# A study of the agile whole team and its effectiveness in the software development process

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We hereby certify that this dissertation, submitted by Matthew Robert Ganis, satisfies the dissertation requirements for the degree of *Doctor of Professional Studies in Computing* and has been approved.

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# Abstract

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In early 2000 several software development methodologies began to receive increasing public attention. Close collaboration between the development team and the business experts (or product owner) and a constant stream of communication was thought to be paramount. As such, during a development cycle, teams would strive to deliver code as frequently as possible, producing deployable business value with each release at a regular cadence. These methods, known as agile Methodologies have continued to gain considerable interest in the IT community over the last several years. This acceptance is supported by a number of industry surveys indicating the rapid acceptance of these methods in the software development industry

As a result of the formalization of these methodologies, teams will adhere to a number of practices defined within these methods that represent best practices in software development. These practices, when followed, allow a team operate with a higher level of agility and speed to market than traditional methodologies allow for, enabling a rapid response to customer change. Many of these practices are synergistic in nature, increasing their effectiveness when supporting practices are implemented and conversely, causing a decline in their effectiveness when not implemented.

While there have been a large number of experience reports produced in the popular literature that detail that the various success rates teams enjoy with these methods, little has been documented on the optimization of the various agile practices and the effect they have on teams. This dissertation examines the effect of the whole team (a practice that emphasizes the need to include all of the subject matter experts and disciplines within the same team) on the morale and productivity of an agile development organization. To date, there has been no empirical evidence that enumerates the effects of a partial whole team (one that is not fully whole) or the supposed benefits of having one that is completely whole. The result of these findings will enable development organizations to consider the composition of their teams, enabling them to optimize in an effort to achieve the maximum results from their endeavors.

## Acknowledgements

There are many people that I have crossed paths with in my personal life, my work and over the course of writing this dissertation that have affected me in a variety of ways. To thank them all for their advice, council (and at times pleasant and heated debates) would be impossible, but rest assured, I am indebted to each and every one of you.

There are some people I do need to thank and acknowledge. First and foremost is my family. While I tried my best to not let my continuing education get in the way of any family matters, it always seemed to be lurking in the background. Therefore, to my children (Matthew and Taylor) I want to say thanks for putting up with Daddy always reading papers or writing something during all of the soccer/baseball/basketball games. I always had one eye on my work, and one on you, I promise !

To my wife, Karen, who put up with all of the mess, the laptop glued to my side and a missing husband on Friday nights and Saturday; thank you.

It is said that "No one who achieves success does so without acknowledging the help of others. The wise and confident acknowledge this help with gratitude", well, I may not be wise, but thanks to the Professors and staff at Pace University I am confident in my abilities and the knowledge I have gained over the years. This work (and my new career path) would not have been possible without the advice, friendship and yes "nagging" of Dr. Fred Grossman. It's a "good" teacher that helps us learn, but it's the "great" teacher that never gives up on one! Thanks Fred.

To every journey, there is a beginning and mine started about 40 years ago. How can I not be thankful for a set of parents that showed me the right path for journey, encouraging and helping along the way? Thanks Mom and Dad. I am especially thankful to my father, Sam Ganis, who, at an early age, taught me the value of writing well; a lesson that's stayed with me over the years, and was especially useful in this endeavor. Hey Dad, that "Lincoln Cent" sure went a long way didn't it ? – thanks!

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# Introduction

*"What we need to do is learn to work in the system, by which I mean that everybody, every team, every platform, every division, every component is there not for individual competitive profit or recognition, but for contribution to the system as a whole on a win-win basis."*

**~W Edwards Deming**

## 1.1 High Level summary of Dissertation

The introduction of the extreme programming methods [12] has been widely acknowledged as the starting point for the various agile software development approaches. However, there are also a number of other methods that fall under the "agile" umbrella that have been arisen since extreme programming was introduced. These include Crystal Methods [31], Feature Driven Development [100] and Adaptive Software Development [56]. The introduction of agile methods came about as a result of the changing environment in the software industry which would attempt to satisfy the customer at the time of delivery rather than agile methods that look to develop feedback loops during the development cycle to ensure customer satisfaction throughout the project [29]. This leads to processes that deal with changes throughout a product development cycle, rather than stopping change altogether. As a result, agile methods attempt to produce the delivery of code in short iterations in an effort to gain rapid and frequent feedback. These methods allow the creation of simple solutions, which in turn

leads to lesser or simplified changes as the product evolves. As a result these methods tend to simplify and stabilize the design throughout the product lifecycle through a practice called refactoring. Refactoring is the process of clarifying and simplifying the design of existing code, without changing its behavior.

In order to achieve these goals agile teams adhere to the agile Manifesto[13] which has as one of its four tenants: that "teams value individuals and interactions over processes and tools". This infers that an agile method must emphasize the relationship and communality of software developers and the human role reflected in the contracts between members, as opposed to the institutionalized processes and development tools. Within the various agile practices this manifests itself by the fostering of a close team relationship, a working environment and procedures that allow for a swift resolution of issues and quick delivery of simple, working products.



From an agile software development methodology perspective, a *whole team* is one in which all of the skills and disciplines needed to complete a given project are participating in the team's development methodology. Tom Poppendieck defines a whole team as the development team that is responsible for achieving the project mission specified in their charter [107]. This means that all functions necessary for the project to succeed are closely involved and working together. In essence, it is similar to the concept of cross-functional teams, but due to the heavy communication required for an agile team's success it is thought to be essential for the success of an agile project. A whole team conveys the concept of readily available resources where intense interactions are

necessary for the health of the project; those interacting should be primarily identified with the team and not their functions. Lack of a whole team can not only be frustrating to the agile development team, but costly as well, For example, lack of a proper "onsite" customer has led teams to make assumptions and incorrect decisions (out of a need to maintain a sprint schedule) which in turn led to large amounts of unplanned changes or retrofitting which could have been avoided had the customer role been more closely aligned with the team[10].

This dissertation focuses on the team aspect of agile software development. Specifically it analyzes the impact of not having a whole team and the consequences of having a less than whole team. By following an organization's changing team dynamic over four projects, the analysis of team retrospectives and various productivity measures, this dissertation concludes that the creation of a whole team atmosphere can have a dramatic effect on a software product.



More importantly, from this work it appears that the implementation of a whole team can result in both productivity gains within an agile team as well as helping a team to maintain a strong sense of team morale. As a result of this experiment, it appears that in the creation of a larger whole team from several smaller teams, there needs to be a degree of care taken when merging individual disciplines into the larger team. Based on the cohesiveness of the teams, increasing the number of disciplines on a team is not as important as mixing the "right" teams together at the right time.

## 1.2 Research Problem

This study examined the assertion that agile teams perform better when they are composed of what is commonly termed a whole team. A whole team is one that encompasses all of the disciplined needed to design, build, implement and deploy a software project.

For example, if the level of variety of work processes is low, the work tends to be predominantly repetitive in nature. In this case, it would be more efficient to control the team by standardization of processes/tools and procedures. The need for local autonomy and decision making concerning these processes (and hence, the need for self-organization) seems to be low. If, on the other hand, the level of variety is high, for example in the constant changing of priorities in the case of agile projects, management may enhance the organizational responsiveness by delegating responsibilities and control to self-organizing teams, which have local autonomy to deal with variety in customer demand and work processes [94]. In this latter case, the need to have the right personnel on the team is essential to allow for rapid turn-around on decisions as described by Bebbe [11]

According to the Asby's Law of Requisite Variety [7, 98] the level of self-organization within a team is contingent on the level of variety (or change) the organization needs to

deal with. This implies that a team should have enough means to transform the input of information, materials, and parts into the output that is desired. In other words, the level of self-organization is related to the variety of transactions and the impact of this variety on the transformation processes. So in order to achieve a high level of self-organization, a larger set of disciplines or viewpoints are required.

Applying Ashby's law to the use of agile software methods, a system's internal variety (in this case the composition of the disciplines encompassed within the team) should at least match the variety and complexity of the environment with which it is confronted. The diversity of the team and the various agile practices such as active stakeholder participation and redundancy of skills (i.e. interchangeable roles) which are built into self-organizing agile teams amplify the variety within the system. This variety enables agile teams to respond with minimal delay to the changing environment.



The main theme of this research project is to understand how the composition of the team affects the resultant output from the perspective of the customer as well the team itself. Does having a whole team (or all of the disciplines needed for the completion of the project) working on a common project, positively or negatively affect the end deliverable.

### *1.2.1 Research Environment*

In 2004 the IBM Corporate Webmaster Team undertook the task of converting their development process from a traditional Waterfall method to an agile (Extreme Programming) model. During this initial project, there was an overt attempt to treat this newly formed team as two separate and distinct development teams: one for Java development and the other for Cascading Style Sheets (CSS) and Extended Markup Language (XML). The user experience (UE) team which is an integral step in the web development process was (among many of the needed disciplines) missing from the agile team. This meant that for each change in an agile story that the development team was asked to implement, the requirement needed to flow through the User Experience team. This caused the development team to have to wait for the various User Experience artifacts to flow to them as opposed to see them as they were created, thus slowing down the overall process.



For the purposes of this research, this work merged various disciplines of a web development team into a single, more whole agile teams across a number of consecutive releases in a product cycle. The experiment logically followed from the first agile release where there was a perceived rift between the various entities of the agile team and other portions of the organization to which they belonged. Based on results from retrospectives and team input, this study systematically brought various disciplines in the organization closer together to observe the results of creating more whole or more complete teams.

### *1.2.2 Whole team Composition*

Within this work a whole team is defined as a single operating unit that contains all of the disciplines that are affected by or affect the implementation of a specific project. In this dissertation, the disciplines that were viewed to be directly affected by the delivery of the observed projects included:

- Metric Analysts
- User Experience
- Information Architects
- Quality Assurance
- Enterprise Architects
- Code developers
- The customer
- Deployment
- User Stakeholders

## 1.3 Hypothesis

Many of the agile practices are said to be synergistic [12, 44]. This implies that in order to obtain the maximum benefit of one or more of the practices, a team is dependent upon the implementation of one (or more) additional practices. One of the often overlooked agile practices is that of the whole team. This agile practice encourages the creation of a team where all of the disciplines needed to perform work on a specific project are represented as part of the complete agile team.

As teams move toward a high performing model, one of the critical elements is that they gel and work as an independent entity without the need of management intervention. To achieve this end the team morale and willingness to work with and trust one another must be at a high level.

The creation of a team isn't as simple as putting a number of people together in a room and watching them perform. Because of the rapid response to change, agile methods rely on a high degree of inter-team communication and functioning [12, 118, 99] to achieve a high degree of success. Models and scientific evidence suggest that organizations are more successful at new-product development if there is greater communication among various disciplines (such as marketing, engineering, and manufacturing) [42].

This study tested the hypothesis that the more whole a team becomes, the more benefit will be realized from the implementation of the agile method used and therefore the productivity of the team will increase. It was also hypothesized that team morale will increase as teams become more whole due to the ease of communication flow and better understanding of cross disciplined tasks .

When forming teams by combining existing disciplines into a single whole team, one must consider the degree of team cohesion that exists between various disciplines. Incorporating disciplines with low cohesion levels may not have the desired effect on productivity; while on the other hand, combining disciplines with a high degree of cohesion may cause feelings of isolation in the disciplines not part of the larger agile team.

There are several factors that must be present for cohesion to exist within a team. First good and appropriate communication is essential to creating and maintaining cohesion. Communication leads to the second factor which is a unity of purpose or common goal. For a team to work as a cohesive team they must share a common goal and to collectively