



# Individual empowerment of agile and non-agile software developers in small teams



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## ABSTRACT

**Context:** Empowerment of employees at work has been known to have a positive impact on job motivation and satisfaction. Software development is a field of knowledge work wherein one should also expect to see these effects, and the idea of empowerment has become particularly visible in agile methodologies, in which proponents emphasise team empowerment and individual control of the work activities as a central concern.

**Objective:** This research aims to get a better understanding of how empowerment is enabled in software development teams, both agile and non-agile, to identify differences in empowering practices and levels of individual empowerment.

**Method:** Twenty-five interviews with agile and non-agile developers from Norway and Canada on decision making and empowerment are analysed. The analysis is conducted using a conceptual model with categories for involvement, structural empowerment and psychological empowerment.

**Results:** Both kinds of development organisations are highly empowered and they are similar in most aspects relating to empowerment. However, there is a distinction in the sense that agile developers have more possibilities to select work tasks and influence the priorities in a development project due to team empowerment. Agile developers seem to put a higher emphasis on the value of information in decision making, and have more prescribed activities to enable low-cost information flow. More power is obtained through the achievement of managing roles for the non-agile developers who show interest and are rich in initiatives.

**Conclusion:** Agile developers have a higher sense of being able to impact the organisation than non-agile developers and have information channels that is significantly differently from non-agile developers. For non-agile teams, higher empowerment can be obtained by systematically applying low-cost participative decision making practices in the manager–developer relation and among peer developers. For agile teams, it is essential to more rigorously follow the empowering practices already established.

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## 1. Introduction

It is now more than 10 years since the agile movement started to have a significant impact on the software development industry. Since then, agile development approaches have grown from a somewhat obscure status to mainstream, and we have been introduced to the meanings of Extreme Programming [1], Scrum [2] and Lean Development [3]. The proponents of agility suggest a collection of technical and social practices that, when combined, constitute development processes that are distinct from traditional software development, and, supposedly, should ensure higher quality in software at less cost.

The agile manifesto<sup>1</sup> gives us an idea of what agile software development is, by emphasising “Individuals and interactions over processes and tools”, “Working software over comprehensive documentation”, “Customer collaboration over contract negotiation” and “Responding to change over following a plan”. But in research we also need to understand the theoretical underpinnings of the concept in order to be able to analyse it rigidly, and complement the formulations found in the manifesto. Theoretical elaborations include Conboy [4] who defines agility in software development as emerging from a flexible and lean development team. Vidgen and Wang [5] define agility as built on three principles adopted from complex adaptive systems theory: (1) match co-evolutionary change rate, (2) optimise self-organising, and (3) synchronise exploitation and exploration of

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<sup>1</sup> <http://www.agilemanifesto.org>.

knowledge. For Lee and Xia [6], central foundations for agility include the concepts of autonomy and team diversity.

Empowerment in the workplace has a long tradition in practice and research, and there is a substantial literature describing the effects of empowerment in different types of organisations [7–13]. Positive effects on productivity, product quality and innovation, as well as affective reactions like workers' job satisfaction and motivation are found both in blue-collar and knowledge-based lines of business [14], and thus we also expect to see some of these effects in the software development organisation as a result of introducing empowering processes and structures. The empowerment concept is often discussed in terms of structural empowerment, that is, the organisation's approach to empower its workers [15], and psychological empowerment, that is, the individual person's feeling of having control of one's own work [16]. Mathieu et al. [17] assert that psychological empowerment is highly dependent on structural empowerment. Further, psychological empowerment is again an antecedent for performance, job satisfaction and motivation [18], which are some of the effects aimed for and claimed for in agile software development. Hence, empowerment is a concept worth analysing in relation to agile software development. Still, research that studies the effects of empowerment in software development is scarce, even though there is some evidence that agile processes increase job satisfaction and motivation, and that this is caused by agile developers being more empowered than non-agile developers [19]. On the side of this argument, it is worthwhile mentioning here that research has not shown a correlation between job satisfaction and productivity [20], but job satisfaction has the positive effect of less turn-over in the business, and with that less cost on recruitment and training [21]. This alone makes empowerment a goal worthwhile pursuing for any software development organisation.

Much of the professional literature on agile software development focuses on practices that aim to enhance productive social interaction and participation, like stand-up meetings, iteration planning, iteration retrospective, and even pair programming, which all contribute to shaping decision processes and empowering the development teams and the individual developers [1,22–25]. McHugh et al. [26] discuss how such practices have higher motivation as a consequence when enacted in meaningful ways. Even if empowerment is not mentioned explicitly in theoretical studies of agility in software engineering, empowerment as a concept is deeply intertwined with the theoretical concepts that define agility: Team empowerment has been considered a foundation for leanness [27], which is central with Conboy [4]; it is overlapping strongly with the concept of team autonomy and self-organisation, which is considered central by Lee and Xia [6] and Vidgen and Wang [5]; and it is also considered a result of the team's ability to, on its own, effectively explore and exploit new knowledge in the work process [15], which is claimed by Vidgen and Wang [5] to be central for agility. Maruping et al. [28] use a control theory perspective and shows that the successful agile teams have control modes that provide team autonomy in development combined with a strong focus on the project objectives. We see that concepts that contribute to defining agile software development both practically and theoretically, like participation, interaction, autonomy, self-organisation, and knowledge exploration, all have a strong "team empowerment" association to them. Hence, empowering the developer team is deeply melded into the effective realisation of agile software development.

In the professional literature, practices and perspectives in agile development have the aim of increasing the performance of the team, often by enabling empowerment of the individual developer within the team. Some examples of agile practices that potentially empower the individual are

- *Stand-up meetings*: Developers present their problems, suggest solutions to other developers and to the team, and choose tasks for their own work day.
- *Pair programming*: Developers work together with another developer, influence the partner's work, and learn about solutions in the current project as well as available technologies.
- *Shared code ownership*: Developers have the freedom to change other team mates' solutions, whenever the developer finds it necessary.

Individual, affective effects like higher job satisfaction and motivation are known to be a consequence of individual, psychological empowerment [29]. At the same time we know that empowered teams have a higher level of job satisfaction [30]. This higher level applies at both the individual level and at the team level [31]. Since team empowerment is so central in an agile software development organisation's overall approach, it could with its implementation through the agile practices found in the literature, potentially lead to the effects of individual psychological empowerment, and further to job satisfaction and motivation for the individual. But, whether the agile practices in fact leads to a higher level of individual empowerment than found elsewhere, and if so, how strong it is, is not obvious. Only through empirical studies can we find out what these effects are.

At the same time, even though non-agile software development organisations work according to processes whereby empowering practices are not explicitly emphasised, this does not mean that the non-agile developers are not empowered. For example, Shrednick et al., from before the agile development era, discuss how empowerment improve on information systems development [32]. In many cases, non-agile development organisations have adopted supplementary practices that ensure high levels of participation in decisions regarding their work, as exemplified by many software process improvement initiatives [33]. These are forms of empowerment that may have the same effects as the practices found in agile software development. There is as of yet no reason to claim that non-agile software developers are less empowered than agile.

This study examines how empowerment for the developer is enabled in both agile and non-agile software development organisations, and the aim is to determine whether there is a difference between agile and non-agile development processes in this regard and further, to what extent the individual developer is empowered. As mentioned, agile processes implicitly suggest high team empowerment levels, but how this contributes to how the single developer feels empowered is not clear. Since empowerment is an underlying, maybe even defining facet of agility, we should expect to see some differences.

The starting point for this research is to try to identify the differences in how developers in software development organisations are empowered, then further to discuss why these differences occur, and finally ask ourselves whether we can conclude that there are differences in levels of empowerment, and what consequences these have. To answer these questions, data from 25 semi-structured interviews with agile and non-agile developers from Canada and Norway are used. The interviews are with businesses developing software for the oil industry, finance industry, graphical printing, public information systems and several other areas. The data came mainly from programmers and managers, but also the occasional tester and business representative. The interviews are analysed qualitatively according to a conceptual model that includes factors that influence empowerment, including involvement, power, information flow and sense of impact.

The article first presents some background material on empowerment and how it is studied in general and then continues with an overview of some of the research that has been conducted on this

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