

Designing Cross-Device Systems and Evaluating their Potential to Improve Access to Justice

Research Proposal - Jonathan Sayers

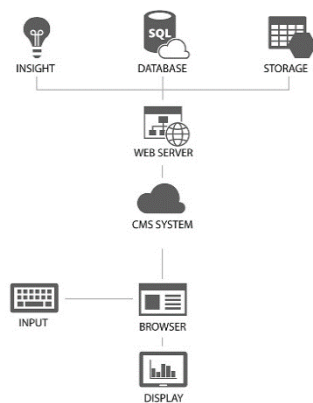


Figure 1a. CMS System

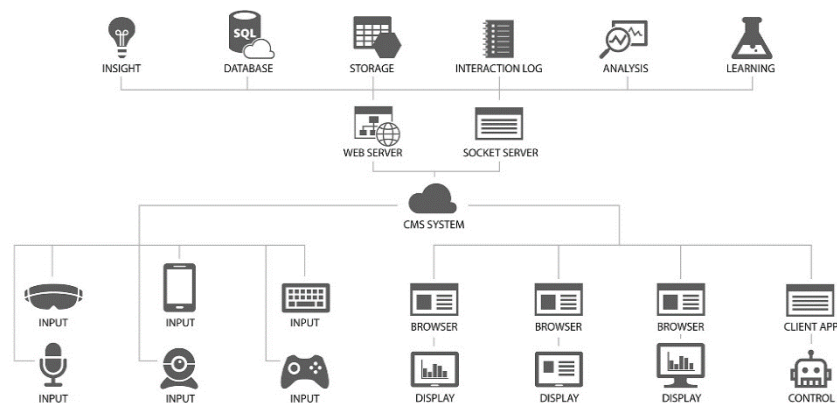


Figure 1b. Cross-Device CMS System

Introduction

Building on the work undertaken in SurfaceConstellations [1] and rising to this works stated ambition to *“inspire users’ creativity to build, use and re-appropriate such environments for various scenarios of use, which we hope takes us one step closer to making cross-device applications available to the masses,”* the purpose of this study is to investigate, prototype and determine the effectiveness of a cloud-based system to deliver on this goal. With recent cuts to legal aid and the court system, there is growing consensus in the legal profession that there is a crisis in access to justice. By implementing cross-device systems that have both the potential to aid technology illiterate participants, and enable greater efficiency in the processing of data by legal professionals, I will investigate how ad-hoc Surface Constellations can be used to improve the experience and reduce the cost of accessing the justice system.

From an architectural perspective, this study will investigate how existing architectural patterns can be used as a starting point for the system, with a particular focus on Xiaohong Qiu’s study of M-MVC [2]. By relating this new area of system design to existing patterns and methodologies I inspire to leave a development framework that other developers can adopt and expand upon.

The success of this research will require far more than a solid architectural footing, as Donald Norman acknowledges, *“In order to achieve high-quality user experience in a company’s offerings there must be a seamless merging of the services of multiple disciplines”* [3], believing the first requirement of an exemplary user experience is to meet the exact needs of the customer, he goes on to say, *“next comes simplicity and elegance that produce products that are a joy to own, a joy to use.”* This study will look to expand on some of the research done in the area of UX Design, and how it has been delivered, including the Microsoft Fluent Design System [4]. The user experience will be key to the analysis of this development and with a starting point of regarding the array of displays as a single Cross-Device View, the intent is to focus on the system interaction as a whole.

From a legal perspective, I will work with academics and practitioners to identify areas where this research can be focused, and its impact measured. From my previous experience prototyping family law systems, implementation focused on litigants-in-person, client triage and online dispute resolution are possibilities that could be explored.

The goals of this study are formalised into the following specific research questions:

Research Questions

1. Can a cloud-based Content Management System be designed as a framework to deliver wide-ranging modular content to Cross-Device Applications?
2. In terms of existing architectural patterns and cloud-based distributed systems, how is such a framework best understood?
3. How does existing good practice in User Experience Design guide the delivery of a Cross-Device View, and what additional practices improve the use of essentially a new interface?
4. Does the implementation of such an interface have the potential to improve access to justice?

Theoretical Framework

Separation of Concerns [5] is a well-established design principle for modular systems, and with the rise in popularity of cloud services [6], it can now be applied to both code structure and architecture. Whilst it could be regarded as contradictory to use separation to facilitate the seamless integration of independent devices, an initial proof of concepts has indicated that it may be key.

The illustrations in *Figure 1a* and *Figure 1b* show an initial overview of how a cloud-based CMS could be expanded to achieve the required functionality. Whereas in *Figure 1a*, inputs such as 'touch' and 'click' manipulate the displayed DOM directly, in *Figure 1b* inputs and displays are separated with inputs sent via messages to a Socket Server which relays them to multiple DOM manipulators for display. This approach allows a single input device to seamlessly interact with all displays in the Cross-Device View and expands upon the aforementioned work on M-MVC and relates in some respects to Mike Potel's early work on MVP [7].

Whilst Portel's work illustrated how a 'presenter control' could be split across front and back ends, and Qiu's model allowed for distributed views and controllers, the proposed research involves a back-end controller and an array of client-side presenters combining to create the Cross-Device View, this could be regarded as a new paradigm, or at least the manipulation of device constraints to achieve an existing one.

Delivering the technical infrastructure is arguably the simplest part of this research, the potential uptake of Cross-Device Workspaces will be evaluated on the user experience and the perceived value. The research will look at the psychological aspects of UX design such as Semiotics, in particular, Saussure's work on signs and signifiers [8] which has been expanded on in this field by Don Norman [3]. Baudrillard and Eco's ideas around HyperReality [9, 10] will prove relevant as the boundaries between simulation and 'the real' blur further, are we experiencing nostalgia for the future as it takes the form of the fiction from our pasts?

If this is indeed the case, it highlights a potential consideration in evaluating what could be perceived as 'futuristic solutions', Murakami, Nakagawa and Yanagisawa identified this characteristic in their work on 'Expectology' [11]. With nostalgia comes expectation, if an interface appears to belong in the science fiction of our past but operates like the systems of the present, the experience may be regarded as negative as the user was promised so much more. This research will investigate if

gamification, artificial intelligence and modern interfaces, such as voice and gesture, offer an antidote to this potential barrier to uptake.

Existing Study

Whilst there is a wealth of study to draw on for both system architecture and user interaction, their combined application to achieve a Cross-Device View will be a new area of research. This study will look at the trends driving wider system delivery and research what might be learned to encourage wider take-up of cross-device computing.

The SurfaceConstellations project [1] highlighted research into software development to deliver solutions across devices, the most relevant for this study being XDBrowser and Connichiwa. [12,13] This study will investigate if their findings have any bearings on our research and what can be learned from their methodology.

Dr Roger Smith and Dr Richard Susskind have written extensively on the effect of technology on the legal profession. Smith on its ability to improve access to justice and Susskind on its likely effect on the profession as a whole [17,18]. The Law Society has launched a Public Policy Commission into the use of algorithms in the justice system, co-chaired by Dr Sofia Olhede from UCL, this commission includes the publication of a Horizon Scanning Report [19] that may help guide the definition of the case studies detailed in Module 3 of the Methodological Approach.

Methodological Approach

The chosen methodology for software development would be closest to that of Extreme Programming [14] as the short cycle between conceptualization and development is suited to the rapid prototyping and proving of ideas. This methodology is also flexible enough to deal with changes in direction and combined with a modular approach to architecture would allow the research to react to new developments and breakthroughs.

The implementation of the system to aid access to justice will use the 'Design Thinking' methodology, taking an empathetic approach to the user's issues and exploring then prototyping possible solutions. The effect of multi-device interfaces cannot be assessed in isolation so the solutions designed must take into account current and future advances in legal technology.

The research and development will broadly fall into the following four modules:

Module 1: Research, build and evaluate a cloud-based Content Management System to deliver a Cross-Device View to Cross-Device Workspaces.

Module 2: Research and build User Interfaces and evaluate use patterns and user experience of Cross-Device Systems.

Module 3: Define real-life case studies and focus groups, taking advantage of synergy with other research projects, and the UCL Faculty of Laws.

Module 4: Configure the system to deliver content for defined case studies and evaluate advantage over existing delivery methods.

Quantitative Analysis

The aggregation and pivoting of web server logs will form the basis of the quantitative research, tools such as Google Analytics automate this task and offer great insight, whilst Microsoft's HDInsight goes even further and integrates into the design environment giving you feedback on the performance of your code as well as the websites.

The separation of inputs from views illustrated in *Figure 1b* and advocated in this research proposal offers a further possibility, which is potentially very powerful for research. The proposed Interaction Log will store a timestamped record of every DOM command. This allows user sessions to be both duplicated in real time, for instance, a researcher watching a subject’s navigation of the system in another location, and recreated ‘click-for-click’ for analysis at a later date.

Qualitative Analysis

The qualitative analysis will follow the “Semi-structured Qualitative Studies” guidelines laid out by Ann Blandford for the Interaction Design Foundation [15]. Technology will be used to gather feedback where possible as this would enable the additional logging of feedback against the session timeline. IoT devices such as microphones or mood buttons could be included as inputs in the system architecture, their use also recorded in the Interaction Log.

Researchers could play back sessions from the Interaction Log with users and discuss their interactions with them to gain further insight into what they were experiencing. The availability of detailed timings, use paths and logged system errors would act as a form of triangulation to strengthen the qualitative theory.

Whilst working with legal professionals to define and implement the case studies outlined in the Methodological Approach, a set of metrics for the measurement of success would be defined, these would later be used to analyse the results from an ‘access to justice’ perspective.

Timeline

	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Literature Review																
Research Question																
Module 1																
Module 2																
Module 3																
Module 4																
Evaluation																
Thesis																

Suitability

For the last three years, I have led a small team in the research and development of solutions for the legal profession. Looking at issues around access to justice, working with family lawyers and talking to various stakeholders from government and legal organisations, we designed and prototyped a system called Siaro, that if implemented would, as Dr Roger Smith stated in his Legal Education Report, “have *tremendous possibilities in cutting costs while potentially raising standards*” [17].

Drawing on my experience in both Graphic Design and Development, we produced a modular cloud-based content management system and recursive logic engine that enabled the delivery of responsive templates across all devices. Due to the sensitive nature of the data, security was the starting point for system design, with further emphasis on defining standard digital case definitions and looking at how their visual representation could give immediate insight into the case.

The work on standardising data definitions and visual analytics stem from my previous position working in the City for a Lloyds Broker. Designing both distributed sales systems and claims and

underwriting analysis solutions, this was a data heavy position. I wrote queries and visualised the results to represent claims trends, earning patterns, burn rates and claims triangulation.

The availability of cloud services such as Microsoft Azure, and my combination of creative and technical experience, have enabled me to produce scalable, secure systems to prove ideas quickly. This is an incredibly rewarding time to design and develop systems, and with artificial intelligence set to change the structure of the professions, research into how we will work and accessibility to technology is vitally important. I am keen to move into an academic environment, to formalise my research, and believe that working alongside academics and other students, I will continue to learn and will be able to define and produce solutions that have the potential to influence future developments, and ultimately, guide how we prepare professionals for careers that will be significantly different from today's.

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