Joanna Brumfield

WEB-425

Department of Web Development, Bellevue University

Professor Richard Krasso

March 24, 2024

**The Principles Underpinning DevOps**

In software, DevOps is a framework designed to blend development and operations processes into a unified system. This methodology, defined as "a set of practices intended to reduce the time between committing a change to a system and the change being placed into normal production, while ensuring high quality,"(Riungu-Kalliosaari et al., 2016), enables organizations to efficiently produce high-quality products, create high customer satisfaction, foster an innovative and positive environment to work in, while continuously improving due to the consistent feedback loops.

There are many principles that underlie DevOps; The DevOps Handbook refers to these main principles as the Three Ways: Flow, Feedback, and Continual Learning and Experimentation. These concepts are essential for understanding how DevOps help ensure quality, reliability, and faster delivery.

The first, which is defined as Flow, is essentially a framework for creating efficient processes that do not create bottlenecks for downstream work centers. This is achieved by making work visible, which includes using tools like kanban boards to visualize processes and progress, limiting work in progress (WIP), which includes controlling queue sizes, reducing batch sizes and modularizing tasks, minimizing handoffs, identifying constraints, and eliminating hardships and waste in the value streams, which can include using tools such as value stream mapping (VMS). "Improving flow through the technology value stream is essential to achieving DevOps outcomes." (Kim et al., 2021).

The second way, The Principle of Feedback, focuses on the critical nature of creating rapid feedback loops for quick detection and resolutions of issues, as well as opportunities to learn and grow through communication and creating safe environments for mistakes, which inevitably happen. The approach involves promptly identifying and addressing issues, swarming to solve problems, which entails stopping everything and getting all hands on deck until a problem is solved vs. waiting to find time, keeping quality at the source in order to empower local teams close to the issue, and optimizing processes for downstream work centers to avoid more complex issues from arising (Kim et al., 2021).

The third way, Principles of Continual Learning and Experimentation, focuses on fostering a culture of continuous learning and experimentation across the organization, and encouraging the collaboration of development and operations teams. The handbook focuses on enabling organizational learning and safety culture, institutionalizing the improvement of daily work by paying down technical debt, fixing defects, and refactoring and improving problematic areas of code and environments, transforming local discoveries into global solutions, injecting resilience patterns into daily work, and leaders reinforcing a learning culture (Kim et al., 2021).

In a case study focusing on the benefits and challenges of employing DevOps, the respondents “highlighted the implementation of more features and more frequent releases.” They noted automation and intensified feedback cycles as the main drivers. One lead developer stated “There are multiple factors, relating to this but yes, definitely one of the key drivers of DevOps is actually that you can get more commits of code into each day basically.” (Riungu-Kalliosaari et al., 2016).

Another critical success factor found when doing a systematic literature review of DevOps was the emphasis on social and cultural success, as that is what truly bridges the gap between both development and operational teams and creates successful organizations. “When a company has good collaboration, this leads the organization to achieve good progress for successful implementation of DevOps practices” (Azad & Hyrynsalmi, 2023) The study noted that “cultural shift’s impacts on DevOps adoption are bigger than technical or process issues.” and that “companies should emphasize culture rather than tools that will help with task execution.” This emphasis on collaboration and company culture underpins the “Third Way” laid out in the DevOps handbook.

By bridging the divide between development and operations processes and focusing on a holistic process involving the three principles of DevOps, it is clear there are many benefits to everyone who has a stake in an organization. There are various case studies and systematic reviews noting the benefits of employing DevOps to get faster deployment times, enhanced product quality, improved customer satisfaction, and continuous feedback for growth.

**References:**

Azad, N., & Hyrynsalmi, S. (2023). DevOps critical success factors — a systematic literature review. *Information and Software Technology*, *157*, 107150. https://doi.org/10.1016/j.infsof.2023.107150

Kim, G., Debois, P., Willis, J., Humble, J., Forsgren, N., & Allspaw, J. (2021). *The devops handbook: How to create world-class agility, reliability, & Security in Technology Organizations*. IT Revolution Press, LLC.

Riungu-Kalliosaari, L., Mäkinen, S., Lwakatare, L. E., Tiihonen, J., & Männistö, T. (2016). DevOps adoption benefits and challenges in practice: A case study. *Product-Focused Software Process Improvement*, 590–597. https://doi.org/10.1007/978-3-319-49094-6\_44

* **Design & Development: Characterized by high variability and creativity, tasks in this phase are unique and unpredictable.**
* **Testing & Operations: Aims for predictability and efficiency, mirroring Lean Manufacturing principles to achieve consistent outputs and minimal defects.**