

Empowering Productivity¹

Mission

The modern workplace demands more of its employees than ever before. We empower the productivity of software developers, improving the efficiency and effectiveness of software development teams by amplifying the cognitive capabilities of individuals.

Objectives

We focus on empowering the productivity of individuals and teams by analyzing, modelling, and developing novel approaches that foster productive behaviours at work. In particular we focus on the following topics:

Increasing focus at work

Knowledge workers experience frequent interruptions from their co-workers. While some of these interruptions are important and necessary, others can cause a high cost, especially if they happen at inopportune times. We aim to reduce expensive interruptions, both external and self-induced, to increase focused work time. An example of our research is the *FlowLight*, a desktop traffic light that indicates a worker's interruptibility to co-workers and has been shown to significantly reduce interruptions.

Monitoring productivity

Little is known about how to best measure the productivity of developers, teams, and organizations. Assessing productivity is especially challenging given today's complex, highly fragmented, and collaborative work. Our objective is to use personal and biometric data to understand and monitor productivity, provide meaningful self-monitoring approaches, and foster productive behavior in developers. One example of our research is *PersonalAnalytics*, a self-monitoring approach that provides (actionable) productivity insights for individuals.

Automating workflows

Developers have to perform a variety of complex tasks while they work. To accomplish these tasks, developers have to perform several atomic steps, combine many disparate sources of information, and use multiple tools and applications. We aim to automatically identify developers' task workflows and automate the atomic steps so developers can focus on the intent of their high-level tasks. One approach we are currently working on is *Devy*, a voice-activated conversational assistant (like Apple's Siri) that automates complex cross-application workflows for high-level tasks.

Reducing information overload

Software development teams constantly deal with an avalanche of information. Making smart decisions as development proceeds can be difficult given the time constraints most development

¹ This proposal has been expanded and submitted for the 2017 GCRC competition in conjunction with collaborators from Computer Science (Science), Psychology (Arts), Psychiatry (Medicine), School of Public Health (Medicine), and Organizational Behaviour (Sauder). An updated SE-specific strategic plan will be submitted by Nov 13.

teams face. We work on recommenders that can help bring forward the right information to make a decision at the right time in the development process. An example of a past project is the Eclipse *Mylyn* project that provides a recommendation of which files and source code are associated with a given task. Current recommenders being investigated focus on identifying and representing design constraints that exist for a system under development to help a development understand and evolve the design of a system to meet desired quality goals.

Supporting effective testing

Software quality is an invariant in the modern workplace; despite increases in velocity and complexity, there is an expectation that the quality of work is maintained. Our objective is to help developers to achieve continuous high quality by supporting effective testing. In particular, we aim to identify metrics and develop approaches that help developers to track, review, and improve the quality of their work. As an example, we have previously shown that common metrics for assessing the effectiveness of automated testing approaches are insufficient and are currently working on new and more meaningful metrics to help developers better assess the quality of their work.

Who We Are

Dr. Gail Murphy, Dr. Reid Holmes and Dr. Thomas Fritz are all professors in Computer Science. We work collaboratively in the Developer Productivity Group (DevProG) currently supervising more than 20 graduate and undergraduate students. We are in the process of increasing the lab size to adequately address our research objectives and vision.

Impact and Industrial Relationships

Our ultimate goal is to improve the productivity of professional developers and knowledge workers. To achieve this, we are collaborating with more than 20 industrial partners. Collaboration takes many different forms. For instance, one form of collaboration involves placing tools we develop into the work site to provide continuous insights on and suggestions for their teams' work practices. As another example, we frequently conduct formative interview-based studies at work sites to gain an industrial perspective and propose new projects that can improve the work site practices. We further develop concrete approaches and tools to improve productivity, some of which have already been deployed with more than 500 professionals over periods longer than a year.

University Collaborations

Given the multi-disciplinarity nature of our objectives, we are actively collaborating with researchers within the department of Computer Science, in particular researchers in Human Computer Interaction and Cognitive Sciences, as well as within the university environment, including researchers in psychology, business, information sciences and engineering.

Teaching

We train our students to be top software developers as soon as they leave the university and create a measurable impact on the productivity of the teams they are working in. By fostering active interaction between students and professional software developers, they are able to contribute effectively to the productivity of their teams directly after graduation.