] is a jargon term used to classify video games with the highest development and promotional budgets. Gamers and critics alike expect a title considered "AAA" to be a high-quality game, or one of the best-selling games of the year." Source: Wikipedia, AAA (video game), see [https://fr.wikipedia.org/wiki/AAA_\(jeu_vidéo\)](https://fr.wikipedia.org/wiki/AAA_(jeu_vid%C3%A9o)).

⁷⁰ See the case of the Bibliothèque nationale de France in Paris and its legal deposit of multimedia documents covering video games. See <https://www.bnf.fr/fr/les-jeux-video-la-bnf>.

References for further reading

For Switzerland

BERNARD Éléonore, FRANÇOIS Robin, KRICHANE Selim, LÜSCHER Aurore, ROCHAT Yannick, TADDEI Lucas, VETTER Magalie, *Sauvegarder le jeu vidéo suisse. État des lieux de la préservation du jeu vidéo en Suisse et dans le monde*, report from Memoriav's Pixelvetica pilot project, 2022. Link: [DOI:10.5281/zenodo.15388727](https://doi.org/10.5281/zenodo.15388727)
<https://rapport.pixelvetica.ch>

CONSEIL FÉDÉRAL, *Video games. A developing field of cultural creation. Report of the Federal Council in response to postulate 15.3114 Jacqueline Fehr of 12.03.2015*, March 21, 2018. Link: <https://www.news.admin.ch/news/message/attachments/51747.pdf>

JAVET David and PELLET Matthieu, "Switzerland" Mark J. P. Wolf (ed.), *Video Games around the World*, Cambridge, MIT Press, 2015, pp. 535-543. ISBN: 9780262527163

JAVET David and ROCHAT Yannick, "Panorama historique du développement des jeux vidéo en Suisse" S. Genvo and T. Philippette (dir.), *Introduction aux théories des jeux vidéo*, Presses Universitaires de Liège, 2023. Link: [DOI:10.4000/books.pulg.26349](https://doi.org/10.4000/books.pulg.26349)
https://serval.unil.ch/resource/serval:BIB_31ACDC632F7F.P001/REF.pdf

JOUHAR Myriam, *Archivage des jeux vidéo suisses : Suivi et enjeux lors de la création d'un jeu vidéo (Lausanne 1830 : Histoires de registres, 2022)*, Geneva, HEG Genève, 2022. Link: <https://sonar.rero.ch/global/documents/323062>

International

DE GROAT Greta [et al], "Core Metadata Schema for Cataloging Video Games Version 1: Game Metadata and Citation Project (GAMECIP) Tech Report 1", *Institute of Museum and Library Services*, December 2015. Link: https://gamecip.soe.ucsc.edu/sites/default/files/GAMECIP-Tech-Report-1_0.pdf

DE VRIES Denise and SWALWELL Melanie, "Creating Disk Images of Born Digital Content: A Case Study Comparing Success Rates of Institutional Versus Private Collections," *New Review of Information Networking*, volume 21, number 2, pp. 129-140, 2016. Link: <https://www.tandfonline.com/doi/abs/10.1080/13614576.2016.1251849>

ENGEL Deena and WHARTON Glenn, "Reading between the lines: Source code documentation as a conservation strategy for software-based art", *Studies in Conservation*, vol. 59, issue 6, 2014, pp. 404-415. Link: <https://www.tandfonline.com/doi/full/10.1179/2047058413Y.0000000115>

ENSOM Thomas, "Revealing Hidden Processes: Instrumentation and Reverse Engineering in the Conservation of Software-based Art", *The Electronic Media Review*, vol. 5, 2017-2018. Link: <https://resources.culturalheritage.org/emg-review/volume-5-2017-2018/ensom/>

FUKUDA, Kazufumi, "Using Wikidata as Work Authority for Video Games", *International Conference on Dublin Core and Metadata Applications*, 2019. Link: <https://dcpapers.dublincore.org/pubs/article/viewFile/4245/2439.pdf>

GRAU Olivier, HOTH Janina and WANDL-VOGT Eveline (eds.), *Digital Art Through the Looking Glass*, Donau, Edition Donau-Universität, 2019. Link: <https://doi.org/10.1080/00043249.1990.10792701>

MCDONALD Claire, SCHMALZ Marc, MONHEIM Allee, KEATING Stephen, LEWIN Kelsey, CIFALDI Frank, LEE Jin Ha, "Describing, organizing, and maintaining video game development artifacts", *Journal of the Association for Information Science and Technology*, 72(5), 540-553, 2021. Link: <https://gamer.ischool.uw.edu/files/2019/09/Describing-organizing-and-maintaining-video-game-development-artifacts.pdf>

MONCHAMP Jocelyn, *Le dépôt légal des jeux vidéo*, Dissertation, ENSSIB, January 2014. Link: <https://www.enssib.fr/bibliotheque-numerique/documents/64150-le-depotlegal-des-jeux-video.pdf>

PHILLIPS Joanna, "Reporting Iterations: A Documentation Model for Time-Based Media Art", *Performing Documentation, Revista De História Da Arte*, Lisbon, 4 (2015): 168-177, 2015. Link: <http://revistaharte.fcsh.unl.pt/rhaw4/RHAW4.pdf>

RECHERT Klaus, FALCÃO Patricia and ENSOM Thomas, *Introduction to an emulation based preservation strategy for software-based artworks*, Tate, 2016. Link: <https://www.tate.org.uk/documents/1184/tate-report-sba-emulation.pdf>

SWALWELL Melanie, STUCKEY Helen, MOYA Cynde, DE VRIES Denise, *Collecting, Curating, Preserving, and Researching Media Arts: A good practice report*. Swinburne. Report, 2023. Link: <https://doi.org/10.25916/sut.26255072.v1>

Appendices

Appendix A: Game functionality check and summary documentation⁷¹

A1. Menus and functions

The *CoronaQuest* home screen features the following functions:

- **Jouer:** Access to the game.
- **Mon deck:** View of player and Corona cards. Cards are unlocked as we progress through the game's leagues.
- **A propos ?:** Includes an explanation of the background to the game's creation, a teacher's guide to using the game in the classroom, credits and media coverage of the game.
- A button to mute the game sound.
- A button to change the game language (choice of French, German, Italian, English, Spanish, Portuguese, Brazilian Portuguese, Albanian, Bosnian, Romanian).

During a *CoronaQuest* game, the in-game menu allows the player to :

- Review the rules of the game;
- Restart the game;
- Exit the game and return to the menu.

A2. Game rules

A2.1. General information

CoronaQuest is a 1 player online card game, in which the payer takes on the computer (Corona) and must reduce its courage points (PV) to zero in order to win the game, by destroying its viruses and countering its attacks.

The game is divided into 4 leagues (difficulties), which define the cards available and the number of courage points for the player and Corona.

League name	Number of courage points	Access conditions
Bronze League	10 PV	Basic unlocked
Silver League	15 PV	1 bronze league win
Diamond League	20 PV	2 silver league wins
Master League	25 PV	3 diamond league wins

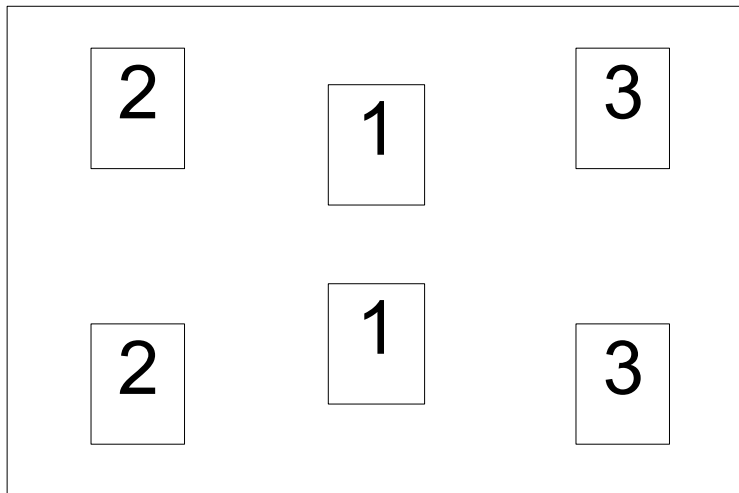
⁷¹ The heritage edition contains the second part of this work, with a recording of a game played and various illustrations of the game.

A3. Flow of a game

A3.1. Start of the game

The player and Corona each start with 5 cards in hand, X courage points according to the selected league and 4 energy points. The player and Corona have three empty card spaces on their side of the field.

The game follows a precise placement order for characters: center, left and right (from the player's point of view, both sides of the field). When a character is defeated, he leaves his square to the next character.



A3.2. Turn sequence

The player always starts the game.

- **Player's turn**
 - Draw 2 cards (except first round)
 - Lay yellow and blue cards within the limit of energy points.
 - Yellow cards have immediate effect when played. They cannot be countered by Corona.
 - When a blue card is laid down, it is asleep and cannot attack until the player's next turn.
 - Press Done when the laying is complete.
 - Attack the character in the center, then to the left, then to the right, on the enemy card in the center, then to our left, to our right. If there are no cards left, Corona's courage points are targeted.
 - End of turn. Draw 2 cards and recover spent energy points.
- **Corona's turn**
 - Lay yellow and blue cards within the limit of energy points.
 - Calculate damage and attack on the player's cards or on the player's courage points directly if he has nothing left to defend himself.

A4. Cards

A4.1. Character/virus cards

Character cards (blue for the player) or virus cards (Corona) have attack and courage points. They remain on the field until their courage point drops to 0. They have an energy cost.

Some blue cards can have effects that are either permanent (icon below the number of courage points) or activated instantly when placed on the field (icon at the top of the card). Card effects are activated even when characters are asleep.

Below is a list of the blue cards that can be used by the player, their specific features and the league from which they are unlocked.

A4.1.1. Character cards

Bronze League				
Card	Attack	Courage	Energy cost	Remarks/effects
PARENT	1	2	1	
LA PROF	1	4	2	
L'INFIRMIER	3	1	2	
Silver League				
LA POTE	3	2	2	
LE POTE	2	3	2	
CONCIERGE	0	6	2	
DRE. MABOULE	?	?	3	Attack and courage randomly generated (from 1 to 5) when the card is placed.
Diamond League				
LE POLITICIEN	5	2	4	When the card is placed on the ground, all monsters lose one point of courage.
LA MÉDIATRICE	3	4	3	When the card is placed on the field, all monsters lose one attack point.
Master League				
JOURNALISTE	4	4	3	When the card is placed on the field, the player draws 2 cards.
STATISTICIENNE	2	4	3	As long as the card is on the field, the player gains one point of courage each turn (even if the card is asleep).

A.4.1.2. Virus cards

Bronze League				
Card	Attack	Courage	Energy cost	Remarks/effects
A'TCHI	2	3	2	
KOFKOF	1	5	2	
MICROBOS	2	2	1	
Silver League				
KONTADJIA	4	4	3	
MASTER ISOLOS	0	8	2	
Diamond League				
TRISTUS	2	3	1	
PREKARITÉ	5	3	3	When the card is placed on the field, all the player's characters lose one courage point.
Master League				
SKEPTIKA	3	3	3	When the card is placed on the field, all monsters switch their courage and attack points.
MUTATUS	1	4	2	This card gains 1 attack point at the end of each turn.

A4.2 Power cards

Power cards (yellow) can be played to activate immediate effects, and most require energy points to play. Below are the various power cards, their cost and effect, and the league required to unlock them.

A4.2.1. Player powers

Bronze League		
Card	Energy cost	Remarks/effects
DÉSINFECTION	4	Withdraw 3 points of courage from Corona.
AIDER LES AUTRES	2	Adds 1 point of courage to all the player's characters. Cumulative effect.
CONSIGNES	2	Adds 1 attack point to all the player's characters. Cumulative effect.
Silver League		
CHECK DU COUDE	2	Eliminate an enemy monster at random.
RECHERCHE DE VACCIN	2	Removes 1 attack point from all enemy monsters.
APPLAUDIR À 21H	1	Wake up all sleeping allies.
AÉRER	0	Regains 2 energy points (cannot exceed the maximum of 4).
Diamond League		
RIRE UN COUP	2	Puts the entire opposing team to sleep until the end of its next turn.
DÉCONFINEMENT	1	Adds 2 cards from the deck to the hand.
Master League		
TEST DE DÉPISTAGE	3	Turn a random enemy card into an ally card and place it on the player's field.
CONFINEMENT	1	Hand over all the cards on the field.
PLAN DE RELANCE	0	Replaces the current hand with new cards, in the same quantity.

A4.2.2. Corona powers

Bronze League		
Card	Energy costs	Remarks/effects
TOUX	3	Removes 1 point of courage from all the player's cards on the field.
FIÈVRE	2	Subtracts 1 attack point from all the player's cards on the field.
PEUR	2	Removes 2 points of courage from the player.
FATIGUE	2	Removes 2 energy points from the player's next turn.
CONTAMINATION	4	Removes 4 courage points from the central character card only (the difference does not affect the player's other cards).
Silver League		
SOLITUDE	3	Destroys the cards on the player's field to leave 1.
ENNUI	1	Endorses 1 random player card.
PROPAGATION MASSIVE	2	Adds 1 attack point to all Corona cards.
TRANSMISSION	1	Switches the positions of the player's cards.
Diamond League		
FAKE NEWS	2	Returns a random character card to the player's hand.
PÉNURIE de PQ	2	Removes a card from the player's hand.
DISPUTE	2	Corona steals a character card from the player and places it on his field.
Master League		
DEUXIÈME VAGUE	0	Corona regains 2 energy points (cannot exceed the maximum of 4).
RELÂCHEMENT	1	Wakes up all Corona's sleeping cards.
NOUVEAU FOYER	1	Add a random monster to enemy terrain.

A4.3. Defense cards

Defense cards (green) can only be used by the player and counter Corona's powers. They always cost 1 energy point and can only be played in response to a power. Defense cards have three levels of effectiveness, depending on the enemy card they counter.

Not effective (X): the enemy card ignores the defense and uses its effect.

Counter (V): the enemy card is blocked.

Perfect counter (O): the enemy card is blocked and the player recovers 1 energy point.

Below is a table summarizing the different defense cards, sorted by league (**Bronze**, **Silver**, **Diamond**, **Master**) and their level of effectiveness against Corona's powers.

	BRONZE					SILVER				DIAMOND	MASTER	
	APPEL MÉDECIN	SE LAVER LES MAINS	REPOS	TROUVER DE L'AIDE	COUDE	DISTANCE SOCIALE	JEUX VIDÉO	EN PARLER À UN AMI	ÉVITER DE TOUCHER	INFORMATIONS OFFICIELLES	MASQUE	TRAÇAGE
FIÈVRE	O	X	X	X	X	X	X	X	X	X	X	X
CONTAMINATION	X	O	X	X	X	X	X	X	V	X	X	X
FATIGUE	V	X	O	X	X	X	X	X	X	X	X	X
PEUR	X	X	X	O	X	X	X	V	X	X	X	X
TRANSMISSION	X	V	X	X	X	X	X	X	O	X	X	X
TOUX	V	V	X	X	O	X	X	X	X	X	V	X
PROPAGATION MASSIVE	X	V	X	X	X	O	X	X	X	X	V	X
ENNUI	X	X	X	X	X	X	O	V	X	X	X	X
SOLITUDE	X	X	X	V	X	X	O	O	X	X	X	X
PÉNURIE DE PQ	X	V	X	X	X	X	X	X	X	O	X	X
DISPUTE	X	X	X	O	X	X	X	V	X	X	X	X
DEUXIÈME VAGUE	X	X	X	X	X	X	X	X	X	X	O	V
NOUVEAU FOYER	X	X	X	X	X	X	X	X	X	X	X	O
FAKE NEWS	X	X	X	X	X	X	X	X	X	O	X	X
RELÂCHEMENT	X	X	X	X	X	V	X	X	X	X	V	O

Appendix B: List of DNA Studios projects

Source: DNA Studios projects page⁷², presented using the information available on the site in September 2024, and with the hyperlinks reproduced in the descriptions. David Hofer has enabled us to fill in the missing dates. A major update in January 2025 changed the content of the page: the number of projects presented is now smaller.

Title	Year	Sponsor	Description
<i>The Sunboy</i>	Before 2013 ⁷³	Caravel Production	« Ce film, prêt depuis début février 2014, va commencer sa tournée de festival. DNA Studios a travaillé sur des séquences d'animations intégrées dans une scène de combat entre un homme et un monstre. L'équipe a déjà eu la chance de pouvoir le visionner ! Et c'est un régal pour les yeux ! Nous nous réjouissons que ce dernier soit rendu public afin que vous puissiez le voir également. Martin Charrière, notre animateur, s'est occupé de ce travail que vous pouvez contempler sur les vidéos ci-dessous. »
<i>Le Duc sans coeur</i>	2015	Caravel Production	« Court-métrage de Gesenn Rosset, réalisateur chez Caravel Production, ce film est un conte fantastique sur un homme déchu qui a perdu son coeur et qui essaie de le retrouver. Il sera réalisé en utilisant une technique hybride entre animation 2D et stop motion. Nous réalisons les décors et les personnages à la main à petite échelle, comme pour un film en stop motion. Les personnages n'ont pourtant pas d'armatures, et nous les assemblons puis les intégrons par ordinateur dans le décor. Un peu de découpe, du modelage et de la sculpture, quelques photographies, une bonne dose de dessin, un peu de créativité et un soupçon de hasard voici notre recette pour ce film. Les challenges sont nombreux et passionnants ! »

⁷² See <https://www.dna-studios.ch/le-studio/nos-projets> (old version, the one used as of September 2024 to reproduce the information in this appendix). A major update changed the content in January 2025. The new reference page for DNA Studios projects is now: <https://www.dna-studios.ch/projects/>.

⁷³ Clarification provided by David Hofer.

<i>Antyz</i>	2015	DNA Studios	<p>« Une nouvelle ère glaciaire approche. Pour échapper à cette catastrophe, les fourmis décident de creuser vers le centre de la terre pour profiter de la chaleur du noyau. Vous incarnez une fourmi éclaïreuse qui va ouvrir la voie à ses pairs. Antyz est un jeu développé en interne. L'étendue du projet inclut :</p> <ul style="list-style-type: none"> • Jeu mobile Android & iOS • Un backend web pour la configuration à distance des valeurs du jeu et certaines statistiques • Matériel de promotion complet <p>La musique est réalisée par Mathias Winum. »</p>
<i>Dans Ton Quizz</i>	2015	Couleur 3	<p>« Couleur 3 désirait mettre en avant sa programmation musicale de manière plus accessible pour un public jeune. Nous avons conçu, en partenariat avec une équipe de la RTS, un jeu de quiz musical. Le contenu, directement tiré des émissions, était créé et publié automatiquement dans le jeu par Couleur 3 au moyen d'un outil développé sur mesure.</p> <p>Nous nous sommes chargés de la conception et de la production du jeu, de l'application de gestion des playlists ainsi que du spot et des images de promotion du jeu. »</p>
<i>Datak</i>	2016	RTS	<p>« Datak est un jeu sérieux développé pour la RTS, plus précisément l'émission On en Parle qui passe sur les ondes de la 1ère. Il synthétise 18 mois d'enquête ouverte sur l'utilisation de nos données personnelles.</p> <p>Dans Datak, vous incarnez l'assistant stagiaire de M. Le Maire de DataVille. Si la tâche s'avère facile à première vue, vous devrez rapidement prendre des décisions qui dépassent totalement vos compétences. Et gare aux mauvais choix car M. Le Maire n'est guère tolérant.</p> <p>Mais ce n'est pas tout. Il vous faudra également gérer votre vie privée. Traiter vos e-mails et votre courrier feront partie intégrante de vos tâches. Chaque décision dans le jeu vidéo sérieux Datak est liée à la protection des données. »</p> <p>« Le projet consistait à développer un serious game web pour aider le joueur à comprendre comment, où et par qui ses données sont utilisées ainsi qu'à être conscient de l'impact de ses décisions.</p>

			<p>Dans ce jeu, le joueur gagne de l'expertise en fonction de ses décisions en lien avec les données personnelles. Est-ce que ses décisions seront bénéfiques ou non pour DataVille et sa vie personnelle ? Libre à lui d'en juger.</p> <p>Le jeu intègre également plusieurs vidéos de YouTubers tels que le Grand JD ou encore Dear Caroline. Entre dossiers et e-mails, des mini-jeux apportent un peu de divertissement. »</p>
<i>Tower of Babel</i>	2016 (AirConsole) 2020 (Switch)	AirConsole	<p>« Tower of Babel - no mercy est un jeu vidéo multiplayer sur Nintendo Switch de construction de tour basé sur une physique intransigeante. Dans ce jeu, toi et tes amis construisez une tour ensemble... Mais prenez garde ! Celui qui fait tomber la tour perd la partie.</p> <p>Et pour pimenter le tout, tu peux lancer des mauvais sorts pour saboter les coups de tes adversaires. Une sorte de Jenga digital... avec des explosions et des sortilèges ! Facile à prendre en main, à consommer sans modération entre amis ou en famille. Les plus jeunes comme les plus âgés vont adorer ! »</p> <p>« Tower of Babel a été développé initialement pour AirConsole, une plateforme novatrice de cloud gaming. Le but était de concevoir un jeu vidéo tout public, drôle, facile à prendre en main et surtout adapté à la plateforme. Il est d'ailleurs toujours disponible ici.</p> <p>Après un franc succès sur AirConsole, nous avons décidé de porter le jeu vidéo sur la Nintendo Switch, ce qui n'aurait pu se faire sans le soutien de Pro Helvetia. Le jeu fait peau neuve, intègre plein de nouveaux contenus et s'appelle désormais "Tower of Babel - no mercy". »</p>
<i>The Neighborhood</i>	2016	AirConsole	<p>« Ce jeu vidéo nous a été commandé par la plateforme en ligne AirConsole. Après le succès de Tower of Babel, nous avons donc pu développer un nouveau jeu pour la start-up zurichoise.</p> <p>Le mandat consistait à retravailler le concept fourni par AirConsole pour en faire un jeu unique, abordable et fun, en utilisant l'univers graphique de Tower of Babel. »</p> <p>« AirConsole est une plateforme de jeux vidéo multi-joueur en local qui utilise les smartphones comme manettes. Cela amène ses atouts et contraintes avec lesquelles</p>

			<p>nous devons travailler. Le plus gros challenge a donc été le game design.</p> <p>Les challenges :</p> <ul style="list-style-type: none"> – Adapter les mécaniques de jeu pour une prise en main agréable et intuitive sur smartphone. – Créer un jeu fun ayant de la rejouabilité. – Supporter et gérer jusqu'à 8 joueurs. <p>Nos solutions :</p> <ul style="list-style-type: none"> • Une manette simple et intuitive, adaptée au touch screen. • Génération aléatoire des armes et structures, pour qu'aucune partie ne se ressemble. • Aucune élimination. Les équipes sont composées de 5 personnages, mais aucun n'est attribué à un joueur. Si un personnage meurt, personne n'est écarté. »
<i>The Babs</i>	2017	AirConsole	<p>« The Babs a été commandé par AirConsole. Ce jeu vidéo multijoueur local fait la part belle à la coopération entre les joueurs qui poursuivent un but commun. Les joueurs incarnent tous un grand prêtre dont la seule fonction est de mener les Babs à l'autel du sacrifice. Ils devront collaborer pour surmonter les pièges, les surprises et les bêtises de leurs ouailles. Le but du jeu est de sauver un maximum de Babs dans un temps imparti afin d'éviter la colère du dieu Bab. »</p> <p>« The Babs a été commandé en 2017 par AirConsole pour étoffer son offre de jeux vidéo de coopération. La principale difficulté a été de mettre en place un concept qui soit fun immédiatement, et sur lequel du nouveau contenu puisse être intégré facilement.</p> <p>De nombreuses tentatives ont dû être testées avant de trouver le concept final du jeu. »</p>
<i>Rat Race</i>	2017	AirConsole	<p>« Dans ce jeu vidéo de course plein d'action pour AirConsole, le but est de franchir la ligne d'arrivée avec le plus haut score. Évitez de vous faire pousser dans les pièges qui se tendent à vous le long de la course. Nos petits personnages colorés, les Babs sont de retour, alors ne montrez aucune pitié et poussez vos amis dans les hachoirs.</p>

			<p>Jusqu'à 8 joueurs, les contrôles sont très faciles à prendre en main et tout spécialement designés pour vos téléphones et AirConsole. Alors accrochez-vous à vos smartphones et courez pour vos vies ! »</p> <p>« Rat Race est un jeu vidéo développé par nos soins, issu d'un désir de créer un jeu d'action délirant, rapidement pris en main et avec lequel les joueurs ont directement du plaisir à jouer.</p> <p>Les joueurs ne peuvent que sauter et envoyer une frappe vers l'avant. La piste de course est générée par assemblage de blocs pré-définis, chacun doté de mécaniques uniques. »</p>
<i>Mito / Pas Mito</i>	2017	Tataki	<p>« Alors que les collaborateurs de la RTS se sont occupés de construire et de mettre sur pied le boîtier avec tout son équipement, nous avons conçu le programme de la borne interactive. L'écran d'accueil de la Tatamobile propose deux jeux vidéo, Mito / Pas Mito et Clash Ta Star, que nous avons également produits.</p> <p>Les deux jeux vidéo ont été faits de manière à ce que le contenu soit facilement manipulable par le personnel de Tataki. Dans Mito / Pas Mito, par exemple, les questions et les réponses sont facilement adaptables en vue d'un événement précis, comme le SwissSneaks, par exemple. »</p> <p>« Ce jeu a été conçu pour sensibiliser les gens aux fausses informations et à quel point elles peuvent paraître crédibles, au milieu d'autres informations véridiques. Cela se présente sous forme de cartes sur lesquelles une affirmation est écrite : au joueur de décider si l'information est vraie ou pas, en swipant vers la gauche ou vers la droite. Si la réponse est juste, des points de score sont obtenus en fonction du temps mis pour répondre.</p> <p>Ces points de score permettent à la fin du jeu de débloquer des éléments personnalisables pour la photo. Après avoir immortalisé sa victoire (ou sa défaite), le joueur peut personnaliser une photo avec les items débloqués et se l'envoyer par mail. »</p> <p>« Tatamobile, c'est une borne promotionnelle de jeux vidéo tactiles commandée en 2017 par Tataki - un média numérique "impertinent, curieux, drôle et positif qui diffuse</p>

			<p>actu, humour, découverte et décryptages en tout genre". On peut les retrouver sur Facebook, sur Youtube ou encore sur Instagram.</p> <p>Conçue pour être emportée dans toutes sortes d'événements, comme des festivals, des congrès ou encore des salons, la Tatamobile est la seule présence physique d'une marque numérique. Malgré son look fun, ses enceintes puissantes et son aspect ludique, la borne sert avant tout à sensibiliser les gens sur des sujets cruciaux, comme les fausses informations ou la manipulation d'une citation hors-contexte. »</p>
<i>The Veggies</i>	2017	RTS	<p>« The Veggies est une web-série de stop-motion et d'animation, produite par la RTS et diffusée sur la chaîne de réseaux sociaux Tataki (Facebook, Snapchat, Instagram, RTS Player). »</p> <p>« The Veggies se base sur l'actualité de la pop culture 2017 et en rigole allègrement. Que ce soit pour rendre hommage ou pour se moquer, The Veggies transpose des sujets d'actualité, des films ou autres objets culturels dans le monde merveilleux des légumes.</p> <p>La contrainte de nos tournages ? Tout doit être fait dans la cuisine de notre studio. Les épisodes sont découpés en parties correspondant à des stories telles qu'on en trouve régulièrement sur les réseaux sociaux les plus fréquentés. Nous faisons d'abord un montage de stop-motion (image par image) avant de rajouter des animations flash pour les visages et les divers éléments.</p> <p>Adaptation et créativité sont les maîtres mots de ce projet : en passant du four au studio fait main, imprimant nos décors ou les réalisant à partir de nos ressources personnelles, nous explorons les techniques à disposition tout en gardant une ligne directrice claire. »</p>
<i>Unframed</i>	2017-2022	RTS	<p>« Saviez-vous que Paul Klee avait réalisé des marionnettes pour son fils et que l'une d'entre elles était son autoportrait ? A l'aide d'une reproduction précise et fidèle de celles-ci, le quatrième épisode de la série en réalité virtuelle Hors-Cadre part à la découverte du célèbre peintre et de ses nombreuses facettes.</p> <p>Dans ce court-métrage, les marionnettes racontent elles-mêmes les événements</p>

			majeurs et les aspects importants de la vie de leur créateur. A la limite entre fiction comique et documentaire, l'histoire s'intéresse à la fois à la vie de famille de Paul Klee, à ses enseignements et sa fuite du régime nazi en Suisse. »
<i>Intimités</i>	2017-2022	RTS	<p>« Ce deuxième épisode de la série Hors-Cadre propose de découvrir la série de gravures Intimités, réalisée par Félix Vallotton en 1898. Cet artiste suisse, originaire de Lausanne, fit carrière à Paris et y devint un maître incontesté de la gravure sur bois. Grâce à une mise en scène exceptionnelle, son oeuvre se découvre une seconde vie dans ce court-métrage.</p> <p>Guidé par la voix de Misia Sert, qu'on surnomme alors la Reine de Paris, le spectateur traverse les dix gravures de Félix Vallotton. Il y découvre, en plus des intérieurs parisiens, la vie intime de Misia, partagée entre ennui du couple, adultère et tendresse. Un regard unique sur une oeuvre fascinante qui résonne encore aujourd'hui. »</p>
<i>Hodler</i>	2017-2022	RTS	<p>« Ce troisième épisode de la série Hors-Cadre prend la forme d'un parcours interactif. Fini les courts-métrages à 360°. Désormais, le spectateur est libre de visiter, à son rythme, La Nuit, Le Bûcheron et les Paysages peints par Ferdinand Hodler.</p> <p>A l'occasion de la commémoration du centième anniversaire du célèbre peintre suisse, le spectateur est appelé à se balader parmi deux des plus grandes toiles du Maître. Découvrir les différentes versions du Bûcheron, circuler au milieu des personnages de La Nuit, ou encore admirer les Paysages - voilà le programme proposé par DNA Studios.</p> <p>Un parcours inédit et novateur pour un peintre lui-même à l'avant-garde de son temps, à découvrir pour la première fois du 2 au 10 novembre au Geneva International Film Festival ! »</p>
<i>L'île des Morts</i>	2017-2022	RTS	<p>« Plongez au coeur du célèbre tableau de Böcklin pour en découvrir tous les secrets, et visitez L'Île comme si vous y étiez...</p> <p>Réalisé par DNA Studios, écrit et narré par Yann Marguet, le premier épisode de la série Hors-Cadre est disponible depuis le 9 novembre 2017 sur YouTube. »</p>
<i>CheeseMaster</i>	2018	RTS and HES-SO Valais	« Cheesemaster est un mini-jeu vidéo Web créé en partenariat avec la Radio Télévision Suisse (RTS) et la HES-SO Valais. Ce jeu éphémère faisait partie intégrante de l'émission spéciale Dataland, diffusée par la SSR dans toute la Suisse en 4

			<p>langues. Au final, plus de 15'000 joueurs ont participé à l'expérience.</p> <p>Le jeu était accessible depuis n'importe quel navigateur internet. L'objectif était de montrer en direct, à la fin de l'émission, comment un jeu apparemment innocent peut voler vos données personnelles.</p> <p>DNA Studios en a réalisé toute la conception et a développé la partie frontend. »</p>
<i>Foire du Valais</i>	2019	FVS Group, in partnership with Raiffeisen Valais and PlasmaCom	<p>« Dans le cadre de la Foire du Valais 2019, FVS Group, en partenariat avec Raiffeisen Valais et PlasmaCom, a mandaté DNA Studios pour la création d'une installation interactive qui prenait une photo d'un mur brandé Raiffeisen toutes les 30 secondes. Les visiteurs étaient invités à prendre la pose.</p> <p>Ces photos étaient ensuite diffusées en live sur un écran géant au coeur de l'événement, qui avait lieu du 27 septembre au 6 octobre. L'installation a pris des milliers de photos et a déchaîné la créativité de bien des passants.</p> <p>Nous nous sommes occupés du développement software. »</p>
<i>Quiz RTS</i>	2018	RTS	<p>« Ce quiz a été initialement commandé par la RTS pour créer une animation publique sur son stand du Montreux Jazz Festival 2018. Il est depuis utilisé dans de nombreux événements publics où la RTS est présente.</p> <p>Développé sur mesure, il s'adapte parfaitement à tous types d'événements et son contenu peut être enrichi / modifié par les animateurs depuis une application web. »</p>
<i>Féroce</i>	2018	Caravel Production	<p>« Féroce est un court métrage en animation 2D d'Izù Troin co-produit par Folimage (France), Popiul (Belgique) et Caravel Production (Suisse), sur lequel nous avons réalisé 2 minutes d'animation sur TV Paint.</p> <p>Après avoir été kidnappé dans son appartement, un jeune cadre d'entreprise se réveille en pleine forêt. Il se retrouve alors traqué par un mystérieux chasseur. »</p>
<i>HEIA-FR</i>	2019	Haute Ecole d'Ingénierie et d'Architecture de Fribourg	<p>« Cette application en Réalité Virtuelle a été développée pour la Haute Ecole d'Ingénierie et d'Architecture de Fribourg. Elle sert de carte de visite de la HEIA-FR lors des événements et permet de présenter les différentes filières grâce à une visite virtuelle interactive. Deux mini-jeux à l'intérieur de l'application varient les plaisirs lors de la visite. »</p>

<i>NoviLé</i>	2019	Société de Développement du Lac de la Gruyère and coordinated by Bulle-based communication agency Dép-Art	<p>« A l'initiative de la Société de Développement du Lac de la Gruyère et coordonnée par l'agence de communication bulloise Dép-Art, NoviLé est une application pour accompagner le parcours ludique en réalité augmentée qui propose de découvrir le Lac de la Gruyère d'une manière totalement innovante. »</p> <p>« Le tour du lac est divisé en 7 balades d'environ 1h30 qui comprennent chacune entre 3 et 5 panneaux didactiques. L'application NoviLé permet d'activer, en ligne ou en les téléchargeant à l'avance, des animations pleines de surprises en réalité augmentée ! Au contact de 30 panneaux répartis sur les chemins, l'application active des informations sur les thèmes de la faune, la flore, la géologie et l'histoire du Lac de la Gruyère. Elle donne également toutes les informations pratiques nécessaires à leur découverte (horaires des transports publics, places de parking, commerces à proximité...) et permet également de participer à une chasse aux trésors ! »</p>
<i>Energeek</i>	2019	Romande Energie	<p>« DNA Studios a réalisé un jeu promotionnel que Romande Energie partage via sa newsletter, son site internet ainsi que les réseaux sociaux. Avec un objectif simple (trancher le plus de guitares en évitant les pièges), le jeu se joue en parties très rapides de maximum 3 minutes - ce qui laisse le temps de recommencer et d'améliorer son score - et qui sait ? de remporter un prix ! »</p> <p>« Energeek est un jeu vidéo promotionnel commandé par Romande Energie. Il a été conçu pour la communication événementielle de l'entreprise. Le premier jeu-concours organisé offrait des places pour la Fête des Vignerons 2019. Plus de 4'000 participants se sont inscrits, pour une moyenne de 8 parties par joueur. Le second jeu-concours, organisé en 2020, met en jeu des billets pour le concert de Céline Dion au Paléo Festival de Nyon 2020. »</p>
<i>Le petit Burki animé</i>	2019	RTS	<p>« "Le petit Burki animé" est une initiative du fils de Raymond Burki, Stanislas, directeur des relations média de la RTS. L'objectif était de réaliser un court film à 360° et de le projeter quotidiennement dans un dôme à la Fête des Vignerons 2019. Produit par la RTS, écrit par Laurent Flütsch, doublé par Yann Lambiel et réalisé par Martin Charrière, le film a connu un grand succès lors de la fête. »</p>

<i>Fête des Vignerons 2019</i>	2019	Groupe Raboud	<p>« Pour s'occuper de la construction du stand du canton de Fribourg à la Fête des Vignerons, Fribourgissima a mandaté le Groupe Raboud. Celui-ci a ensuite confié à DNA Studios toute la confection du contenu numérique du stand.</p> <p>Le contenu numérique se divisait entre une installation interactive, le Live Poy'art, et une installation de contenus numériques célébrant les traditions fribourgeoises divisées en fonction des saisons, ainsi qu'une grande fresque mettant à l'honneur l'économie fribourgeoise. »</p>
<i>Child safeguarding e-learning module</i>	2019-2023	UEFA and fondation Terre des Hommes	<p>« L'UEFA (Union of European Football Associations) s'est associée à la fondation Terre des Hommes pour mettre sur pied un programme dédié à la protection des enfants et jeunes adultes dans le milieu du football. Dans le cadre de ce vaste programme, DNA Studios a été mandaté pour le développement de quatre modules d'e-learning.</p> <p>Un module e-learning d'introduction est suivi par trois modules spécialisés visant des rôles spécifiques des 55 associations nationales de football en Europe (coach, spécialiste de la sauvegarde des enfants et le staff). Tous ont été publiés en quatre langues : français, anglais, allemand, russe.</p> <p>Les quatre modules e-learning ont été développés en accord avec les standards SCORM et déployés sur la plateforme Moodle. Ils sont responsive et s'adaptent parfaitement à tous les formats d'écran. Leur application est flexible et peut être facilement adaptée en cas de besoin. »</p>
<i>Match Day</i>	2019-2023, is part of the Child Safeguarding metaproject ⁷⁴	UEFA and fondation Terre des Hommes	<p>« Après avoir développé des modules e-learning portant sur la sauvegarde de l'enfance dans les clubs de football, pour le compte de l'UEFA en collaboration avec Terre des Hommes, nous avons réalisé du matériel promotionnel en quatre langues (français, anglais, allemand et russe), sous forme de posters, de dépliants et d'images pour les réseaux sociaux.</p> <p>Notre entreprise d'e-learning a réalisé pour l'occasion un court-métrage d'animation intitulé "Match Day." Celui-ci a été montré pour la première fois lors du UEFA Child & Youth Protection Summit, qui a eu lieu en novembre 2022 en Belgique. »</p>

⁷⁴ Clarification provided by David Hofer.

<i>Anna 1971</i>	2020	SRG SSR	<p>« Le jeu sérieux Anna 1971 a été réalisé pour le groupe de télévision suisse SRG SSR. La RTS a piloté ce projet, résultat d'un concours organisé dans le but de commémorer le 50e anniversaire du droit de vote des femmes en Suisse.</p> <p>Dans ce jeu vidéo qui prend la forme d'une fiction interactive, vous incarnez Anna, une jeune femme de 21 ans, en 1971. Au travers d'un réseau social fictif, "Shoutbox", vous êtes immergé-e-s dans la condition féminine en 1971, dans l'histoire du suffrage féminin et en devenez partie prenante.</p> <p>Le jeu vidéo propose tout au long de l'expérience des dilemmes entre prise de position publique et ménagement des relations privées, qui peuvent mal réagir à certains de vos propos. Ces mécanismes de gamification souhaitent refléter les enjeux du féminisme, dont l'expression publique peut parfois nuire à la vie privée des militantes. En plus du contenu interactif, le jeu sérieux contient plein de médias inédits sous formes d'images, de graphismes, de vidéos tournées avec des acteurs professionnels et des vidéos d'archives de toute la Suisse.</p> <p>Le 7 février 1971, le droit de vote est enfin obtenu, mais le combat féministe était loin d'être terminé. Découvrez son histoire au travers de cette expérience interactive et ludique. »</p>
<i>CoronaQuest</i>	2020	État de Vaud	<p>« Le projet a été réalisé entre le 29 avril et le 11 mai en collaboration avec le Département de la formation, de la jeunesse et de la culture du Canton de Vaud.</p> <p>Le jeu sérieux a pour but de sensibiliser les élèves aux gestes sanitaires et aux actions à entreprendre pour vivre un retour en classe dans un climat serein, sécurisé et avec une attitude bienveillante les uns envers les autres. Son but est également de rendre le contexte moins anxiogène pour les enfants.</p> <p>Librement inspiré du célèbre Hearthstone, il prend la forme d'un jeu de cartes mettant en adversité le joueur et le virus. Les deux parties disposent d'un quota de points de courage. Le but est de décourager la partie adverse en jouant, tour à tour, des cartes tirées au hasard.</p> <p>CoronaQuest est proposé en 12 langues. »</p>
<i>Code of Ethics</i>	2020	Novartis	<p>« Nous avons réalisé un film d'animation pour promouvoir le lancement du nouveau code d'éthique de Novartis auprès de leurs collaborateur-ices.</p> <p>Le film en animation 2D cut-out met en scène une héroïne qui s'aventure à la</p>

			<p>recherche de ce précieux manuscrit.</p> <p>L'idée du film a été conçue avec le client puis nous avons réalisé une animatique qui a servi de base pour les futures discussions. À partir de cette version, il a fallu développer le design des décors et l'animation des personnages, avant d'ajouter la touche finale avec le son et les effets spéciaux. »</p>
<i>Protecteur par nature</i>	2020	Gaultier Collette	<p>« Ce jeu vidéo sérieux a été développé en partenariat avec l'agence genevoise Gaultier Collette. L'objectif est de former une équipe commerciale aux caractéristiques d'un nouveau produit. Pour y arriver, nous avons créé des mécaniques pour un jeu de gestion d'une ferme en tour par tour, qui demandent de répondre à des questions pour avancer. Ces mécaniques rendent la formation ludique et engageante. Elles ont rencontré un franc succès auprès des collaborateurs.</p> <p>Tout le concept et le développement ont été proposés et réalisés par DNA Studios. Le jeu est disponible sur support web en prenant avantage du SVG. Il est adapté pour ordinateur et mobile. »</p>
<i>360° Swiss Heritage</i>	2020	Société d'Histoire de l'Art en Suisse	<p>« En partenariat avec la Société d'Histoire de l'Art en Suisse, DNA Studios a développé une application de Réalité Virtuelle gratuite qui permet de visiter certains des plus beaux châteaux de Suisse. En complément de l'application VR, un site internet offre les mêmes possibilités sans casque.</p> <p>Le coeur de l'application est une carte de la Suisse modélisée à 360°. Sur cette carte apparaissent tous les châteaux disponibles à la visite. On peut les sélectionner facilement grâce aux manettes VR et démarrer une visite.</p> <p>Le voyage commence alors au pied du château sélectionné. Grâce à un parcours fléché avec des indications, on peut se déplacer entre les salles du lieu aussi bien qu'à l'extérieur et dans la cour. Nous avons photographié sur place chaque lieu à 360° afin de donner le plus de naturel possible à l'expérience. »</p>
<i>Frýburg 1606</i>	2020	Fribourg Tourisme	<p>« Initié et piloté par Fribourg Tourisme, ce projet est né de l'envie de révolutionner le monde du tourisme à l'aide des nouvelles technologies.</p> <p>Bien implémenté dans la région et fort d'une collaboration fructueuse en AR qui a donné naissance au projet Novilé, nous avons été sélectionnés pour produire la partie de réalité virtuelle de ce projet ambitieux.</p>

			<p>Les challenges</p> <ul style="list-style-type: none"> – Faire des reconstitutions visuelles fidèles à l'aide de documents historiques et d'experts. – Trouver le bon rapport qualité/poids de l'application pour que tout reste beau sur smartphone et tablette. – Apporter un mini-scénario pour dynamiser l'expérience sur les postes qui nous ont été attribués. <p>Les solutions</p> <ul style="list-style-type: none"> • Proposer un flow de travail itératif qui permet une bonne communication entre les initiateurs du projet, les experts et les partenaires. • Effectuer de nombreux tests en préambule de la production pour d'affiner les solutions et trouver celles qui sont le plus convaincantes d'après les critères. • Exploitation maximum des technologies mises à disposition par nos partenaires. »
<i>Hals und Beinbruch</i>	2021	HFR	<p>« Nous avons développé ce jeu vidéo sérieux pour l'HFR (hôpital fribourgeois) avec comme objectif de faciliter l'apprentissage de l'allemand en milieu hospitalier pour tous les collaborateur-ice-s, en particulier le personnel soignant.</p> <p>L'objectif du jeu vidéo pédagogique, en plus d'acquérir les bases du vocabulaire hospitalier, est d'apprendre à réagir et à prendre des décisions à partir d'informations en allemand. L'accent est mis sur la compréhension plutôt que sur l'expression en poussant les utilisateur-ice-s à agir pour résoudre des situations et répondre aux besoins des patients. De plus, chaque situation résolue débloque un mot de vocabulaire (ou une phrase) accessible en tout temps dans le journal de l'utilisateur-ice.</p> <p>Le 24 septembre 2022, Hals und Beinbruch a reçu le 2ème prix de la Journée du Bilinguisme du Canton de Fribourg. »</p>
<i>Monumentissimo !</i>	2021	AMCC	<p>« L'AMCC, dont le but est la promotion du monument des Comtes et des Comtesses de Neuchâtel, nous a approchés sans avoir une idée bien précise du produit final. Nous avons alors imaginé ensemble la création d'une application capable de retransmettre l'histoire derrière l'édification de ce monument, autant unique que captivant.</p>

			<p>Les challenges</p> <ul style="list-style-type: none"> – L'application ne doit pas "remplacer" le monument, mais être complémentaire. – Reconstitution photoréaliste en 3D, tout en étant utilisable sur smartphone et tablette. – Raconter une histoire très riche, sans que le contenu soit ennuyeux. <p>Les solutions</p> <ul style="list-style-type: none"> – L'application est scindée en 2 parties. La première est à découvrir chez soi, tandis qu'il est nécessaire d'aller sur place pour découvrir la seconde partie de l'histoire et surtout, le monument lui-même. – Nous avons reconstitué le modèle grâce à un subtil mélange entre la photogrammétrie et la modélisation basée sur des photos prises sur place à l'aide d'une nacelle. – Travail sur la scénographie, le scénario et les dialogues tout particulièrement millimétré, afin de proposer une expérience passionnante du début à la fin. »
<i>Oiken</i>	2021	Oiken	<p>« Ce jeu vidéo a été spécialement développé pour OIKEN afin de célébrer l'inauguration de ses espaces clients installés à Sion et à Sierre (VS) en 2022 avec un jeu concours.</p> <p>L'objectif était de mettre en place un concours pour l'inauguration et d'autres événements à venir. Pour ce faire, nous avons développé un jeu accessible à tout le monde sur support tactile, ainsi qu'un système de tirage au sort de cadeaux. Chaque joueur qui parvient à terminer le parcours reçoit immédiatement un prix tiré au sort par le jeu lui-même parmi les possibilités fournies par OIKEN. »</p>
<i>Dawn</i>	2021		<p>« Cette expérience nous a été commandée à l'occasion de la Journée internationale des personnes en situation de handicap (International day of person with disabilities). Ce jeu vidéo avait deux objectifs : l'organisation d'un concours interne destiné aux employé-e-s de l'entreprise commanditaire, et surtout la sensibilisation aux difficultés que peuvent rencontrer les personnes en situation d'handicap. »</p>
<i>Zeu Pom'Tri Challenge</i>	2021	Planète Lessus Sàrl	<p>« DNA Studios a été mandaté par la société Planète Lessus Sàrl pour réaliser ce jeu vidéo sur le recyclage. Ils sont venus vers nous avec l'idée de réaliser un jeu vidéo concours en ligne sur le tri des déchets.</p>

			<p>L'univers du jeu (personnages et décors) devait être tiré de la bande dessinée Rose Pom. Pour réaliser ces visuels, nous avons collaboré avec l'illustrateur / graphiste de la BD Michaël Terraz.</p> <p>Le jeu devait comporter un classement en ligne afin de motiver la compétition entre les joueurs et ainsi récompenser les dix meilleurs à la fin du concours. »</p>
<i>FunDent</i>	2022	État de Fribourg	<p>« L'application est gratuite et a été développée par notre entreprise d'e-learning pour le Service dentaire scolaire (SDS) du canton de Fribourg. Elle est basée sur les films d'animation produit par les frères Guillaume (Ciné3D), créés sur commande pour la Direction de la Santé et des Affaires Sociales (Fribourg). Sam et Fred ont également fourni une bonne partie du design de l'application. La musique est signée par Gaëtan et les bruitages par Florian Pittet. L'entreprise DNA Studios s'est chargée du développement de l'application ainsi que des deux jeux vidéo qu'elle contient. »</p>
<i>Lightbox</i>	2022	Satom SA	<p>« Le parcours Energiom a été réalisé par Thematics Cultural Engineering SA à l'occasion des 50 ans de SATOM SA. Son objectif est de mettre en avant la contribution de l'entreprise vers la création d'une économie circulaire, transformant nos déchets en énergie. Il emmène les visiteurs dans l'usine de valorisation des déchets et leur permet d'appréhender et mieux comprendre les futurs défis liés à la gestion des matières.</p> <p>Nous avons été mandatés pour développer les contenus de la "Lightbox", une partie gamifiée et interactive du parcours, inauguré par SATOM SA à Monthey en 2022. Notre part dans le projet comprend la scénarisation de l'expérience, la création d'animations sur mesure, le développement numérique ainsi qu'une application iPad qui permet aux guides de contrôler la "Lightbox". »</p>
<i>Incorrigible vs Incorrigible</i>	2022	Ragusa, Thematics	<p>« A l'occasion des 80 ans de la marque Ragusa, les chocolats Camille Bloch mandatent Thematics Cultural Engineering SA pour repenser le concept d'exposition à Courtelary. Parmi toutes les idées proposées sera notamment retenue un ciné-gaming 4D à la place du petit cinéma de Chez Camille Bloch.</p> <p>Thematics collabore alors avec DNA Studios pour produire un jeu vidéo unique en Suisse, aux couleurs du célèbre chocolat Ragusa ! »</p>

<i>Dolce Vista</i>	2022	Thematis SA	<p>« THEMATIS SA nous ont approchés avec une idée assez large. La mission était à la fois simple mais contraignante : greffer une activité ludique pour les plus jeunes à un parcours existant et dédié principalement aux adultes.</p> <p>Nous avons proposé plusieurs idées, dont celle choisie qui a immédiatement séduit par ses côtés simples et cohérents.</p> <p>Il s'agit d'une chasse au trésor virtuelle, effectuée avec un smartphone tout le long du parcours. Les enfants sont priés de retrouver le petit Vista qui se cache dans le paysage, en 360°.</p> <p>Une fois l'avatar découvert, il raconte une anecdote drôle par rapport au poste, aux montagnes des alentours.</p> <p>Les challenges</p> <ul style="list-style-type: none"> • Le parcours bénéficie d'un cadre magnifique. L'activité ne doit pas freiner l'occasion de profiter de la nature. • Trouver une solution peu coûteuse qui doit être déployé sur CMS existant sans engendrer des coûts disproportionnés. • Trouver une activité qui soit ludique, mais avec un minimum d'interactivité et de complexité. <p>Les solutions</p> <ul style="list-style-type: none"> • L'activité reproduit exactement le même cadre virtuellement, en plus d'être relativement courte, afin de limiter le temps derrière un smartphone • Nous avons développé nous-même la partie chasse au trésor, clé-en-main. De cette manière, les créateurs du site, Ergopix, ont pu facilement l'intégrer sans créer de surcoûts. • La chasse au trésor qui mélange photographie et avatar cartoon nous a paru comme un bon compromis. Il s'agit d'une activité chouette, qui n'entre pas en concurrence avec le prisme, la nature ni le cadre idyllique. »
<i>Salle des légendes</i>	2023	Château de Gruyères	<p>« Dans la Salle des Légendes, deux espaces intimes sont aménagés pour permettre à celles et ceux qui le souhaitent d'interagir avec les deux Boîtes à contes. On peut alors choisir parmi 5 histoires différentes, animées et contées. Les 5 récits proposés dans ces boîtes ont un lien avec l'ancienne résidence comtale et ne manquent pas de mettre en lumière un riche pan du patrimoine immatériel de la Gruyère.</p> <p>DNA Studios s'est occupé de la programmation et de l'interface des Boîtes à contes. »</p>

<i>Fabuleux</i>	2023	Éditions Montsalvens	<p>« Grâce aux éditions Montsalvens, il existe désormais une version en patois des célèbres fables de La Fontaine. Traduites et enregistrées, elles font l'objet d'un magnifique livre qui renvoie à un site web où les enregistrements des fables, en français comme en patois, sont disponibles ! Et pour celles et ceux qui se tâteraient, il est possible d'écouter quelques extraits sans acheter le livre...</p> <p>Jean de La Fontaine aurait-il imaginé que près de quatre siècles après sa première publication, on pourrait lire et écouter son œuvre sur le même support et de surcroît, en deux langues ?</p> <p>Partez à la découverte de 40 fables richement illustrées, à lire en français et en patois ou à écouter à l'aide des codes QR qui jalonnent l'ouvrage. »</p> <p>« Dans ce projet hybride d'adaptation en patois des fables de La Fontaine, DNA Studios a conçu le site web.</p> <p>Nous avons également réalisé tous les enregistrements, en français et en patois, des lectures faites par les comédiens et conteurs chevronnés.</p> <p>Enfin, nous avons conçu le système de renvoi grâce à des QR Codes. »</p>
<i>Till Next Bill</i>	2023	État de Vaud and Fondation neuchâteloise pour la coordination de l'action sociale and Canton of Ticino	<p>« Till Next Bill est un jeu vidéo de prévention du surendettement proposé par le Canton de Vaud et soutenu par la Fondation neuchâteloise pour la coordination de l'action sociale et le Canton du Tessin.</p> <p>Notre entreprise l'a réalisé à l'aide d'un panel d'expert-e-s composé d'une trentaine de personnes issues des différents services d'aide aux personnes en situation de surendettement.</p> <p>La liste complète est disponible dans le dossier de presse. »</p>

Appendix C: Details of playability preservation strategies (part 3.3.)

C3.1 Information on checksums

To guarantee the integrity of the data we have collected, we have generated checksums in a fairly standard format using the following command under Linux:

```
$ md5deep -r -l * > md5sum.md5
```

One way of checking these checksums is to use the following command:

```
$ md5sum -c md5sum.md5 --quiet
```

If a file has been modified (voluntarily or involuntarily), this command will return, for example :

```
$ md5sum -c md5sum.md5 --quiet
CoronaQuest_Sources/CoronaQuest/Src/README.md: Échec
md5sum: Attention : 1 somme de contrôle ne correspond pas
```

C3.2. Details of the source code data set

We have used the Siegfried tool (<https://github.com/richardlehane/siegfried>) to produce this listing. The Siegfried tool uses signature files to identify the formats of the files analyzed. It also calculates checksums.

Here is information on software versions and signatures.

```
$ ~/go/bin/sf -v
siegfried 1.11.0
identifiers:
- pronoun: DROID_SignatureFile_V118.xml; container-signature-20240501.xml
```

Here we have more precise statistics on formats and their number in the data set. Note the presence of two empty files and several files whose format is not detected (UNKNOWN), whose formats are non-standardized text formats.

```
$ ~/go/bin/sf -csv . | cut -d "," -f6,7 | sort | uniq -c | sort -n
[FILE] src/app/app.component.scss [ERROR] empty source
```

```
[FILE] src/assets/.gitkeep [ERROR] empty source
1 fmt/101,Extensible Markup Language
1 fmt/1149,Markdown
1 fmt/1172,Web Open Font Format
1 fmt/13,Portable Network Graphics
1 fmt/1812,Audio Data Transport Stream
1 fmt/41,Raw JPEG Stream
1 fmt/471,Hypertext Markup Language
1 fmt/616,Web Open Font Format
1 fmt/818,YAML
1 fmt/91,Scalable Vector Graphics
1 x-fmt/224,Cascading Style Sheet
1 x-fmt/418,Icon file format
2 fmt/43,JPEG File Interchange Format
4 x-fmt/423,JavaScript file
6 fmt/12,Portable Network Graphics
13 UNKNOWN,
14 fmt/134,MPEG 1/2 Audio Layer 3
22 fmt/817,JSON Data Interchange Format
44 x-fmt/111,Plain Text File
54 fmt/1652,Typescript
172 fmt/11,Portable Network Graphics
```

In the Siegfried output below, we have filtered certain columns of the CSV output, then used command-line tools to obtain quantified statistics: the first column contains the number of files that correspond to the contents of the second column. In the second column, a first field indicates the Pronom Unique ID (PUID⁷⁵), then after a comma (','), the name of the file format.

It cannot be ruled out that Siegfried and the signatures may have detected some files inaccurately. Nevertheless, we do not believe that the batch of data contains any real surprises in terms of format.

C3.3. Details of strategy 1: Preservation of source code

For strategy 1, the actions we have taken are rather limited. The aim is to check that the formats of the data set are all acceptable for long-term preservation. As we have seen, there are no proprietary format in the source code supplied to us.

⁷⁵ The PRONOM Persistent Unique Identifier (PUID) is an extensible system of persistent, unique and unambiguous identifiers for records in the PRONOM registry.

The presence of the .git folder makes it possible to go back to previous versions of the source code, thanks to the widespread open-source tool git. Each of these versions could itself be the subject of the other strategies we have described. This task could not be carried out as part of this project.

We have used the following bash script to generate a "commits" folder, which contains one folder for each version of the source code. Each folder is named with the commit date, and the script also creates a SVGA_commit_message.txt file at the root of this folder. This text file contains the text message entered by developers when saving this version. This message generally provides information on changes made to the version.

```
#!/bin/bash

# Create a folder to store commit snapshots
mkdir -p commits

# Iterate through each commit
git rev-list --all | while read commit_hash; do
    # Get the commit date in a suitable format for a folder name
    commit_date=$(git show -s --format=%ci $commit_hash | sed 's/[-:]/_/g; s/ /_/g')

    # Create a folder for each commit using the formatted commit date
    mkdir -p "commits/$commit_date"

    # Get the commit message
    commit_message=$(git show -s --format=%B $commit_hash)

    # Write the commit message to the SVGA_commit_message.txt file
    echo "$commit_message" > "commits/$commit_date/SVGA_commit_message.txt"

    # Checkout the entire commit into a temporary directory
    temp_dir=$(mktemp -d)
    git --work-tree="$temp_dir" checkout -f $commit_hash

    # Copy all files from the temporary directory to the commit folder
    cp -r "$temp_dir/." "commits/$commit_date/"

    # Remove the temporary directory
    rm -rf "$temp_dir"
done
```

The game statistics file "stats.json" takes the form of a simple JSON table. The first element is the number of wins, the second the number of losses (as can be seen from lines 84-88 of the "src/app/services/game.service.ts" file).

```
$ curl https://coronaquest.game/assets/stats.json
```

```
[123301,97959]
```

C3.4. Details of strategy 2: preservation of source code and necessary libraries

For this strategy, we need to obtain the dependencies/libraries required to create a distribution version.

The presence of the "package.json" file in the source root indicates that we need to use npm (the default package manager for the Node.js JavaScript runtime environment). Once npm has been installed on a Linux machine, we can download all dependencies directly from the Internet with a single command.

A few remarks before giving the full command output:

- We can see that the npm tool reports a large number of dependencies as "deprecated", i.e. obsolete. For a code base dating from 2020-2021, this is unfortunately not very surprising, given that the libraries used change very quickly. This state of affairs is of course not reassuring in terms of long-term durability and preservation.
- The npm tool also reports library versions that contain security vulnerabilities.
- The CoronaQuest source folder was around 40 MB in size, before we downloaded the dependencies. After this download, a "node_modules" folder of almost 520 MB appeared at the root.
- Running the npm tool also modified the structure of the package-lock.json file to update it, as we used a more recent version of the npm tool than the one used during game development.

```
$ npm install
npm warn old lockfile
npm warn old lockfile The package-lock.json file was created with an old version of npm,
npm warn old lockfile so supplemental metadata must be fetched from the registry.
npm warn old lockfile
npm warn old lockfile This is a one-time fix-up, please be patient...
npm warn old lockfile
npm warn deprecated urix@0.1.0: Please see https://github.com/lydell/urix#deprecated
npm war
n deprecated uuid@3.4.0: Please upgrade to version 7 or higher. Older versions may use
Math.random() in certain circumstances, which is known to be problematic. See
https://v8.dev/blog/math-random for details.
npm warn deprecated streamroller@1.0.6: 1.x is no longer supported. Please upgrade to
3.x or higher.
npm warn deprecated svgo@1.3.2: This SVGO version is no longer supported. Upgrade to
v2.x.x.
npm warn deprecated stable@0.1.8: Modern JS already guarantees Array#sort() is a stable
sort, so this library is deprecated. See the compatibility table on MDN:
```


https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array/sort#browser_compatibility

npm warn deprecated source-map-url@0.4.0: See <https://github.com/lydell/source-map-url#deprecated>

npm warn deprecated source-map-resolve@0.5.3: See <https://github.com/lydell/source-map-resolve#deprecated>

npm warn deprecated sourcemap-codec@1.4.8: Please use [@jridgewell/sourcemap-codec](https://github.com/jridgewell/sourcemap-codec) instead

npm warn deprecated rimraf@3.0.0: Rimraf versions prior to v4 are no longer supported

npm warn deprecated resolve-url@0.2.1: <https://github.com/lydell/resolve-url#deprecated>

npm warn deprecated readdir-scoped-modules@1.1.0: This functionality has been moved to [@npmcli/fs](https://github.com/npmcli/fs)

npm warn deprecated read-package-tree@5.3.1: The functionality that this package provided is now in [@npmcli/arborist](https://github.com/npmcli/arborist)

npm warn deprecated read-package-json@2.1.1: This package is no longer supported. Please use [@npmcli/package-json](https://github.com/npmcli/package-json) instead.

npm warn deprecated request@2.88.2: request has been deprecated, see <https://github.com/request/request/issues/3142>

npm warn deprecated q@1.5.1: You or someone you depend on is using Q, the JavaScript Promise library that gave JavaScript developers strong feelings about promises. They can almost certainly migrate to the native JavaScript promise now. Thank you literally everyone for joining me in this bet against the odds. Be excellent to each other.

npm warn deprecated

npm warn deprecated (For a CapTP with native promises, see [@endo/eventual-send](https://github.com/endo/eventual-send) and [@endo/captp](https://github.com/endo/captp))

npm warn deprecated querystring@0.2.0: The querystring API is considered Legacy. new code should use the [URLSearchParams](https://github.com/nodejs/urlsearchparams) API instead.

npm warn deprecated osenv@0.1.5: This package is no longer supported.

npm warn deprecated protractor@5.4.4: We have news to share - Protractor is deprecated and will reach end-of-life by Summer 2023. To learn more and find out about other options please refer to this post on the Angular blog. Thank you for using and contributing to Protractor. <https://goo.gle/state-of-e2e-in-angular>

npm warn deprecated node-fetch-npm@2.0.4: This module is not used anymore, npm uses [minipass-fetch](https://github.com/minipass-fetch) for its fetch implementation now

npm warn deprecated move-concurrently@1.0.1: This package is no longer supported.

npm warn deprecated log4js@4.5.1: 4.x is no longer supported. Please upgrade to 6.x or higher.

npm warn deprecated is-data-descriptor@0.1.4: Please upgrade to v0.1.5

npm warn deprecated is-accessor-descriptor@0.1.6: Please upgrade to v0.1.7

npm warn deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out [lru-cache](https://github.com/isaacs/lru-cache) if you want a good and tested way to coalesce async requests by a key value, which is much more comprehensive and powerful.

npm warn deprecated ini@1.3.5: Please update to ini $\geq 1.3.6$ to avoid a prototype pollution issue

npm warn deprecated har-validator@5.1.3: this library is no longer supported

npm warn deprecated glob@7.1.5: Glob versions prior to v9 are no longer supported

npm warn deprecated fs-write-stream-atomic@1.0.10: This package is no longer supported.

npm warn deprecated figgy-pudding@3.5.2: This module is no longer supported.

npm warn deprecated debuglog@1.0.1: Package no longer supported. Contact Support at <https://www.npmjs.com/support> for more info.

npm warn deprecated debug@4.1.1: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)

npm warn deprecated date-format@2.1.0: 2.x is no longer supported. Please upgrade to 4.x or higher.

npm warn deprecated copy-concurrently@1.0.5: This package is no longer supported.

npm warn deprecated @schematics/update@0.900.7: This was an internal-only Angular package up through Angular v11 which is no longer used or maintained. Upgrade Angular to v12+ to remove this dependency.

npm warn deprecated @babel/plugin-proposal-optional-catch-binding@7.8.3: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-optional-catch-binding instead.

npm warn deprecated @babel/plugin-proposal-unicode-property-regex@7.8.8: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-unicode-property-regex instead.

npm warn deprecated @babel/plugin-proposal-object-rest-spread@7.9.5: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-object-rest-spread instead.

npm warn deprecated @babel/plugin-proposal-dynamic-import@7.8.3: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-dynamic-import instead.

npm warn deprecated @babel/plugin-proposal-async-generator-functions@7.8.3: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-async-generator-functions instead.

npm warn deprecated @babel/plugin-proposal-json-strings@7.8.3: This proposal has been merged to the ECMAScript standard and thus this plugin is no longer maintained. Please use @babel/plugin-transform-json-strings instead.

npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported

npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)

npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)

npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)

npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated q@1.4.1: You or someone you depend on is using Q, the JavaScript Promise library that gave JavaScript developers strong feelings about promises. They can almost certainly migrate to the native JavaScript promise now. Thank you literally everyone for joining me in this bet against the odds. Be excellent to each other.
npm warn deprecated
npm warn deprecated (For a CapTP with native promises, see @endo/eventual-send and @endo/captp)
npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)
npm warn deprecated core-js@3.6.4: core-js@<3.23.3 is no longer maintained and not recommended for usage due to the number of issues. Because of the V8 engine whims, feature detection in old core-js versions could cause a slowdown up to 100x even if nothing is polyfilled. Some versions have web compatibility issues. Please, upgrade your dependencies to the actual version of core-js.
npm warn deprecated debug@3.2.6: Debug versions >=3.2.0 <3.2.7 || >=4 <4.3.1 have a low-severity ReDos regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (<https://github.com/visionmedia/debug/issues/797>)
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated rimraf@2.7.1: Rimraf versions prior to v4 are no longer supported
npm warn deprecated is-accessor-descriptor@1.0.0: Please upgrade to v1.0.1
npm warn deprecated is-data-descriptor@1.0.0: Please upgrade to v1.0.1

added 1358 packages, and audited 1359 packages in 23s

37 packages are looking for funding

```
run `npm fund` for details
```

119 vulnerabilities (5 low, 47 moderate, 55 high, 12 critical)

To address issues that do not require attention, run:

```
npm audit fix
```

To address all issues possible (including breaking changes), run:

```
npm audit fix --force
```

Some issues need review, and may require choosing a different dependency.

Run `npm audit` for details.

```
npm notice
```

```
npm notice New minor version of npm available! 10.8.2 -> 10.9.0
```

```
npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.9.0
```

```
npm notice To update run: npm install -g npm@10.9.0
```

Furthermore, to analyze the evolution of dependencies across versions, we can search for the different versions of the package.json file in the different folders of the commit folder in strategy 1. We find 4 versions of the package.json file.

```
$ find -name package.json | xargs -I {} sh -c 'md5sum {}' | cut -d " " -f1 | sort | uniq -c
  7 34869f7d4256daf0f102a82764380f6b
  3 b11a10a3e552969c22e797416b5d1d7b
  59 c97d241c2ea13eca813e00dd7a1bce15
 160 d7d19f584caf7938de893f7d3095faf7
```

C3.5. Details of compilation environment recreation (strategy 3 and strategy 4)

To realize strategy 3 or strategy 4, we need to recreate a compilation environment and have all the necessary tools at our disposal.

We can start from strategy 2, where, thanks to npm, we have downloaded all the external dependencies/libraries needed for compilation.

Next, we need to install the Angular CLI tool:

```
npm install -g @angular/cli
```

```
added 266 packages in 7s

49 packages are looking for funding
  run `npm fund` for details

npm notice
npm notice New minor version of npm available! 10.8.2 -> 10.9.0
npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.9.0
npm notice To update run: npm install -g npm@10.9.0
npm notice
```

run `npm fund` for details

```
npm notice New minor version of npm available! 10.8.2 -> 10.9.0
```

npm notice Changelog: <https://github.com/npm/cli/releases/tag/v10.9.0>

```
npm notice To update run: npm install -g npm@10.9.0
```

npm notice

```
$ curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.39.3/install.sh | bash
$ nvm install 18
$ nvm use 18
```

```
$ ng version
```

Angular CLI: 9.0.7

OS: linux x64

... animations, cli, common, compiler, compiler-cli, core, forms

... language-service, platform-browser, platform-browser-dynamic

```
... router
```

Ivy Workspace: Yes

Package Version

@angular-devkit/architect 0.900.7

@angular-devkit/build-angular 0.900.7

@angular-devkit/build-optimizer 0.900.7

@angular-devkit/build-webpack 0.900.7

@angular-devkit/core 9.0.7

@angular-devkit/schematics 9.0.7

@ngtools/webpack 9.0.7

@schematics/angular 9.0.7

@schematics/update 0.900.7

rxjs 6.5.5

typescript 3.7.5

webpack 4.41.2

We can also list all dependencies/libraries and their versions:

```
$ npm list
novirus@0.0.0 /home/rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src
├─ @angular-devkit/build-angular@0.900.7
├─ @angular/animations@9.0.7
├─ @angular/cli@9.0.7
├─ @angular/common@9.0.7
├─ @angular/compiler-cli@9.0.7
├─ @angular/compiler@9.0.7
├─ @angular/core@9.0.7
├─ @angular/forms@9.0.7
├─ @angular/language-service@9.0.7
├─ @angular/platform-browser-dynamic@9.0.7
├─ @angular/platform-browser@9.0.7
├─ @angular/router@9.0.7
├─ @ngx-translate/core@12.1.2
├─ @ngx-translate/http-loader@4.0.0
├─ @types/jasmine@3.5.10
├─ @types/jasminewd2@2.0.8
├─ @types/lodash@4.14.150
├─ @types/node@12.12.37
├─ angular-fittext@2.1.1
├─ codelyzer@5.2.2
├─ jasmine-core@3.5.0
├─ jasmine-spec-reporter@4.2.1
├─ karma-chrome-launcher@3.1.0
├─ karma-coverage-istanbul-reporter@2.1.1
├─ karma-jasmine-html-reporter@1.5.3
├─ karma-jasmine@2.0.1
├─ karma@4.3.0
├─ lodash@4.17.15
├─ ngx-drag-scroll@8.0.0-beta.2
├─ ngx-matomo@0.1.4
├─ protractor@5.4.4
├─ rxjs@6.5.5
├─ ts-node@8.3.0
├─ tslib@1.11.1
├─ tslint@5.18.0
├─ typescript@3.7.5
└─ zone.js@0.10.3
```

C3.6. Details of strategy 4 - preservation of a compiled version of the game

Once the build environment has been prepared and the dependencies downloaded (see previous chapters), we can proceed with compiling the game to obtain a distribution version.

```
$ ng build
0% compiling
Compiling @angular/core: es2015 as esm2015
Compiling @angular/common: es2015 as esm2015
Compiling @angular/platform-browser: es2015 as esm2015
Compiling @angular/platform-browser-dynamic: es2015 as esm2015
Compiling @angular/router: es2015 as esm2015
Compiling @angular/animations: es2015 as esm2015
Compiling ngx-matomo: es2015 as esm2015
Compiling @angular/common/http: es2015 as esm2015
Compiling @ngx-translate/core : es2015 as esm2015
Compiling @ngx-translate/http-loader: es2015 as esm2015
Compiling angular-fittext : es2015 as esm2015
Compiling @angular/animations/browser: es2015 as esm2015
Compiling @angular/platform-browser/animations: es2015 as esm2015
Compiling ngx-drag-scroll: es2015 as esm2015
10% building 4/5 modules 1 active
.../rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src/node_modules/@angular-devkit/
build-angular/src/angular-cli-files/models/es5-polyfills.jsnode:internal/crypto/hash:79
  this[kHandle] = new _Hash(algorithm, xofLen, algorithmId, getHashCache());
                    ^
Error: error:0308010C:digital envelope routines::unsupported
    at new Hash (node:internal/crypto/hash:79:19)
    at Object.createHash (node:crypto:139:10)
    at module.exports
(/home/rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src/node_modules/webpack/lib/
util/createHash.js:135:53)
    at NormalModule._initBuildHash
(/home/rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src/node_modules/webpack/lib/
NormalModule.js:417:16)
[...]
    at Compilation.buildModule
(/home/rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src/node_modules/webpack/lib/
Compilation.js:739:10)
    at /home/rfrancois/Perso/SVGA/CQFD/S4/CoronaQuest/Src/node_modules/webpack/
lib/Compilation.js:981:14 {
```



```
opensslErrorStack: [  
  'error:03000086:digital envelope routines::initialization error',  
  'error:0308010C:digital envelope routines::unsupported'  
],  
library: 'digital envelope routines',  
reason: 'unsupported',  
code: 'ERR_OSSL_EVP_UNSUPPORTED'  
}
```

Node.js v20.17.0

There seems to be a problem with an OpenSSL element. By setting an environment variable, we can then compile :

```
$ export NODE_OPTIONS=--openssl-legacy-provider  
$ ng build  
Generating ES5 bundles for differential loading...  
ES5 bundle generation complete.  
chunk {runtime} runtime-es2015.js, runtime-es2015.js.map (runtime) 6.16 kB [entry]  
[rendered]  
chunk {runtime} runtime-es5.js, runtime-es5.js.map (runtime) 6.16 kB [entry] [rendered]  
chunk {polyfills} polyfills-es2015.js, polyfills-es2015.js.map (polyfills) 141 kB [initial]  
[rendered]  
chunk {styles} styles-es2015.js, styles-es2015.js.map (styles) 63.3 kB [initial] [rendered]  
chunk {styles} styles-es5.js, styles-es5.js.map (styles) 64.6 kB [initial] [rendered]  
chunk {polyfills-es5} polyfills-es5.js, polyfills-es5.js.map (polyfills-es5) 658 kB [initial]  
[rendered]  
chunk {main} main-es2015.js, main-es2015.js.map (main) 592 kB [initial] [rendered]  
chunk {main} main-es5.js, main-es5.js.map (main) 650 kB [initial] [rendered]  
chunk {vendor} vendor-es2015.js, vendor-es2015.js.map (vendor) 3.78 MB [initial]  
[rendered]  
chunk {vendor} vendor-es5.js, vendor-es5.js.map (vendor) 4.44 MB [initial] [rendered]  
Date: 2024-10-20T14:36:28.315Z - Hash: c9ebc51f0ad094adc286 - Time: 10956ms
```

After running this command, we get our distribution version in the "dist" folder, which looks like this:

```
dist/
├─ novirus
│  ├─ assets
│  │  └─ css
│  │  └─ favicon
│  │  └─ fonts
│  │  └─ i18n
│  │  └─ images
│  │  └─ javascript
│  │  └─ og
│  │  └─ sounds
│  └─ stats.json
├─ favicon.ico
├─ HTTPServerCQFD.py
├─ index.html
├─ main-es2015.js
├─ main-es2015.js.map
├─ main-es5.js
├─ main-es5.js.map
├─ polyfills-es2015.js
├─ polyfills-es2015.js.map
├─ polyfills-es5.js
├─ polyfills-es5.js.map
├─ runtime-es2015.js
├─ runtime-es2015.js.map
├─ runtime-es5.js
├─ runtime-es5.js.map
├─ styles-es2015.js
├─ styles-es2015.js.map
├─ styles-es5.js
├─ styles-es5.js.map
├─ vendor-es2015.js
├─ vendor-es2015.js.map
├─ vendor-es5.js
└─ vendor-es5.js.map
```

Note that this folder must then be used with a web/HTTP server, which will present the files so that a web/Internet browser can access them.

Note that in the source dataset, there are configuration files for the Apache server to "serve" this distribution version, e.g. "src/environments/prod/.htaccess".

```

$ cat .htaccess
# Gzip
SetOutputFilter DEFLATE
AddOutputFilterByType DEFLATE "application/atom+xml" "application/javascript"
"application/json" "application/ld+json" "application/manifest+json" "application/rdf+xml"
"application/rss+xml" "application/schema+json" "application/vnd.geo+json"
"application/vnd.ms-fontobject" "application/x-font-ttf" "application/x-javascript"
"application/x-web-app-manifest+json" "application/xhtml+xml" "application/xml"
"font/eot" "font/opentype" "image/bmp" "image/svg+xml" "image/vnd.microsoft.icon"
"image/x-icon" "text/cache-manifest" "text/css" "text/html" "text/javascript" "text/plain"
"text/vcard" "text/vnd.rim.location.xloc" "text/vtt" "text/x-component" "text/x-cross-
domain-policy" "text/xml"

# No cache for index.html
<filesMatch "\index.html$" >
  FileETag None
  <ifModule mod_headers.c>
    Header unset ETag
    Header set Cache-Control "max-age=0, no-cache, no-store, must-revalidate"
    Pragma "no-cache" header set
    Header set Expires "Wed, 11 Jan 1984 05:00:00 GMT"
  </ifModule>
</filesMatch>

RewriteEngine on

RewriteCond %{HTTP_HOST} !^coronaquest\.game
RewriteRule (.*?) https://coronaquest.game/$1 [L,R=301]

RewriteCond %{HTTP_HOST} ^(www\.)(.+) [OR]
RewriteCond %{HTTPS} off
RewriteCond %{HTTP_HOST} ^(www\.)?(.+)
RewriteRule ^ https://%2%{REQUEST_URI} [R=301,L]

# Don't rewrite files or directories
RewriteCond %{REQUEST_FILENAME} -f [OR]
RewriteCond %{REQUEST_FILENAME} -d
RewriteRule ^ - [L]

# Rewrite everything else to index.html to allow html5 state links

```

We also provide a small Python script "HTTPServerCQFD.py" which acts as a very simple HTTP server, allowing for testing the distribution version. We cannot guarantee that the game will work perfectly with this little test server, but a few tests indicate that it does work rather well.

```

#!/usr/bin/env python3
'''
Taken from:
http://stackoverflow.com/users/1074592/fakerainbrigand
http://stackoverflow.com/questions/15401815/python-simplehttpserver
'''

from http.server import HTTPServer, BaseHTTPRequestHandler,
SimpleHTTPRequestHandler
from urllib.parse import urlparse
import os

INDEXFILE = 'index.html'

class MyHandler(SimpleHTTPRequestHandler):
    def do_GET(self):
        # first we need to parse it
        parsed = urlparse(self.path)
        # get the query string
        query_string = parsed.query
        # get the request path, this new path does not have the query string
        path = parsed.path

        if os.access('.' + os.sep + path, os.R_OK):
            SimpleHTTPRequestHandler.do_GET(self)
        else:
            self.send_response(200)
            self.send_header('Content-Type', 'text/html')
            self.end_headers()
            with open(INDEXFILE, 'rb') as fin:
                self.copyfile(fin, self.wfile)

print("http://localhost:10000")
httpd = HTTPServer(('0.0.0.0', 10000), MyHandler)
httpd.serve_forever()

```

C3.7. Details of strategy 5: All-in-one Electron application

In order to integrate the existing Angular application into an "all-in-one" Electron package, we had to perform a number of operations.

First, we had to figure out how to "make" this Electron package. First, we had to edit the package.json file to add the elements needed to integrate Electron. Here is the package.json file with the changes in bold. Above all, we have added the dependency on Electron version 29.0.1, as well as two new commands to facilitate the package creation process.

```
{
  "name": "novirus",
  "version": "0.0.0",
  "main": "app.js",
  "scripts": {
    "ng": "ng",
    "start": "ng serve",
    "build": "ng build",
    "test": "ng test",
    "lint": "ng lint",
    "e2e": "ng e2e",
    "electron": "electron .",
    "electron-build": "export NODE_OPTIONS=--openssl-legacy-provider && ng build && export NODE_OPTIONS= && electron ."
  },
  "private": true,
  "dependencies": {
    "@angular/animations": "~9.0.3",
    "@angular/common": "~9.0.3",
    "@angular/compiler": "~9.0.3",
    "@angular/core": "~9.0.3",
    "@angular/forms": "~9.0.3",
    "@angular/platform-browser": "~9.0.3",
    "@angular/platform-browser-dynamic": "~9.0.3",
    "@angular/router": "~9.0.3",
    "@ngx-translate/core": "^12.1.2",
    "@ngx-translate/http-loader": "^4.0.0",
    "angular-fittext": "^2.1.1",
    "electron": "^29.0.1",
    "lodash": "^4.17.15",
    "ngx-drag-scroll": "^8.0.0-beta.2",
    "ngx-matomo": "^0.1.4",
    "rxjs": "~6.5.4",
```

```

"tslib": "^1.10.0",
"zone.js": "~0.10.2"
},
"devDependencies": {
"@angular-devkit/build-angular": "~0.900.4",
"@angular/cli": "~9.0.4",
"@angular/compiler-cli": "~9.0.3",
"@angular/language-service": "~9.0.3",
"@types/jasmine": "~3.5.0",
"@types/jasminewd2": "~2.0.3",
"@types/lodash": "^4.14.150",
"@types/node": "^12.11.1",
"codemirror": "^5.1.2",
"jasmine-core": "~3.5.0",
"jasmine-spec-reporter": "~4.2.1",
"karma": "~4.3.0",
"karma-chrome-launcher": "~3.1.0",
"karma-coverage-istanbul-reporter": "~2.1.0",
"karma-jasmine": "~2.0.1",
"karma-jasmine-html-reporter": "^1.4.2",
"protractor": "~5.4.3",
"ts-node": "~8.3.0",
"tslint": "~5.18.0",
"typescript": "~3.7.5"
}
}

```

We also used a tool called "electron-packager" on our workstation:

```

$ sudo npm install -g electron-packager --save-dev
npm warn deprecated electron-packager@17.1.2: Please use @electron/packager moving forward. There is no API change, just a package name change
npm warn deprecated boolean@3.2.0: Package no longer supported. Contact Support at https://www.npmjs.com/support for more info.
npm warn deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out lru-cache if you want a good and tested way to coalesce async requests by a key value, which is much more comprehensive and powerful.
npm warn deprecated glob@7.2.3: Glob versions prior to v9 are no longer supported

added 164 packages in 6s

34 packages are looking for funding
run `npm fund` for details

```

To make the package for Windows and the x64 architecture, we first need to compile a distribution version and then use the following command:

```
$ electron-packager ./ CQFD --platform=win32 --arch=x64
```

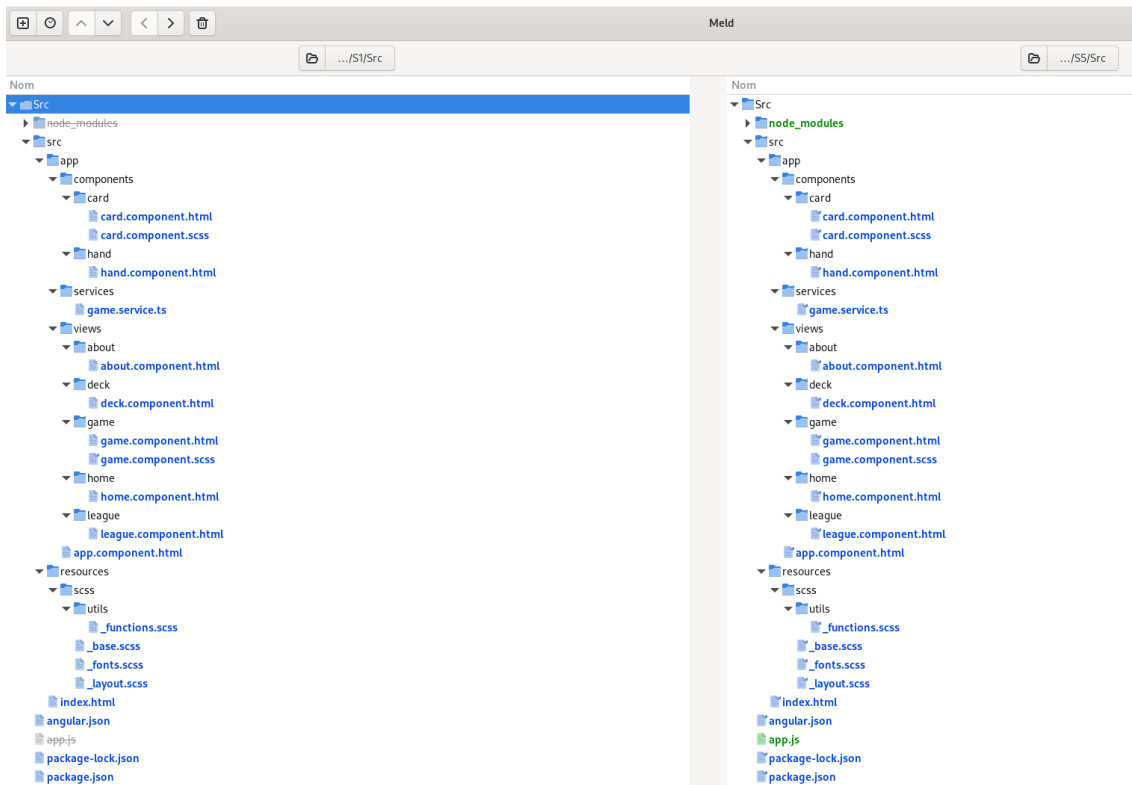
This command generates a "CQFD-win32-x64" folder at the root of the project, which looks like this and weighs about 475 MB:

```
CQFD-win32-x64/
├─ chrome_100_percent.pak
├─ chrome_200_percent.pak
├─ CQFD_d3d11.log
├─ CQFD.dxvk-cache
├─ CQFD.exe
├─ d3dcompiler_47.dll
├─ ffmpeg.dll
├─ icudtl.dat
├─ libEGL.dll
├─ libGLSv2.dll
├─ LICENSE
├─ LICENSES.chromium.html
├─ local
├─ resources
├─ resources.pak
├─ snapshot_blob.bin
├─ v8_context_snapshot.bin
├─ version
├─ vk_swiftshader.dll
├─ vk_swiftshader_icd.json
└─ vulkan-1.dll
```

We have also generated files for other combinations of platforms and processor architectures.

After successive tests, we noticed that references and paths to graphics or audio resources were not working when we were making the Electron package. We therefore had to make a multitude of changes to enable Electron to function properly. These changes were mostly applied to HTML or SCSS files.

As can be seen from the screenshot below of the Meld software, which compares the contents of two folders, we have made many changes to the source files in strategy 5 compared with the original files in strategy 1.



Appendix D: Example of a video game description

In parallel with this report, we are publishing a guide⁷⁶ summarizing some of the ways in which video game creators can work to preserve documentation throughout the game's lifecycle. The guide is accompanied by tables and examples to facilitate the reuse of the suggested resources.

One of the appendices includes a practical example, based on CoronaQuest⁷⁷. We reproduce it here to provide a further example of a documentation strategy.

Title	<i>CoronaQuest</i>
Created by	<i>DNA Studios</i>
Game license	<i>Not mentioned on public site CC-BY-NC-ND for archiving purposes</i>
Contributors	<i>Julien Schekter for the State of Vaud (sponsor) David Hofer and Martin Charrière for DNA Studios (design and development)</i>
Creation date	<i>29.04.2020</i>
Release date	<i>11.05.2020</i>
Game language(s)	<i>French, German, Italian, English, Spanish, Portuguese, Brazilian Portuguese, Albanian, Croatian, Serbian, Bosnian, Romanian</i>
Funded by	<i>State of Vaud, Department of Youth, Education and Culture</i>
Edited by	<i>No publisher</i>
Distributed by	<i>DNA Studios</i>
Distribution method(s)	<i>Web browser</i>
Game mode(s)	<i>Online</i>
Game mode(s)	<i>Solo</i>
Playing time	<i>Variable, 15 minutes on average</i>
Environment	<i>Computer</i>
Summary	<i>Description from the game's About page, dated</i>

⁷⁶ This guide is published in parallel with this report. It is based on Myriam Jouhar's work - *Archivage des jeux vidéo suisses: suivi et enjeux lors de la création d'un jeu vidéo* (Lausanne 1830: Histoires de registres, 2022), Genève: Haute école de gestion de Genève, 2022, 145 p. Available at: <https://sonar.rero.ch/global/documents/323062> - and was produced by Aurore Lüscher, Myriam Jouhar and Magalie Vetter.

⁷⁷ Appendix D Example of game documentation.

	<p>15.10.2024</p> <p><i>"CoronaQuest is a video game developed in just a few days as part of the return to school on May 11, 2020 in the Canton of Vaud, Switzerland, to experience the start of a new school year in a more serene, secure climate and with a caring attitude towards one another. Its aim is to make you aware of the health measures and actions you can take to live together, at school and outside, with the coronavirus.</i></p> <p><i>During the period of confinement and in the current period, you are experiencing or have experienced funny, unique moments, boredom too and perhaps sadder days, but school has resumed, it continues, and all the professionals in the school environment are there to support you. This game will not only help you to consolidate your new habits, but we hope it will also give you a lot of fun and the opportunity to discuss this very special time together.</i></p> <p><i>Let's protect each other. Let's take care of each other.</i></p> <p><i>On August 18, 2020, the game is updated with a new league: the master league. Even more challenging, it includes new maps, some of which have even been proposed by students and classes from the Canton of Vaud!</i></p> <p><i>And welcome to CoronaQuest!"</i></p>
Game type	<i>Educational card game</i>
Preparatory material	<i>Emails, intermediate designs, source code Some documents have disappeared (card and effect design spreadsheet).</i>
Promotional material	<i>Educational sheet Communication on social networks</i>
Software used and versions	<i>Photoshop, unknown version PhpStorm, unknown version Matomo, unknown version Balsmiq, unknown version</i>
File formats	<i>PNG JPG AFDESIGN MP3</i>

	<i>For the code :</i> <i>TYPESCRIPT</i> <i>JSON</i> <i>JAVASCRIPT</i> <i>CSS</i> <i>BMPR</i>
Asset formats	<i>PNG</i> <i>AFDESIGN</i> <i>PSD</i> <i>MP3</i>
Game version(s) available	<i>August 18, 2020 version</i>
Available source code version(s)	<i>August 18, 2020 version</i>

Impressum

Project

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- Interview transcriptions: Magalie Vetter, with the help of Corv , the transcription tool of the University of Lausanne
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- 2. *CoronaQuest* (2020, DNA Studios): Aurore Lüscher, Magalie Vetter
- 3. Approaches: Bastien Baumgartner, Robin François, Aurore Lüscher, Mathijs Roelofsen, Magalie Vetter
- 4. Heritage Edition: Robin François, Magalie Vetter
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