

EUNIS 2019: The taming of Masaryk University websites

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1. ABSTRACT

In this paper we describe the process of modernizing the online presence of Masaryk University, focusing mainly on the technical aspects. Specifically, we discuss how we managed to start a widespread adoption of a single content management system, unify design, and at least partially resolve content problems for about 130 websites. We present a centralized content management system which helps tackle security and technology issues, as well as a design framework which ensures consistency of the websites' looks.

2. INTRODUCTION

Masaryk University (MU) is the second largest higher education institution in the Czech Republic. It is a profoundly decentralized institution comprising a central rector's office, nine faculties and about 400 departments, 6 000 employees and 30 000 students. The rector's office has limited authority over the faculties and mainly runs the university administration.

At the beginning of the process described in this paper, the online presence of MU involved the main university website¹, nine faculties' websites² and somewhere around 800 individual websites of projects, activities and departments of varied - but mostly substandard - quality.

At first glance, 800+ websites may seem adequate considering the size and nature of the institution. The problem is that most of these websites appeared uncontrollably and in an uncoordinated way. They utilized a broad range of infrastructure options and communication forms because there was no better alternative.

While the quality of its websites is certainly not the most important attribute of a university, it still influences how it is perceived. Strong demand for higher education in Czechia after the Velvet Revolution in 1989 led to a vast excess of applicants. Traditional institutions like Masaryk University did not need to strive hard to attract high-quality students. This, however, begins to change as the higher education market becomes saturated and more schools are competing for a promising applicant. And even such a detail as the quality of school's websites can tip the scales.

This led to a decision to do something about the quality of university websites. Properly, a digital strategy should have been created which would drive all online activities - be it website content, Facebook profile or marketing campaign. That was however too much of a challenge for the decentralized MU context since properly implementing such a strategy demands a firm management decision and fundamental organizational changes. But as something had to be done, at least the most apparent issues were addressed and it was decided to:

- build a centralized content management platform, and
- create a unified visual identity and develop a frontend framework based on this identity.

¹ <https://www.muni.cz>

² <https://www.muni.cz/en/about-us/organizational-structure>

All these steps lead to a more centralized way of building websites and thus raise the chance that a proper digital strategy will be implemented one day.

3. INITIAL STATE

To explain the decision to centralize and unify websites, we first need to take a closer look into the problems that plagued the university online presence. The core of these problems can be divided into two categories: technical (infrastructural) problems and user experience problems.

3.1. Technical and infrastructural problems

Running a web requires hardware as well as software infrastructure. As for the hardware, some websites used commercial hosting, some used hosting provided by centralized university platforms³, and the rest had their own dedicated servers. A small portion of these was even running inside ordinary offices.

Concerning software, many websites had their own instances of content management systems, databases, and operating systems.

Keeping this volume of infrastructure up to date and operational with the human and financial resources available was close to impossible. Therefore, technically obsolete, unmonitored or hacked webs were rather the rule than the exception. Furthermore, many editors did not have the IT skills necessary to update anything on their webs and relied heavily on IT staff to do that for them.

3.2. User experience problems

The objective of any website is to provide information in a user-friendly way. In the case of a large institution with multiple webs, it is desirable that individual webs work together and do not confuse the user. Unfortunately, the opposite was true for some of the old websites. One of the problems was the visual design consistency. Masaryk University did not provide a clear and complete web design manual, and thus almost every new web got its own look and a set of CSS and HTML. The same applied for logos. This not only caused a considerable overhead when preparing new websites but it also confused website visitors.

Another aspect actively contributing to visitor confusion was low content quality. Thanks to missing strategies and a lack of cooperation and coordination, a substantial part of the web content was duplicated, obsolete, boring, overly complex, or incomplete. A lot of information was also spread through multiple websites, often providing contradictory facts.

4. CENTRALIZED CONTENT MANAGEMENT PLATFORM

To address both the technical and content-management problems, it was decided to build a centralized web management platform for the university needs. The system launched in 2012 and is based upon an open source Danish content management system (CMS) Umbraco⁴.

In the beginning, the centralized platform did not have higher ambitions than to serve as an alternative to the other hosting options. It aimed only at solving the technical and infrastructural problems by providing a centrally managed software platform for building webs that could be easily used by anyone. It did not offer any higher-level products or services like a customizable frontend template or specialized user support for designing web content. Building new webs was therefore still quite expensive. Some webs were based upon the Twitter Bootstrap template⁵, some had their own sets of CSS and HTML, and all of this had to be reimplemented every time a new web was required. Nevertheless, it still represented a considerable step forward as dedicated IT staff was no longer necessary for every new web.

³ centrally managed LAMP hosting or a shared PHP-capable web server; these appeared way earlier than the centralized content management platform did

⁴ <https://umbraco.com/>

⁵ <https://getbootstrap.com/>, version 2.3.2 at that time

Because of the decentralized university nature, there was no authority to force neither new nor existing websites to use this platform. Therefore, creating an inherent demand for it was necessary. We needed to build its credibility and prove that it is better than the other options. That involved persuading new projects and activities to use the new platform and creating more and more complex and quality websites. In Section 5, we will discuss how this inherent demand evolved.

The slow start of the university platform was timed quite well with respect to the development of the Umbraco open source system. In the beginning, Umbraco was somewhat inadequate to handle the whole MU online presence. This changed with a new major version released in 2015 that brought many new features and a much better editor experience, allowing complex content layouts to be built by non-IT staff in a WYSIWYG environment.

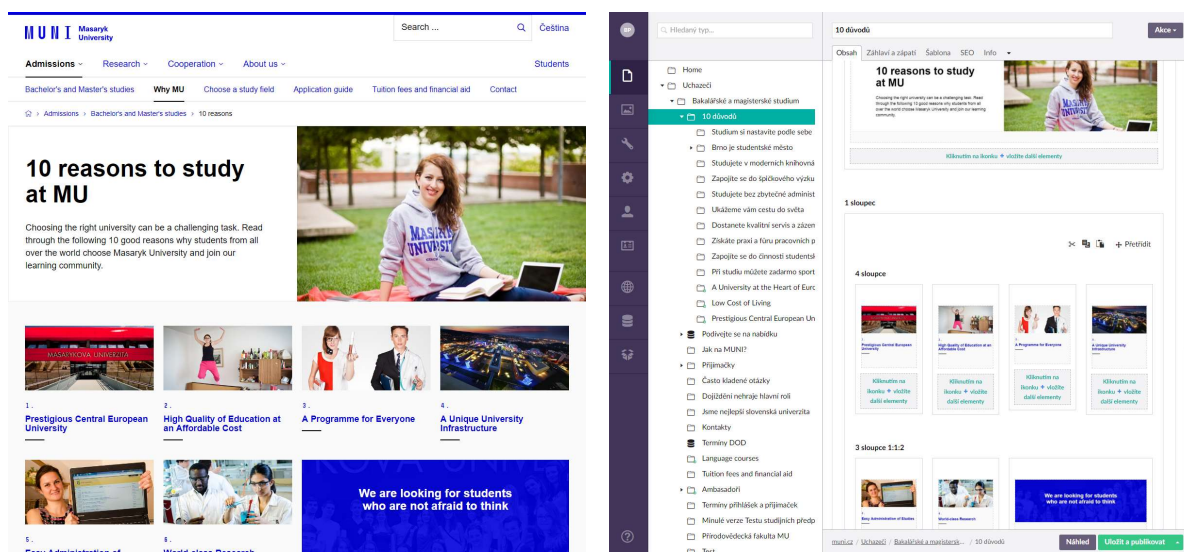


Figure 1. MU webpage and the current Umbraco editor environment for it.

4.1. Technical details

Currently, the whole university web platform includes only one instance of the Umbraco system, running in a load-balanced redundant environment backed by a database cluster. This approach enables quick and easy setup of new webs and a seamless introduction of new features and bug fixes, allowing the platform to evolve quickly and with low maintenance costs. The main disadvantage is that there exists a single point of failure where one small bug can take down many websites. Thus, thorough testing of code changes is crucial.

The business logic part of the whole platform including the Umbraco system itself is based on the original Microsoft ASP.NET 4.5 framework, is written in C# and uses the ASP.NET MVC framework for content rendering. The Umbraco backoffice (the content editor interface) is built in AngularJS 1.15. We use the newest Angular and Typescript for the development of more complex frontend forms.

Web servers are running Microsoft IIS, and the database cluster is based on Microsoft SQL Server Enterprise. No dedicated hardware infrastructure is utilized and all the servers are virtualized inside of an on-premise geographically distributed university cloud.

4.2. Interesting facts and figures

To get a better idea of the size and scope of the MU web platform, we provide some interesting figures and facts about it. All the figures apply to the time of writing, which is April 2019.

Facts and figures about hosted webs:

- About 260 webs are currently hosted on the platform, another 80 are already discontinued and 100 are in preparation (some of these were however abandoned by their editors and will never be launched).

- Apart from simple presentation webs, there are also a few feature-rich web applications implemented in Umbraco⁶.
- 926 university employees (i.e., just under a sixth of all the MU employees) have used the content management system at least once.
- Some 68,000 individual webpages exist within the system, out of which some 50,000 are publicly accessible.
- 93 GB of web-related files is uploaded in the system.
- Actual daily average throughput for all the hosted webs is about 4 webpage requests per second. Another 10 requests per second lead to other resources (images, API, files, etc.). Nearly half of this traffic is attributed to the main university website.
- The internal infrastructure monitoring each website generates one request every two seconds on average.
- A total of 3,673 user tickets were processed by the development team since 2015 when a request tracking system was implemented, which means that 3.5 tickets come on average every day.

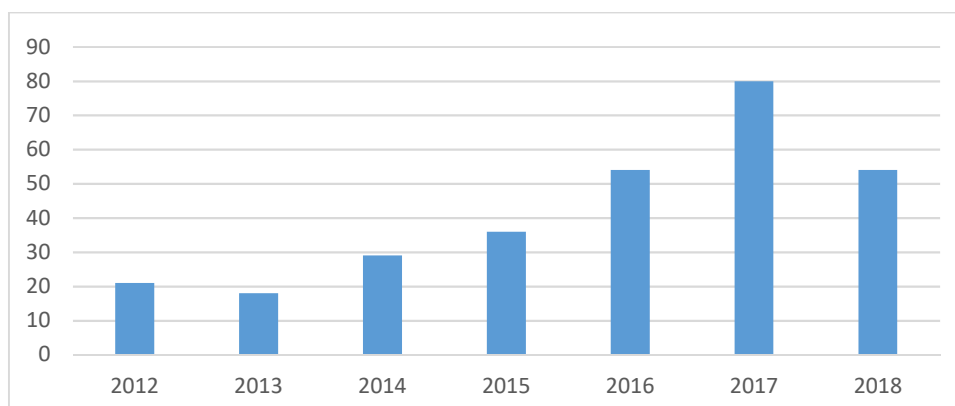


Figure 2. The number of webs launched every year on the MU web platform. Late 2016 has seen the launch of main university website in Umbraco and thanks to that in 2017, one faculty completely migrated all its webs into Umbraco.

Facts and figures about the system:

- The Umbraco customizations, frontend rendering code and javascript libraries developed internally at MU comprise some 180,000 lines of code. Of that, 150,000 is C# code, Javascript and Typescript each take about 12,500 lines, and 5000 are angular HTML templates. Umbraco itself comprises about 500,000 lines of code.
- A custom chromium-based rendering engine is used server-side to render live previews of the content users edit.
- The platform enables not only webs to be built - there are also features for composing and sending newsletters, including basic analytics like a click-through rate or open rate. Already some 1,000 newsletters were sent, reaching out to almost 350,000 individual recipients and comprising more than 1,295,000 individual e-mails. Practically one half of this amount was opened by recipients.

5. UNIFIED VISUAL IDENTITY FRAMEWORK

From the beginning of the MU web platform, we realized that a frontend CSS/JS/HTML framework should also be created to minimize the costs of new webs and enable the platform to scale up.

⁶ Such as a complex student job fair registration system <https://www.jobch.cz/administrace> (developed within a master's thesis <https://theses.cz/id/935kgs?lang=en>) or a platform for advertising student living <https://bydleni.muni.cz/en/>

However, an essential prerequisite for this framework - a unified visual identity - was missing until recently.

Masaryk University did have something we could call a unified visual identity since 1990. Since 2006, there even was a design manual. However, all of this was getting obsolete and was too simple for the new digital requirements such as a manual for web colours, logo application guidelines, etc. To adapt to these requirements, a visual identity revision was needed.

Works on this revision took place during 2015, resulting in a refreshed design manual with a modernized logo. During the revision process, it was soon decided that a full redesign including a new logo and a brand change was needed. But since the timeframe for that was far too long and would postpone the launch of the new identity until 2018 at best, it was decided to complete the identity revision and implement it temporarily, until the full redesign was ready.

All in all, due to the decentralized and somehow disorganized nature of Masaryk University and its processes, it took two iterations to create a fully usable frontend framework and a third one to reimplement it due to the brand change.

5.1. The first framework version⁷

The first frontend framework version was developed simultaneously with the identity revision during 2015 and reflected its outcomes. It was more or less just a proof of concept. Even though it stemmed from the revised identity and included all the latest technical frontend features (it was based upon the Zurb Foundation framework⁸), it was still not backed by a firm university management decision and therefore served only as an option to be considered when preparing a web. Even so, most new webs in Umbraco chose this framework, and a full 62 of them were created throughout 2015 and 2016, including one faculty website.

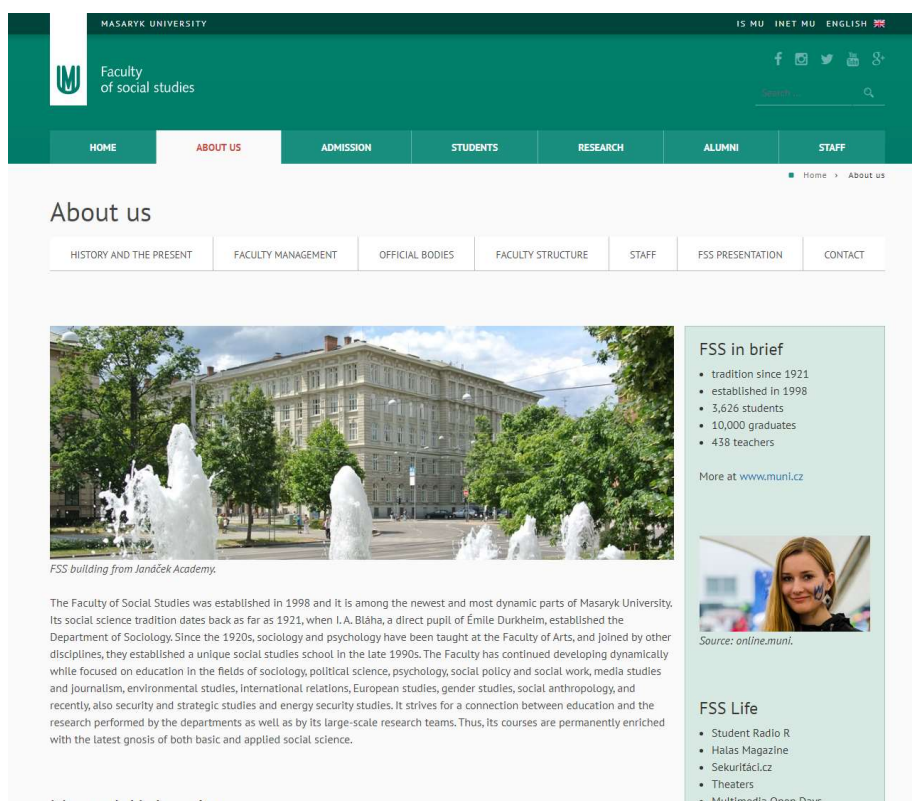


Figure 3. A website created in the first MU frontend framework version.

⁷ <https://sabloni.muni.cz/muniweb/v2015/>

⁸ <https://foundation.zurb.com/>, version 5 at that time

5.2. The second framework version⁹

A firm management decision to push a single frontend framework implemented in Umbraco finally came at the beginning of 2016. It was decided to completely rebuild the main university website and move it into Umbraco (until then, the main university website was run separately, on a custom platform, without a content management system).

To be ready for the full redesign planned for later, the framework had to be built and implemented in Umbraco in such a way that its visual appearance could be easily substituted later. Concerning the HTML/JS/CSS part, its design had to be sufficiently abstract, and it was therefore decided to build it upon the concepts of atomic design¹⁰ and from scratch, without any premade templates or boilerplates.

The atomic design methodology splits the frontend framework into a hierarchy consisting of five levels where each level should consist of the pieces from the previous ones:

- atoms (examples include typography, grid, link design, ...),
- molecules (FAQ boxes, tabs, testimonials, ...),
- organisms (header, footer, ...),
- templates,
- pages.

This helps to define the pieces of the framework and establishes a fixed design system, which can be straightforwardly implemented into a content management system. The concept of assembling more complex items from simpler ones also makes future redesign less painful.

To save time and money, the final framework utilized only the first three levels. Templates and pages were left to be built in Umbraco. Altogether, the framework consisted of about 60 various components on different levels that had to be somehow implemented in Umbraco. In order to maximize the separation of visual form and content, many configuration options were also introduced and made available via the Umbraco editor interface, for example:

- configuration of the web appearance: pickers for the type and content of the main menu, language variants, footer type, logo text, etc.,
- grid editor to create custom content layouts,
- various settings for individual components inserted into the grid: texts, images, various type pickers, etc. These components make up the main web content.

All in all some 350 parameters had to be configured and implemented.

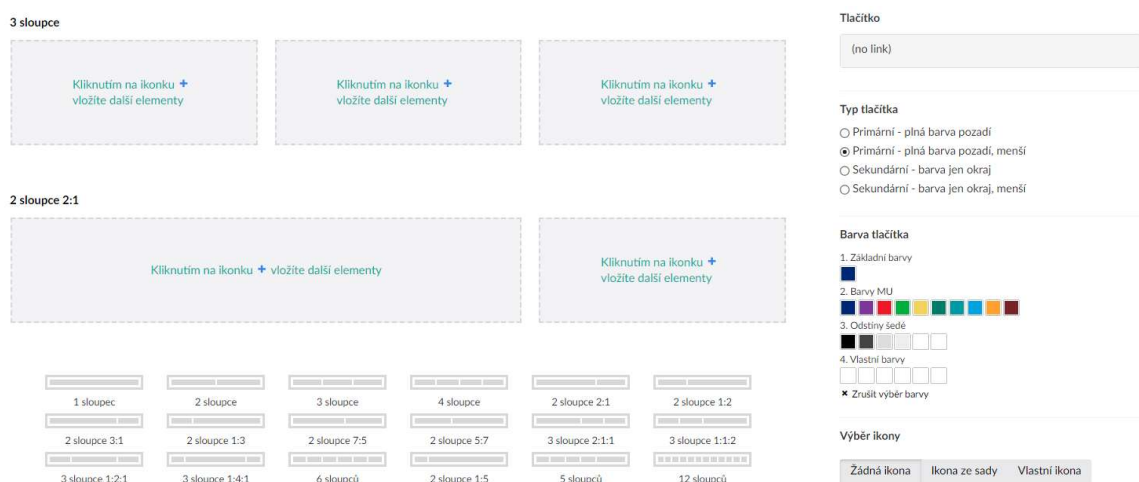


Figure 4. The grid editor and an example of a configuration of a grid component (button).

⁹ <https://sablony.muni.cz/muniweb/v2016/tpl/>

¹⁰ <http://bradfrost.com/blog/post/atomic-web-design/>

It took almost the whole year of 2016 to create the new frontend framework and implement it in Umbraco. The first Umbraco website to be launched based upon the new unified design in late 2016 was the aforementioned main university website. The successful migration of this web helped significantly to bolster the trust in Umbraco and the new visual identity. Since then, about 110 new webs were launched on this framework, including two faculty webs.



Figure 5. A website created in the second MU frontend framework version.

5.3. The third framework version¹¹

During the fall of 2017, a completely new university brand, including a new logo, new colours, custom font, visual impression, etc. was chosen via an open design contest. Thus, a thorough rebranding of the frontend framework was inevitable.

The CSS and HTML parts of the framework had to be completely rebuilt but the Umbraco content had to stay intact, as already around 100 webs were based upon the framework. During the redesign process, this requirement was a very strong imperative, and it made the work harder than to start the design from scratch. Actually, the process took longer than the development of the second framework version.

In late 2018, the work was complete and thanks to the separation of content from the design we were able to switch the templates of all of the 110 webs instantly with no effort. Since then, another 35 new webs were launched in Umbraco based on this framework version, including one faculty web¹².

¹¹ <https://sabloni.muni.cz/muniweb/tpl/muni-framework.html>

¹² At the time of writing, three faculty webs are hosted in Umbraco. Situation of the remaining six faculty webs is as follows: four are in the process of migration to Umbraco while the remaining two will stay on their original platforms, but will use the new visual framework.

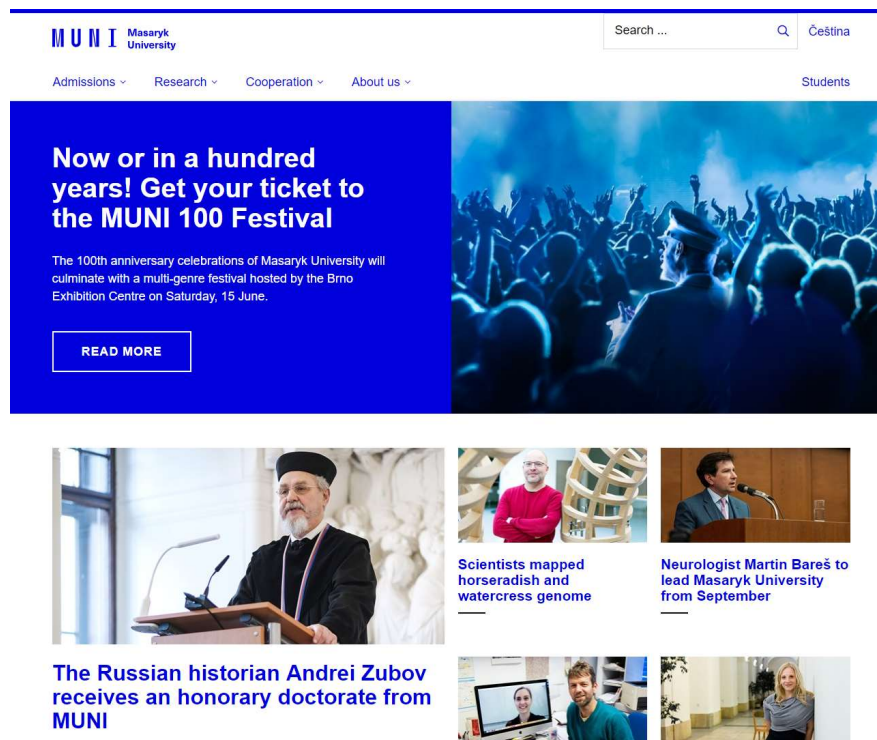


Figure 6. A website created in the third MU frontend framework version.

1. CONCLUSION

In this paper, we presented the process and the steps taken towards a more centralized, more unified and higher quality websites of Masaryk University. We introduced a centralized content management platform developed on top of the Umbraco content management system, and a cutting-edge frontend HTML/JS/CSS framework used for building webs.

From the management point of view, we showed that having great web technologies available and expert IT staff ready to help is not enough when the university does not pull together. Fortunately, the rector's office has decided to use its authority and firmly support the MU web platform, which was accepted by most of the university. Almost all of the new webs currently created at MU are created in the centralized content management platform. The ones outside of it are mostly complex systems where the imposition of a certain technology would rather be a complication than an advantage.

The results are sound and the technical, infrastructural and some of the UX problems mentioned in Section 2 were fixed but the quality of the websites is still not perfect. Although the efforts and resources previously invested in infrastructure and design of new webs could now be redirected into quality content, MU still lacks a digital strategy that would impose an atmosphere of coordination and cooperation. Duplicated content or content spread across multiple websites is still a problem. Also, many of the newly launched webs could easily be integrated into other webs where they would serve their purpose better.

The attempt to implement a proper digital strategy is the next step Masaryk University should take to bring its website quality to the level where it should be for such an institution.

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3. AUTHORS' BIOGRAPHIES

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