Server-Side Experimentation

Common challenges from 12 organisations in The Netherlands

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Server-Side Experimentation: common challenges from 12 organisations in The Netherlands

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ABSTRACT

Background: experimentation is widely adopted within industry. Many large organisations have invested in their own infrastructure to be able to run experiments server-side. *Objective*: we wanted to investigate why organisations switch to server-side experimentation and which challenges they encounter in doing so. *Method*: a qualitative virtual discussion based on a survey was conducted. Twelve Dutch organisations, represented by twelve interviewees, participated in the study. *Results*: organisations switch to server-side experimentation to run higher quality, more advanced and cheaper experiments. Challenges organisations face are: a shortage of development resources, no standardized process and a lack of a culture of experimentation. *Conclusions*: this is the first study that explores why organisations from The Netherlands in transition to continuous experimentation choose for investing in server-side experimentation infrastructure, and the challenges they encounter.

KEYWORDS

Continuous Experimentation, A/B Testing, Infrastructure

1 INTRODUCTION

Organizations like Microsoft, Google, Facebook and Booking.com use online controlled experiments (A/B tests) to assess the impact of changes made to software products and services [2]. The evolution to doing continuous experimentation is well understood and documented within the context of these large tech companies [1]. Many of these tech companies invest in their own experimentation platform, because it is perceived as critical to their business [3].

In organisations where continuous experimentation is not (yet) the standard, but A/B testing is being done to optimise the user experience, this is often done via 3rd party tooling. Examples of this kind of tooling is Optimizely, VWO or Google Optimize. These tools make it easy to start A/B testing by offering many necessary components out of the box, without the need of developing their own infrastructure. Most of the time these experiments are performed client-side, by changing the experience in the browser of the user. The implementation is often easier, in comparison to server-side experimentation, where more integration is necessary.

From interacting with industry peers we learned that more organisations are investing in their own server-side experimentation infrastructure. In this paper we explore why that is and what the challenges are that 12 organisations experience during the transition from external client-side tooling to internal server-side experimentation.

We expect to add to the increasing academic literature on this topic from the perspective of organisations where continuous experimentation is not yet the standard.

1.1 Research Questions

We have defined the following two research questions:

RQ1: Why are organisations switching to or building server-side experimentation infrastructure?

RQ2: What challenges do organisations encounter when making the switch to server-side experimentation?

The remainder of this paper is structured as follows. In Section 2 related work is described. In Section 3 we outline the study design. The results of the study are described in Section 4. We discuss the results in Section 5, and finally, in Section 6 we make conclusions and outline future work.

2 RELATED WORK

A mapping shows that organisations from all sizes and sectors perform continuous experimentation, but the research is dominated by organisations such as Microsoft, Google, and Facebook [7]. There is currently little knowledge available in how large organisations can start the transition to continuous experimentation [5]. The same study identifies developing experimentation infrastructure as a potential future research topic.

3 RESEARCH DESIGN

This study followed a three step process: selecting organisations to participate, a survey and a virtual discussion.

3.1 Selection of organisations

From the network of one of the leading digital experimentation agencies in The Netherlands, people from industry were invited to participate in a knowledge session on server-side experimentation. Participants (n=20) were selected based on expertise with or shown interest in the topic. 14 persons accepted the invitation.

3.2 Survey

The first two authors created a short survey (see appendix A) with open-ended questions which was sent out to the participants to better understand the state of server-side experimentation at the participating organisations. Example questions: is server-side experimentation possible? If yes, where was this technology developed (internal/external)? Why did organisation X choose to develop/buy server-side experimentation technology? What where the most important challenges during development/implementation? If server-side experimentation was not possible: is development/buying of

server-side experimentation being considered with organisation X, and why? 11 persons filled in the survey.

3.3 Virtual discussion

Based on the outcome of the survey a virtual discussion was organised. A broad range of representatives from Dutch companies from different industries were present: e-commerce (4), retail (2), entertainment, finance, government, media, telecom and travel. 8 out of 12 participating organisations already developed or bought a server-side experimentation platform.

The participants (n=12) were placed in four groups to discuss the following two questions:

(1) why did your organisation develop/do you consider server-side experimentation?
(2) which challenges do/did you experience?

The discussion took 2,5 hours and insights were captured in a virtual collaboration tool, figure 1 shows the outcome. The first two authors were present during the discussion.

Figure 1: Outcome of virtual discussion
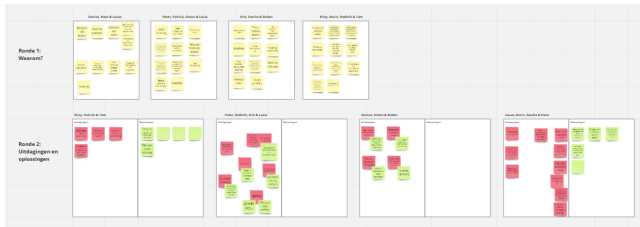
Results captured in a virtual collaboration tool

4 RESULTS

In this section the results from the study will be described.

Of the organisations that were present, 8 out of 12 currently have a server-side experimentation solution in place, 5 have developed this solution internally. The other three organisations use an externally developed tool.

4.1 Why server-side experimentation

The participants from our sample mention three main reasons why they switched to server-side experimentation, or why they are exploring the possibilities of switching, as indicated in figure 2.

4.1.1 Higher quality experiments. Client-side executed experiments can lead to a visible flashing of web components [4]. This flickering effect is also known as Flash of Original Content (FOOC) [6]. Running experiments server-side takes away this issue. Building of experiments is also more in control of developers, in stead of product managers. This ensures higher quality code and less errors.

4.1.2 More advanced experiments. Server-side experimentation is easier to integrate in the development pipeline, making it possible to perform more advanced experiments, like testing complete product features, algorithms and sequence of checkout pages. It also allows

for doing experimentation in environments with a strict deployment process, like online banking.

4.1.3 Lower cost per experiment. This better integration with existing development infrastructure makes it possible to let more product teams experiment independent from each other, increasing the velocity of the number of experiments. Next to that. experiments with positive results are easily deployed to all users, simply because they have already been build for production. This lowers the cost per experiment.

4.2 Challenges

Organisations also experience many challenges during and after the process of switching to server-side experimentation. This is summarized in figure 3.

4.2.1 Lack of development resources. With server-side experimentation the development of experiments is more dependent on developers coding variations. Many teams choose to not spend valuable developer resources on running experiments. The lack of developer resources can hinder the number of experiments an organisation does.

4.2.2 Lack of culture of experimentation. In case of conflicting priorities teams often choose to just 'build and ship it' and not spend some extra time on running an experiment. Teams that are managed on output have an incentive to build features and spend less time on validating if the feature actually delivers customer and business value. This is a known challenge from many larger organisations [1], [2].

4.2.3 Lack of development resources central experimentation team. Although the benefit of developing internal experimentation infrastructure is that it can fully integrate with other parts of an organisation, this choice does mean organisations have to invest in further development and/or maintenance.

4.2.4 Lack of standardized process. Enabling more teams to run their own experiments via the server-side experimentation infrastructure can lead less structure in the way experiments are run. Some organisations therefore invest more in training and in simplifying the interface.

4.2.5 Integration with existing analytics. Many client-side experimentation platforms have analytics built-in to the platform. Organisations that build their own infrastructure have to decide if they will also implement server-side analytics or integrate with existing analytics infrastructure, like Google Analytics.

5 DISCUSSION

The outcomes of our virtual discussion as presented in this paper highlight *why* organizations have adopted server-side experimentation, and what *challenges* such organizations face. From this, we suggest two main lines of action.

First, the reasons why organisations switch to server-side experimentation we distilled give us insight in what value server-side experimentation brings (higher quality, more advanced experiments, and lower costs per experiment). In order to further increase this

Figure 2: Why server-side experimentation
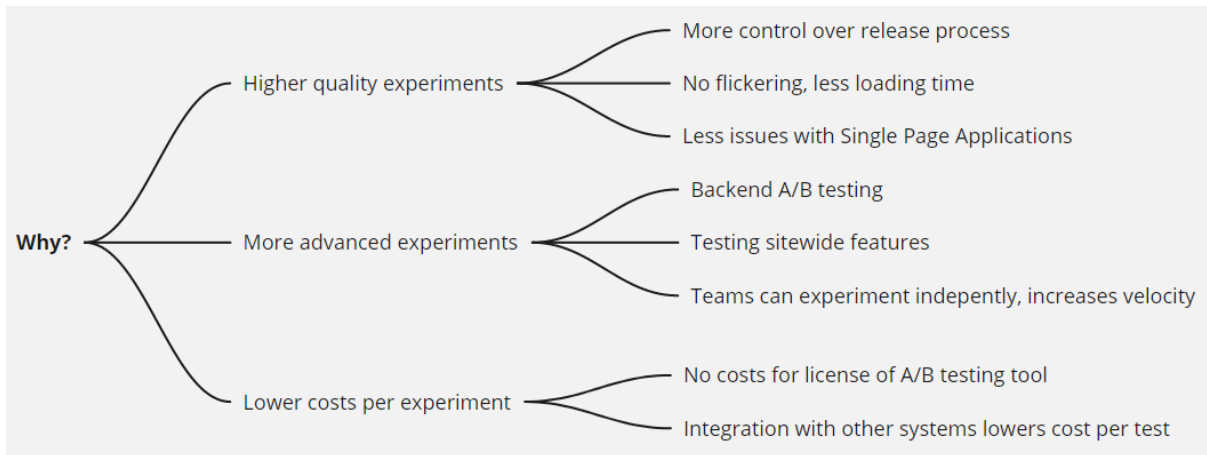
Reasons why organisations switch to server-side experimentation

Figure 3: Challenges
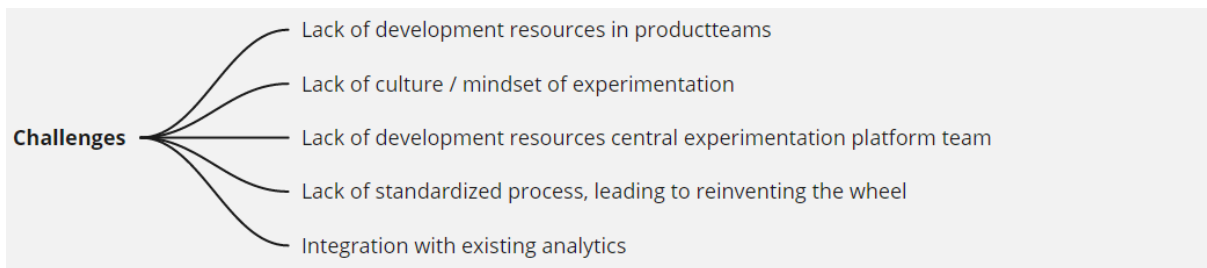
Challenges organisations experience while or after switching to server-side experimentation

value, researchers, organizations adopting experimentation, and solution providers can focus on one or more of the eight sub-reasons distilled. For example, testing side-wide features is a reason to adopt server-side experimentation, which also comes with a range of complications, such as managing of dependencies among parts of the side wide feature, finding relevant side wide metrics, and so on. Addressing these complications will increase the value of server-side experimentation.

Second, the challenges identified pose impediments to the successful adoption. Here the sub-reasons offer pointers to work that needs to be done to take away these impediments. For example, if lack of culture / mindset is a problem, this may be an issue to address *first*, before investing in server-side tooling.

Naturally, our results come from a limited set of organizations in a specific region. Likely when we expand with companies of different sizes, from different application domains, or from other regions we will find additional reasons to adopt server-side experimentation, as well as new challenges that the 12 organisations in our study have not yet been facing. Our results serve as a starting point to conduct such further studies.

6 CONCLUSIONS

This is the first paper that explores why organisations from The Netherlands in transition to continuous experimentation choose for investing in server-side experimentation infrastructure, and the challenges they encounter. Reasons that organisations switch to server-side experimentation is to perform higher quality and more advanced experiments, while reducing the costs of running experiments. Common challenges that people experience are a lack of development resources (in product teams and central platform team), culture of experimentation, the need for a standardized process and integrated analytics.

We hope this paper will trigger more research in academia and industry to accelerate the adoption of experimentation across industry.

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REFERENCES

[1] Aleksander Fabijan, Pavel Dmitriev, Helena Holmström Olsson, and Jan Bosch. 2017. The evolution of continuous experimentation in software product development: from data to a data-driven organization at scale. In *Proceedings of the 39th International Conference on Software Engineering*. IEEE Press, 770–780.

[2] Somit Gupta, Ronny Kohavi, Diane Tang, Ya Xu, Reid Andersen, Eytan Bakshy, Niall Cardin, Sumita Chandran, Nanyu Chen, Dominic Coey, et al. 2019. Top challenges from the first practical online controlled experiments summit. *ACM SIGKDD Explorations Newsletter* 21, 1 (2019), 20–35.

[3] Somit Gupta, Lucy Ulanova, Sumit Bhardwaj, Pavel Dmitriev, Paul Raff, and Aleksander Fabijan. 2018. The Anatomy of a Large-Scale Experimentation Platform. In *2018 IEEE International Conference on Software Architecture (ICSA)*. IEEE, 1–109.

[4] Ron Kohavi, Diane Tang, and Ya Xu. 2020. *Trustworthy Online Controlled Experiments: A Practical Guide to A/B Testing*. Cambridge University Press.

[5] Eveliina Lindgren and Jürgen Münch. 2016. Raising the odds of success: the current state of experimentation in product development. *Information and Software Technology* 77 (2016), 80–91.

[6] Silver Ringvee. 2019 (accessed September 26, 2020). *What Is FOOC and How to Get Rid of It?* https://reflectivedata.com/what-is-fooc-flicker-how-to-get-rid-of-it/.

[7] Rasmus Ros and Per Runeson. 2018. Continuous experimentation and a/b testing: A mapping study. In *2018 IEEE/ACM 4th International Workshop on Rapid Continuous Software Engineering (RCoSE)*. IEEE, 35–41.

A SURVEY QUESTIONS

The following questions were asked in the survey prior to the virtual discussion:

(1) Is it possible to perform server-side experimentation at organisation X?

(2) In case answer on question 1 is *yes*
  (a) Where was this technology developed (internal/external)?
  (b) Why did organisation X choose to develop/buy server-side experimentation technology?
  (c) What where the most important challenges during development/implementation?

(3) In case answer on question 1 is *no*
  (a) Is development/buying of server-side experimentation being considered within organisation X?
  (b) If *yes*, why is development/buying of server-side experimentation being considered?
  (c) If *yes*, what are the most important challenges you have encountered in the process (until now)?

(4) What is the name of your organisation? (*optional*)