

# A Systematic Literature Review On Agile Coaching And The Role Of The Agile Coach

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# **A Systematic Literature Review On Agile Coaching And The Role Of The Agile Coach**

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# Abstract

*Objective:* In this thesis, I have conducted a systematic literature review on agile coaching and the role of the agile coach. The objective of this review is to understand what agile coaching is, what agile coaches do and how they can help in adoption of agile methodologies in software development organizations.

*Method:* Systematic literature review is a well established research method which aims to provide fair and evidence-based answer to specific research questions. A search strategy is defined, as a result of which 209 studies were identified on agile coaching and agile coaches, out of which 66 studies were selected as primary studies and the remainder (143 studies) were excluded based on a number of inclusion and exclusion criteria.

*Results:* The findings suggest that agile coaching facilitates the adoption and sustainability of agile methods and deal with agile adoption challenges. Agile coaches help in training and developing software development teams and all the stakeholders involved in the agile adoption process. The main skills of an agile coach identified from literature are leadership qualities, project management skills, technical skills and expertise in agile methods.

*Conclusion:* Based on the findings, it can be argued that agile coaches can play a significant role in addressing a number of challenges in agile adoption such as resistance to change, difficulty in implementing agile methods, removing barriers to team autonomy in agile teams and making agile meetings more effective using their numerous skill set particularly leadership skills and qualities.

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# 1 Introduction

Agile software development is a popular software development methodology due to its quick response to change, speed, supporting innovation and customer collaboration. However, adoption of agile methodology is not straightforward. The literature has reported various challenges and problems faced by software companies during their agile adoption. For example, the agile adoption process is a socio-technical change in which all aspects of the organization will be affected for instance people's behaviors and mindsets as well as their roles in the development process, the way of development [Parizi et al., 2014].

Coaching is one of the most important success factors in adopting agile software development practices [Misra et al., 2009, Dikert et al., 2016]. To help companies adopt agile methods smoothly, a new field of *Agile Coaching* has been introduced and is constantly gaining in popularity [O'Connor and Duchonova, 2014]. An Agile Coach is a person who coaches and facilitates agile teams, managers etc. in a company or organization in adopting and implementing agile practices, processes, and values in software development [Parizi et al., 2014]. It is a valuable role for organizational change [O'Connor and Duchonova, 2014]. An agile coach can be of different types. A coach can be external agile coach if hired externally or internal agile coach if is a member of the organization that is using the coach [Adkins, 2010]. A coach can teach multiple teams at once by staying with a team part-time, or can stay with a team full time, thus teaching only one team at a time. Another classification is based on the type of agile method, the coach is specialized in. It can be Scrum coach, Kanban coach, XP coach, and DevOps coach [O'Connor and Duchonova, 2014].

## 1.1 Motivation

There are a number of challenges in agile adoption. It is important to understand how agile coaches can help address or overcome these challenges. I feel that there is a lack of understanding what agile coaching is, what agile coaches do and how they can help in adoption of agile methodologies in software development organizations. There is no comprehensive study found in the literature in this area to date.

The aim of this thesis is to carry out systematic literature review (SLR) to summarize all existing evidence on agile coaching and the role of agile coaches. In particular, the thesis aims to do this by answering the following research questions.

**RQ1:** What is agile coaching and its purpose?

**RQ2:** What are the tasks or responsibilities of an agile coach?

**RQ3:** What are the skills required by an agile coach?

## 1.2 Structure of this thesis

This report is divided into the following chapters:

**Chapter 1: Introduction** This chapter provides overview of the research topic and the research questions that will be addressed in this thesis.

**Chapter 2: Background** This chapter provide relevant background information to the reader.

**Chapter 3: Research methodology** This chapter describes the research methodology used in this thesis i.e. systematic literature review (SLR).

Furthermore, the design and the process of conducting SLR on the role of agile coaches is explained.

**Chapter 4: Results** This chapter presents the findings of the SLR.

**Chapter 5: Discussion and limitations** This chapter discusses the findings of the SLR and the limitations of the research conducted.

**Chapter 6: Conclusion and future work** This chapter summarizes the thesis and provide directions for future work.

## 2 Background

The purpose of this chapter is to provide relevant background information to the reader. The chapter starts with an introduction to agile software development, then describes autonomous agile teams and some of the most popular agile software development methods, followed by some thoughts on various challenges that may arise during agile adoption. It gives some background of agile coaching, agile coach and the tasks of an agile coach.

### 2.1 Agile software development

Agile software development represents a major departure from traditional, plan-based approaches to software engineering [Dybå and Dingsøy, 2008]. Agile software development refers to a group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing and cross-functional teams and their customers or end-users [Collier, 2012]. Agile encourages rapid and flexible response to change. Agile methods, such as Scrum, Kanban, DevOps, etc. usually follow an incremental development cycle. These methods have created a new way of thinking about software development, focusing less on a requirement specification, tools, phases and plans, and more on teamwork, cohesion, responding to change and customer collaboration [Beck et al., 2013].

#### 2.1.1 Autonomous teams

One of the prerequisite of agile is self organizing also called autonomous teams. Autonomous agile teams are composed of *“individuals that manage their own workload, shift work among themselves based on need and best fit,*

and participate in team decision making” [Highsmith, 2009]. Autonomous teams track their own performance and are accountable for their actions. Continuous learning and collaborative decision making is at the core of such team. The team members need to have common goals, mutual trust, respect and the ability to organize repeatedly in order to meet new challenges [Cockburn and Highsmith, 2001].

Autonomous teams are cross-functional. This means that the team members possess different skills across several functional areas including technical, managerial and operational skills [Hoda and Murugesan, 2016]. This characteristic equips the team to perform all actions required to accomplish their work, including, design, implementation, testing, deployment and maintenance of software systems, without depending on others outside of the team.

Challenges to team autonomy in self-organizing agile teams are discussed in a section below under the heading challenges during agile adoption 2.2.

### 2.1.2 Scrum

Scrum is one of the most widely used agile development process frameworks in contemporary software development. It is an iterative and incremental development process framework consisting of various components, such as, Scrum teams, their associated roles, events, artifacts and rules [Schwaber and Sutherland, 2017]. The rules of Scrum govern the relationships and interactions between the various component of Scrum. A Scrum iteration is known as a *Sprint* which contains all the other Scrum events. It has a fixed duration or either 2 or 4 weeks during which a usable, potentially releasable product increment is created.

At the heart of Scrum is a small team of people called the *Scrum Team*, that is highly adaptable, cross-functional and self-organizing. Self-organization

enables the team to be autonomous in determining how best to accomplish their tasks and avoid the need for direction from outside. Similarly, being cross-functional ensures that team members are generalists and the team has all the competencies necessary to accomplish their work without depending on outsiders [Schwaber and Sutherland, 2017]. The team as a whole is responsible for working on and delivering a releasable *Increment* of the product at the end of the Sprint. The recommended team size is usually around 7 (+/- 2) people.

In addition to regular members, Scrum Team has two main well-defined roles: namely, the Product Owner (PO) and the Scrum Master (SM). The Product Owner (PO) is the single person responsible for managing the *product backlog* which includes adding and ordering items/requirements. The Scrum Master (SM) guides Scrum team, remove obstacles and facilitates Scrum meetings.

Most teams that follow Scrum, conduct *daily stand-up* meetings. Stray et al. (2018) found that there are challenges of conducting meetings that are beneficial for everyone in the team such as that the information shared is not relevant for all and managers or Scrum masters use the meeting primarily to receive status information [Stray et al., 2018].

### 2.1.3 Kanban

Kanban is a popular framework used to implement agile software development. It emphasis on continual delivery of features while not overburdening the software teams. Kanban has been shown to improve quality of software, coordination and communication, and increased consistency of delivery [Ahmad et al., 2013].

Kanban is task-boxed [Anderson, 2010]. Tasks are represented visually on



Kanban board which has different lanes/columns such as *backlog*, *in progress*, and *done*. The team members have the autonomy to choose tasks from backlog according to their capacity [Anderson, 2010]. The tasks are worked on (*in progress*) and tested until completion (*done*), as opposed to Scrum's time-boxed model where the focus is more on how much can be done within the time-limit of the sprint.

#### 2.1.4 DevOps

DevOps is motivated by the increasing need for rapid and highly frequent deployment of software functionality to customers. It aims to facilitate the shift towards the continuous delivery paradigm by combining both development and operations within the same team. As agile methods improve performance of software development teams by making them more flexible, cross-functional and allow for closer collaboration with customers to achieve iterative and incremental product development. Similarly, DevOps is an extension of agile to the entire software delivery pipeline to optimize the time it takes from writing of code to its use by the end user in a real production environment [Hemon et al., 2019].

There can be dependencies between development and operations teams such as knowledge, process and resource dependencies [Strode, 2016]. Stray et al. (2019) studied a large-scale DevOps project and found that managing dependencies in DevOps projects are important, and meetings, ad-hoc conversations, communication tools, and an open work area with boards has been found to be valuable doing this in DevOps projects [Stray et al., 2019].

## 2.2 Challenges during agile adoption

Agile is not only a set of practices or methods. It is a complete mindset. Agile adoption is considered as an organizational mutation, because the scope of the required changes covers entire organization involving change in people's behaviors, mindsets, roles, responsibilities and expectations [Gandomani and Nafchi, 2016]. The adoption is usually slow and gradual, and it can take up to several years to complete [Korhonen, 2013]. Agile adoption is more challenging in larger organizations because of complex infrastructures, numerous legacy systems and mature organizational culture [Dikert et al., 2016].

The literature has reported various problems and challenges that may arise during agile adoption. Most of the challenges are human-related which include resistance to change [Lalsing et al., 2012, Cockburn and Highsmith, 2001], lack of effective communication [van Kelle et al., 2015], lack of customer collaboration [Melo et al., 2013] and insufficient experience and knowledge of agile methods and practices [Melo et al., 2013, Eloranta et al., 2013]. The organizational-related adoption challenges include cultural issues or cultural mismatch to agile methods due to managers unwilling to change from commanders to team facilitators, lack of management support, and lack of capacity to change the organizational culture [Kompella, 2014].

Individual and team autonomy is one of the critical success factors of agile projects [Chow and Cao, 2008]. Not all agile teams are self-organizing or autonomous [Hoda and Noble, 2017]. The management needs to create enabling conditions for it and help enable the teams to do self-organization. The actual performance of an autonomous agile team depends not just on the team's own ability to organize and carry out its work, but also on the organizational context provided by the management [Hoda and Noble, 2017]. Lack of coaching and organizational support is one of the top barriers for team autonomy [Moe et al., 2019b]. Moe et al. (2019) studied a large-scale

software development projects and found that team autonomy in large-scale agile projects is even more challenging due to lack of shared understanding of goals and direction that makes it hard for the team to self-organize. This lack is due to not letting the team take part in goal setting. Goals are most often set by managers and given to the teams. This causes the team members to set their own goals and working independently towards their own objectives. Team goals not being aligned with the rest of the organization or the large-scale project goals not being aligned with the team reduces the understanding of the shared direction and where the team and project are heading [Moe et al., 2019b].

### 2.3 Agile coaching and the agile coach

Agile coaching is considered as a sub-field of coaching [O'Connor and Duchonova, 2014] which focuses on helping teams or individuals adopt and improve agile methods, and also to rethink and change the way they develop software [?]. Agile coaching is used to mitigate problems during agile adoption and makes the transition easier and more effective [Paasivaara et al., 2014]. Agile coaching involves advocating agile methods and their introduction into daily routine of teams at an organization. Nowadays, the leadership in many organizations consider agile coaching as a dedicated full-time employment rather than as additional, unnecessary work [Pavlič and Heričko, 2018].

Agile coaches are teachers bringing in knowledge to the team and the rest of the organization [Lundh, 2009].

*“An Agile Coach is an experienced user and teacher of agile methodologies, who can take on many roles, such as teacher, facilitator, coach-mentor, conflict navigator, collaboration conductor, problem solver, etc., to help teams adopt and improve their use of*

*agile methodologies.*” [Paasivaara, 2011]

The literature has reported many studies where an agile coach is hired to help companies adopt agile methods smoothly [Hanly et al., 2006, Silva and Doss, 2007, Bäcklander, 2019]. If the transition is happening on a larger scale, such as an entire IT division or an entire company there is a need for several coaches for sustained agile usage [Hanly et al., 2006, Silva and Doss, 2007, Drummond et al., 2008]. These coaches can be both external consultants or internal to the company. Often, companies hire external coaches to provide initial training and kick-start agile development. At the same time, they help train and develop internal coaches who take over the main coaching role later on. [Paasivaara et al., 2014]

## 2.4 The role of an agile coach in agile adoption

According to Steven Fraser [Fraser et al., 2003], “*Coaches help team members become a cohesive unit, understand the 'rules-of-the-game', facilitate interaction, optimize skills, and build motivation towards common goals.*” Agile coaches provide mentoring for projects and organizations seeking to adopt agile [Tengshe and Noble, 2007]. Agile coaches can help the teams resolve process related problems by making sure that the teams follow the process correctly [Padula, 2009]. The job of an agile coach is to help introduce and guide one or more teams in how to use agile methodologies such as Scrum, Kanban and DevOps. One of the task of an agile coach is to facilitate and support the organization during their agile transformation [Parizi et al., 2014]. An agile coach brings numerous benefits to an organization; the benefits, in fact, exceeds the financial cost of employing an agile coach [O’Connor and Duchonova, 2014].

Despite all the benefits of agile coaching reported in the literature and it

being recognized as one of the most important success factors [Dikert et al., 2016] in adopting agile by both researchers and practitioners, there is no guarantee that coaching will prove to be an immediate success [Gandomani et al., 2015].

There are a number of challenges in agile adoption such as resistance to change, insufficient experience and knowledge of agile methods, and barriers to team autonomy in self-organizing teams. It is important to understand how agile coaches can help address or overcome these challenges. As mentioned earlier (Chapter 1) there is a lack of a systematic review of literature in this area. The purpose of this systematic review is to aggregate the evidence on the role of agile coaches in agile adoption and how they can help address or overcome some of the challenges of agile adoption.

## 3 Research methodology

The research methodology used in this thesis is systematic literature review (SLR). The thesis will follow the guidelines for performing SLR in software engineering by Barbara Kitchenham and Stuart Charters [Kitchenham and Charters, 2007]. This chapter provides an overview of SLR, the reasons to perform SLR, the features of SLR and the process of SLR. Next, how the SLR as a research methodology is used in this thesis is explained.

### 3.1 Systematic literature review

Systematic literature reviews have been widely used in software engineering research due to its rigor and evidence-based answers to specific research questions [Kitchenham and Charters, 2007]. According to Kitchenham,

*“a systematic literature review (often referred to as a systematic review) is a means of identifying, evaluating and interpreting all available research relevant to a particular research question, or topic area or phenomenon of interest”* [Kitchenham and Charters, 2007].

A systematic review is a form of secondary study; individual studies that contribute to a systematic review are called primary studies [Kitchenham et al., 2004]. An example of primary study is a peer-reviewed journal article. Other examples are, conference papers, conference proceedings etc.

### 3.1.1 Reasons for performing systematic reviews

Ever since the importance and emphasis on evidence-based software engineering emerged in 2004 [Kitchenham et al., 2004], the number of software engineering researchers performing systematic reviews have been increasing. There can be many reasons to perform a systematic literature review, the most common reasons are as follows [Kitchenham and Charters, 2007]:

- Summarize the existing empirical evidence concerning a treatment or technology
- Provide appropriate background to position new research activities
- Identify gaps in current research leading to get suggestions for further investigation

### 3.1.2 Features of systematic literature review

Systematic reviews differ from simple or random review in that [Kitchenham and Charters, 2007],

- Systematic review starts by defining a review protocol.
- Systematic review follows a predefined search strategy. The search strategy and the results are documented.
- Systematic review requires explicit inclusion and exclusion criteria to asses each potential primary study.
- Specify the information needed to be obtained from primary studies including the quality criteria by which to evaluate each primary study.
- Data extraction forms are used to document the extracted information.

### 3.1.3 Process of systematic literature review

The SLR in this thesis is carried out by adapting the guidelines for conducting systematic literature reviews in software engineering by Barbara Kitchenham and Stuart Charters [[Kitchenham and Charters, 2007](#)]. Systematic review involves three main phases,

- Planning the review
- Conducting the review
- Reporting the review

These three phases involve several discrete activities. Fig. [3.1](#) shows the process of systematic literature review.

## 3.2 Planning the review

Planning the review starts by identifying the need or rationale for review. Specifying research questions and defining search strategy. I present these activities in more detail below.

### 3.2.1 Identifying the need for review

Agile coaching is a rapidly growing area. In recent years, the number of agile coaches has been growing rapidly and numerous books, e.g., [[Davies and Sedley, 2009](#), [Adkins, 2010](#)] and training courses are aimed at them. In addition, several organizations have established agile coaching certification programs to standardize the qualification process e.g., the Agile Coaching Institute [[coa, 2017](#)].



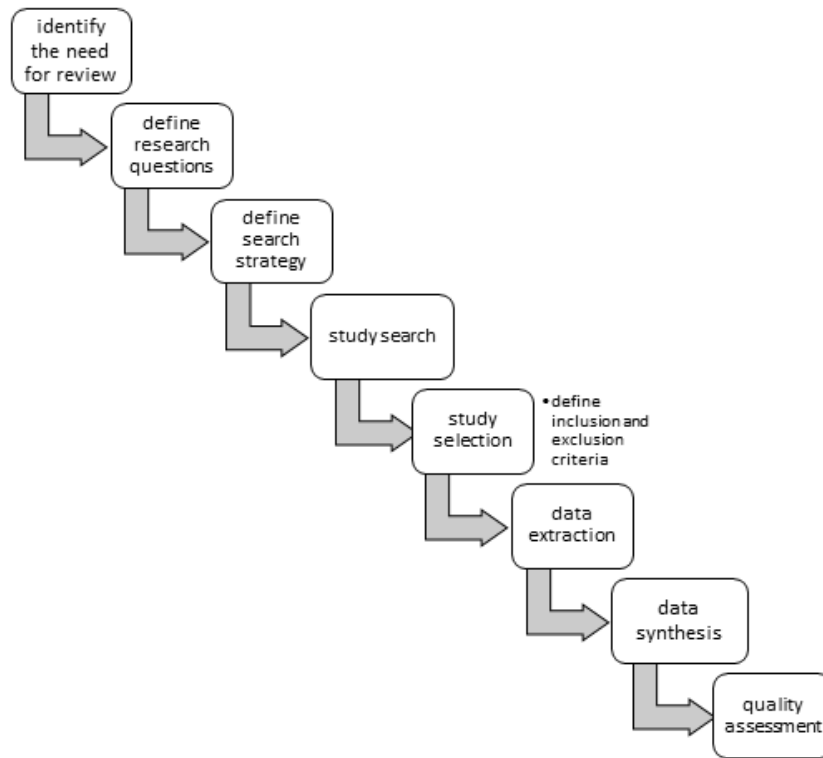


Figure 3.1: Illustration of the systematic literature review process

It is interesting to explore and investigate what academic literature says about it. Based on reading both academic and practitioner literature, it was felt that there is a lack of understanding what agile coaching is, what agile coaches do and how they can help in adoption of agile methodologies in software development organizations. This motivated the need for systematically looking at published evidence in relevant literature. As mentioned in Chapter 1, there is no comprehensive study or SLR published in this area to date.

### 3.2.2 Research question

The goal of this review is to summarize all existing evidence on the role of agile coaches. In particular, the thesis aims to do this by answering the following research questions.

**RQ1:** What is agile coaching and its purpose?

**RQ2:** What are the tasks or responsibilities of an agile coach?

**RQ3:** What are the skills required by an agile coach?

### 3.2.3 Search strategy

A search strategy process should include:

- identifying relevant search keywords
- developing search query
- defining the target for the search query
- selecting different data sources with the aim of identifying candidate publications

The search query was developed iteratively (Fig. 3.2). The search process was started with identifying relevant search keywords for the review. Based on reading both academic and practitioner literature, the two understood keywords were "agile coach" and "agile coaching". My supervisor also helped me in identifying more search keywords and developing an appropriate search query for the review. We began with a trial search by writing "agile

coach” OR “agile coaching” in the Scopus database. We skim through 30 first relevant publications and, read abstract, author keywords and introduction. The aim was to get more search keywords in order to refine the search query. This process was repeated several times until all relevant search keywords identified and an appropriate final search query is developed. Some examples of preliminary search queries are given in Table 3.1. These preliminary search queries were applied to different data sources such as Google Scholar, Scopus and Web of Science, which gives varying number of studies.

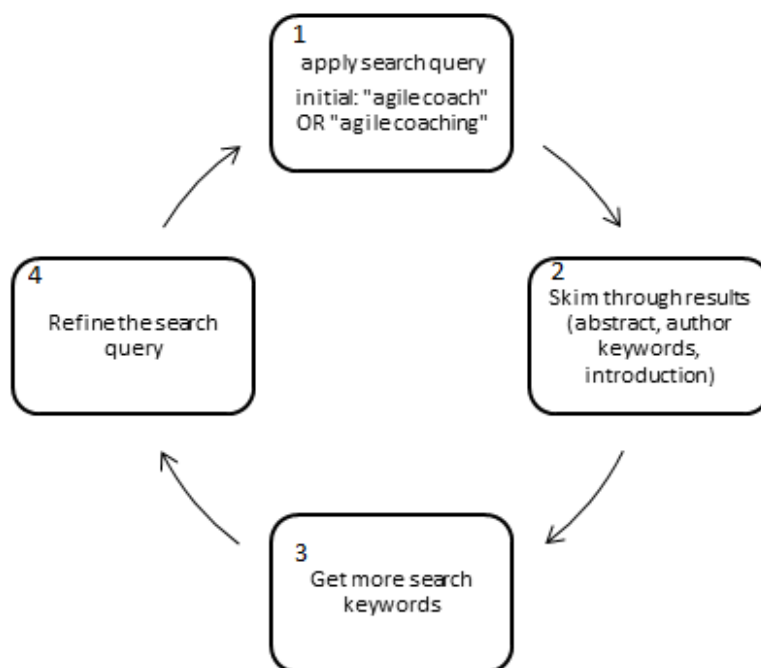


Figure 3.2: Process of developing search query

The search strategy for this review is given in Table 3.2. To increase the likelihood to find publications addressing agile coaching and/or agile coach, the target of the search query is defined to search in all the fields in the document (i.e., full text).

Database	Search string	Nr. of studies on 30th January 2020
Google	("agile coach" OR "agility coach" OR "Devops coach" OR "Kanban coach" OR "Lean coach" OR "Scrum coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching") AND ("Software Development" OR Agile)	2380
Web of Science	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching") AND ("Software Development" OR Agile)	34
Web of Science	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching") AND ("Development" OR Agile)	35
Web of Science	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching")	39
Web of Science	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching" OR "Kanban coaching")	39
Scopus	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching") AND ("Software Development" OR Agile)	54
Scopus	("agile coach" OR "agility coach" OR "Devops coach" OR "Lean coach" OR "Scrum coach" OR "Kanban coach" OR "XP coach" OR "agile coaching" OR "Scrum coaching" OR "Lean coaching" OR "XP coaching" OR "Devops coaching" OR "Kanban coaching") OR "team coaching" AND (Agile OR Lean OR Scrum OR Kanban OR XP OR Devops) OR ("internal coach" AND Agile)	190

Table 3.1: Preliminary search queries

As you can see in Table 3.1, Google Scholar gave too many results and Web of Science too few, whereas Scopus gave a good and manageable amount of results. Therefore, I decided to apply the final search query to the Scopus database only. Another reason for choosing Scopus is that it provides user-friendly interface and various filters that simplify the search process. The main reason for not using Google Scholar as source database is that it is reported to return results from non-journal sources (such as theses) as well as unpublished materials [Martín-Martín et al., 2018].

<b>Search keywords</b>	Agile coach, Scrum coach, XP coach, Kanban coach, Lean coach, DevOps coach, Agility coach, Internal coach, Agile coaching, Team coaching, Scrum coaching, XP coaching, Kanban coaching, Lean coaching, DevOps coaching
<b>Final search query</b>	“agile coach” OR “agility coach” OR “Scrum coach” OR “Lean coach” OR “Kanban coach” OR “XP coach” OR “DevOps coach” OR “agile coaching” OR “Scrum coaching” OR “Lean coaching” OR “Kanban coaching” OR “XP coaching” OR “DevOps coaching” OR (“internal coach” AND (agile OR scrum OR Lean OR Kanban OR XP OR DevOps)) OR (“team coaching” AND (agile OR scrum OR Lean OR Kanban OR XP OR DevOps))
<b>Target for search query</b>	Full document
<b>Data sources</b>	Scopus

Table 3.2: Search strategy

### 3.3 Conducting the review

Conducting the review involves applying search strategy developed during planning phase, defining study selection criteria (i.e., inclusion and exclusion

criteria) to select primary studies, followed by extracting relevant information from each primary study and data synthesis.

### **3.3.1 Study search**

The search query defined in Table 3.2 is applied to Scopus database. The search resulted in 209 results as of 2nd March 2020. The following information of each of the result is exported and maintained in spreadsheet.

- authors
- title
- year
- publication source
- abstract
- author
- and document type

A manual verification process is performed in order to ensure that the information is correctly entered in the excel file. This for example included; checking the publication sources by opening each paper externally in the internet. There were many mistakes in the information exported from the Scopus particularly in the publication sources of the studies. These were corrected manually.

### 3.3.2 Study selection

In the same spreadsheet, study selection is carried out by an extensive inspection of the studies' abstract and author keywords and simultaneously applying the inclusion and exclusion criteria. The spreadsheet containing the Scopus search results together with inclusion/exclusion decisions can be viewed by clicking on this [link](#).

**Define inclusion and exclusion criteria** SLRs require explicit inclusion and exclusion criteria [Kitchenham and Charters, 2007]. The purpose of these criteria is to assess the fitness of the content in each possible primary study with respect to the research questions.

The inclusion and exclusion criteria that have been used in this review are listed in Table 3.3. Each inclusion (IC) and exclusion (EC) criteria is given an ID, so that during study selection each study will be assigned a ID based on the criteria it matches. These criteria are developed iteratively, while performing study selection.

Out of 209 studies, 64 studies meet the inclusion criteria IC1 and 2 studies meet the inclusion criteria IC2. The remaining 143 studies met one or more of the exclusion criteria, thus excluded. Most of the excluded studies (73 in total) don't have their abstract related to the research topic (EC1). Many studies (27 in total) are focused on software engineering education in undergraduate courses (EC7). Few studies (15 in total) are workshop-based conference-papers, tutorials and books (EC3) and a few (4 in total) are relating to usage of agile methods other than software development domain, therefore also excluded. The study selection process is illustrated in Fig. 3.3

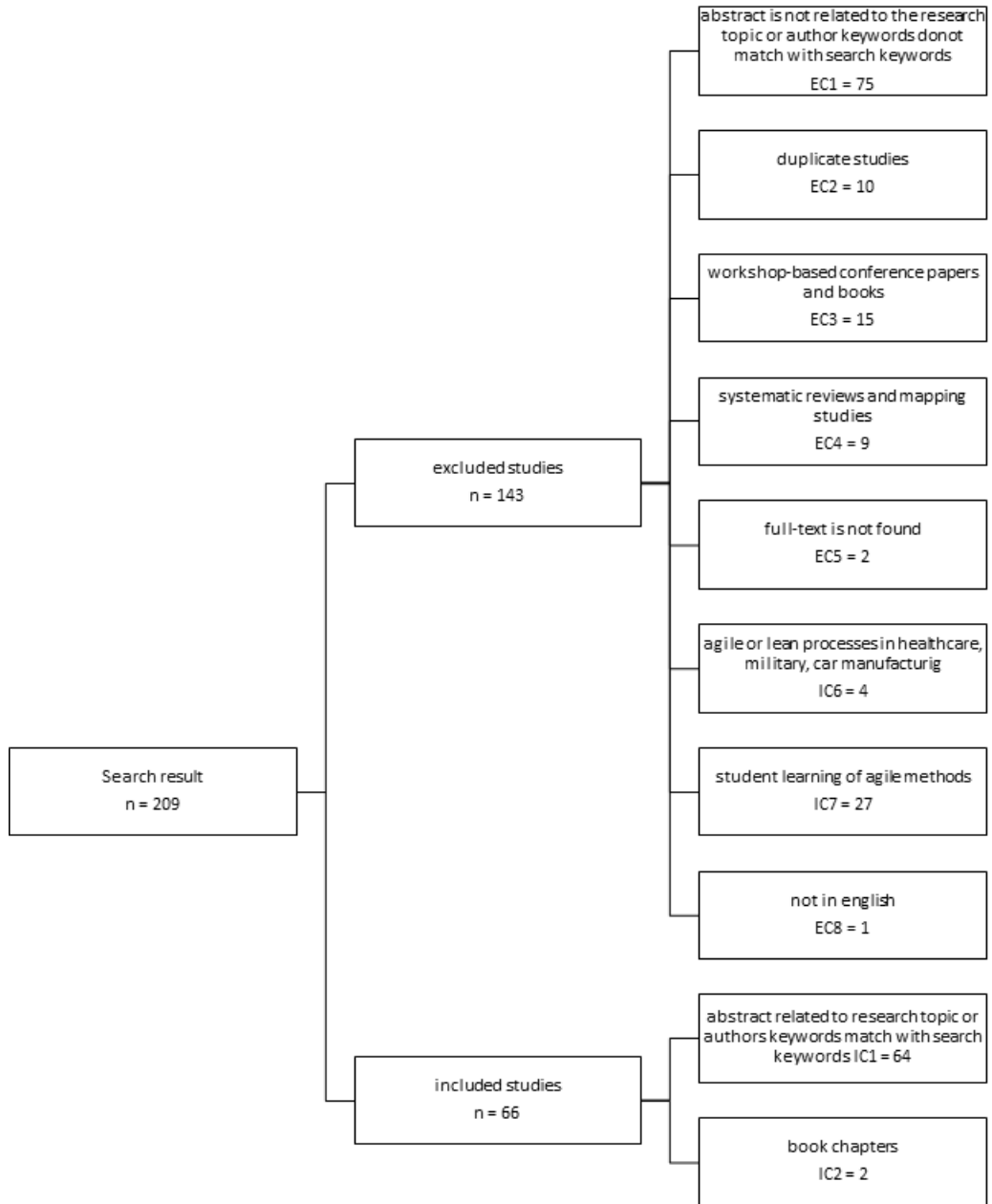


Figure 3.3: Illustration of study selection process



<b>ID</b>	<b>Criterion</b>
<b>IC1</b>	Publications published in journals and in conference proceedings where abstract is related to the research topic or author keywords (if any) match with search keywords defined in the search strategy
<b>IC2</b>	Book chapters relevant to the research topic
<b>EC1</b>	Publications published in journals and in conference proceedings where abstract is not related to the research topic or author's keywords (if any) do not match with any of the search keywords defined in the search strategy
<b>EC2</b>	Duplicate studies are not included as primary studies
<b>EC3</b>	Workshop-based conference papers and books are excluded
<b>EC4</b>	Systematic reviews or mapping studies are not included as primary studies
<b>EC5</b>	Study full text is not found
<b>EC6</b>	Based on the use of Agile or Lean processes, practices or methods in settings other than the software development domain for example car or cement manufacturing industry, military, healthcare, etc.
<b>EC7</b>	Based or focused on student learning of the agile methods such as Scrum, Kanban in university or undergraduate courses
<b>EC8</b>	Study not in English

Table 3.3: Inclusion criteria (IC) and exclusion criteria (EC)

### 3.3.3 Data extraction

In this step, a thorough reading of each of the 66 included studies is performed to extract relevant information. A data collection form is designed (Table 3.4) to record the full details of the study, from general information to specific information. General information of studies included: author, title, year and venue. Specific information included data from each study that can help in answering the RQs. The aim of thorough reading was to look for information on each of the three research questions in each primary study.

Consider a study that has talked about the tasks an agile coach does. A detailed reading was performed to note down what are those tasks. The

identified information is copied as it is from the study and pasted in the data collection form maintained in the excel file. The parts in the study where a particular information is found is highlighted for future reference.

There were many studies (23 in total) that did not provide any information on the three RQs. In such case, “not found” is written in the data collection form. The remaining 43 studies, reported on one or more RQs. The results are presented in detail in the next chapter. The results of data extraction are gathered in a spreadsheet which can be viewed by clicking on this [link](#).

Collected Information	Purpose
Author	General information
Title	”
Year	Data analysis and synthesis
Venue	”
Research method	”
Agile coaching or its purpose	RQ1
Tasks or responsibilities of an agile coach	RQ2
Skills required for an agile coach	RQ3

Table 3.4: Data collection form

### 3.3.4 Data synthesis

Once data extraction is complete, the extracted data on the RQs is closely analyzed to identify common themes. Thematic analysis or synthesis is a method of analyzing qualitative data [Braun and Clarke, 2012], which involved following steps

- Closely analyze extracted data
- Identify themes emerging from the extracted data

- Frequencies for the number of times each theme was identified in different studies.

The results of data synthesis are presented in detail in the next chapter.

## 4 Results

This chapter reports the results of the systematic literature review conducted on agile coaching and the role of the agile coach.

### 4.1 Overview of studies

The study selection process resulted in 66 studies to be included as primary studies in the review. This section describes the results of the SLR in terms of publication source, type of research methods and the publication years.

#### 4.1.1 Publication year

Figure 4.1 shows the number of papers published on agile coaching and agile coaches in each year during 2003-2020. It can be argued that the publication volume during the years 2017 to 2019 is an indicator of researchers growing interest in agile coaching. In fact, more than half of the studies are from last five years which shows that agile coaching and issues surrounding it are gaining research interest and being more actively studied.

#### 4.1.2 Type of research methods

A multitude of research methods have been reported in these studies. The most common is case study and grounded theory research. Out of 67 studies, 19 studies have applied case study as research methodology. 14 studies have used grounded theory. 4 are interview studies and 4 are surveys. 2 studies have used a combination of both interviews and surveys. 4 studies have performed quantitative analysis and 2 have used a combination of quantitative

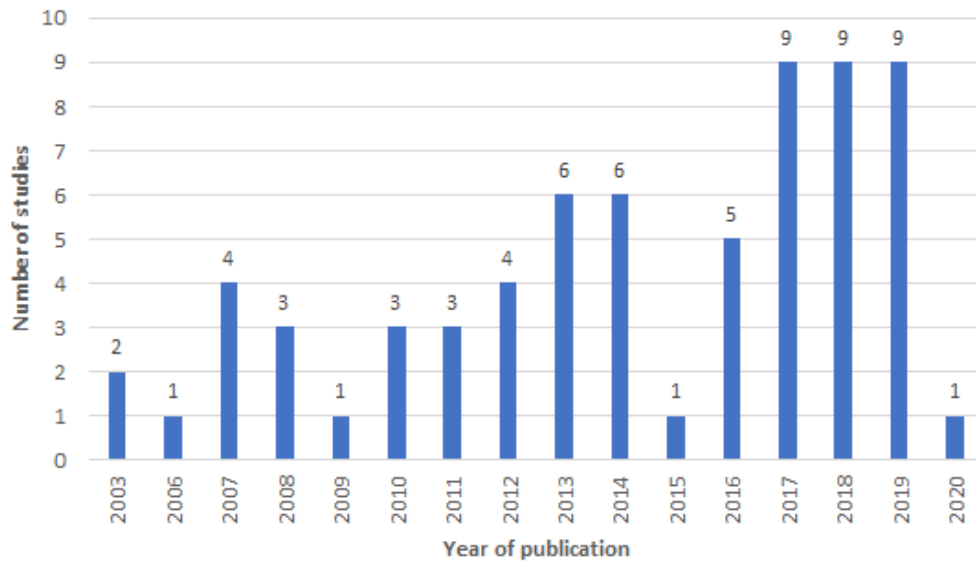


Figure 4.1: Distribution of studies by publication year

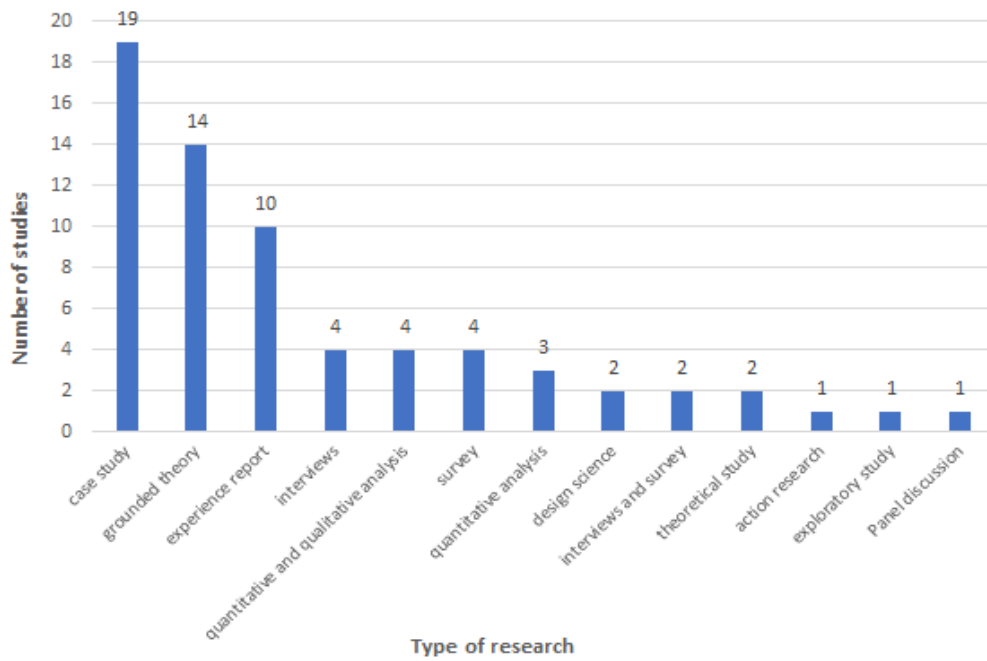


Figure 4.2: Distribution of studies by research method

and qualitative. 10 studies are experience reports based on the author’s own experiences from the field. Fig. 4.2 shows different research methods used versus the number of studies.

<b>Name of journal</b>	<b>Ref. in list of studies</b>
Creativity and Innovation Management	[61]
Empirical Software Engineering	[21], [47], [56]
European Journal of Information Systems	[48]
Governance, govern-mentality and project performance: the role of sovereignty	[58]
IEEE Transactions on Software Engineering	[27]
IET Software	[66]
International Journal of Innovative Technology and Exploring Engineering	[65]
International Journal of System Assurance Engineering and Management	[55]
Journal of Operations Management	[20]
Journal of Software: Evolution and Process	[29]
Journal of Systems and Software	[45], [46]
Project Management Journal	[40], [44]
SA Journal of Human Resource Management	[60]

Table 4.1: Journal articles included in the SLR

### 4.1.3 Publication source

The majority of the studies included in the review are published as conference papers. Out of the 66 studies included in the review (see Appendix A), 46 are conference papers. 17 are journal articles and the remaining 2 are book chapters. Table 4.1 shows the names of the journals in which 17 articles are published and the reference number to each study is written in front of their respective journals. Similarly, Table 4.2 and Table 4.3 shows conference names and book names respectively.

<b>Name of conference</b>	<b>Ref. in list of studies</b>
ACM international conference on Object oriented programming systems languages and applications	[14]
AGILE Conference (2006 – 2013)	[3], [4], [5], [8], [9], [10], [11], [18], [26]
Annual Conference of the International Group for Lean Construction, IGLC 2019	[67]
Annual International Computer Software and Applications Conference (COMPSAC 2007)	[7]
Brazilian Workshop on Agile Methods	[64]
ACM SIGPLAN conference on Object-oriented programming, systems, languages, and applications.	[1]
European Conference on Knowledge Management, ECKM	[43]
European Conference on Software Process Improvement	[28], [49], [50], [59]
European, Mediterranean and Middle Eastern Conference on Information Systems	[6]
Federated Conference on Computer Science and Information Systems, FedCSIS 2019	[62]
Hawaii International Conference on System Sciences	[22]
ICSE Workshop on Cooperative and Human Aspects of Software Engineering	[13]
IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)	[52]
IEEE International Conference on Global Software Engineering	[39], [16], [23], [24], [34], [41]
International Conference on Agile Software Development	[15], [32], [35]
International conference on evaluation and assessment in software engineering	[31],[38]
International Conference on Extreme Programming and Agile Processes in Software Engineering	[2]
International Conference on Information and Software Technologies	[25]
International Conference on Knowledge Management in Organizations	[49]
International Conference on Research Challenges in Information Science (RCIS)	[12]
International Database Engineering and Applications Symposium	[42]
Malaysian Software Engineering Conference (MySEC)	[30], [33]
OTM Confederated International Conferences On the Move to Meaningful Internet Systems	[54]
Telecommunications Forum, TELFOR 2019	[63]
World Conference on Information Systems and Technologies	[51]

Table 4.2: Conference papers included in the SLR

Name of book	Ref. in list of studies
Emerging Innovations in Agile Software Development	[35],[36]

Table 4.3: Book chapters included in the SLR

## 4.2 RQ1: What is agile coaching and its purpose?

Only six studies are found from literature out of 66 studies reviewed, which can help to answer the RQ1. Table 4.4 summarizes the results. (Themes emerged from these studies, number of studies that support a theme i.e. frequency and reference to the study).

Theme	Frequency	Reporting studies
Facilitate adoption of agile methods	2	[Paasivaara and Lassenius, 2014]; [Paterek, 2017]
Facilitate sustainability of agile methods	1	[Paasivaara and Lassenius, 2014]
Deal with transition challenges in agile transformation	2	[Gandomani et al., 2014]; [Nagarajan and Overbeek, 2018]
Improving team performance and avoiding failure	1	[Shamshurin and Saltz, 2019]
Professional advocacy of agile methods and their adoption	1	[Pavlič and Heričko, 2018]

Table 4.4: Themes in reviewed studies addressing RQ1

### 4.2.1 Facilitate adoption of agile methods

[Paasivaara et al., 2014], in their study on Agile Coaching for global software development projects mention that the adoption of agile methodologies can be greatly facilitated by agile coaching. To facilitate this adoption, agile



coaches arranged trainings and workshops in the beginning of agile transition. At the later stage, the agile coaches “live” with the case projects by providing a “deep and narrow” approach to coaching through mentoring and by participating in the meetings, giving advice and feedback. Agile coaching and mentoring is the main precondition and facilitator of an agile transformation process [Paterek, 2017].

#### **4.2.2 Facilitate sustainability of agile methods**

[Paasivaara et al., 2014], in their study on Agile Coaching for global software development projects mention that the adoption of agile methodologies can be greatly facilitated by agile coaching. To facilitate this adoption, agile coaches arranged trainings and workshops in the beginning of agile transition. At the later stage, the agile coaches “live” with the case projects by providing a “deep and narrow” approach to coaching through mentoring and by participating in the meetings, giving advice and feedback. Agile coaching and mentoring is the main precondition and facilitator of an agile transformation process [Paterek, 2017].

#### **4.2.3 Deal with transition challenges in agile transformation**

There are many challenges and obstacles that an organization must deal with while transitioning to agile. Good Agile coaching service can help software teams with the transition challenges [Gandomani et al., 2014] particularly overcoming human impediments to organizational change [Nagarajan and Overbeek, 2018].

#### **4.2.4 Improving team performance and avoiding failures**

Agile coaching helps teams to learn new and better ways to develop software and improve existing ways of working which would ultimately improve team performance. Agile coaching also helps in avoiding failures to new agile initiatives. [Shamshurin and Saltz, 2019], in their study reports on an experiment where teams either had or did not have a Kanban coach. Quantitative and qualitative analysis of the data collected during the experiment found that teams that used a Kanban Coach had significantly better performance than the one that did not have a coach.

#### **4.2.5 Professional advocacy of agile methods and their adoption**

Agile coaching is a full-time employment which involves professional advocacy of agile methods and introducing them to daily routine at company [Pavlič and Heričko, 2018].

### **4.3 RQ2: What are the tasks or responsibilities of an agile coach?**

In general, an agile coach facilitates the agile adoption or agile transition process in software development organizations [Parizi et al., 2014]. Agile adoption is a complex process requiring socio-technical changes in the organization [Misra et al., 2009]. The studies reviewed here reveal several important tasks that could fall upon the shoulders of an agile coach. These range from teaching and mentoring to help the teams understand the agile methods, to empowering them to ask relevant questions and discover the knowledge already hidden in the team, to resolving conflicts, and to facilitate overcoming human impediments in the overall process improvement.

Theme	Frequency	Reporting studies
Develop or train the team	10	[Fraser et al., 2003]; [Drummond et al., 2008], [Hoda et al., 2012], [Santos et al., 2013], [Paasivaara and Lassenius, 2014]; [Paterek, 2017], [Gren et al., 2017], [Pavlič and Heričko, 2018], [Pacheco et al., 2018], [Stettina et al., 2018]
Support all stakeholders to understand and apply agile methods	6	[Gren et al., 2017]; [Parizi et al., 2014]; [Bäcklander, 2019]; [Raith et al., 2017]; [Bass, 2013]; [Hobbs and Petit, 2017]
Facilitate and monitor effective implementation of agile	4	[Senapathi and Srinivasan, 2014]; [Jovanović et al., 2017]; [Santos et al., 2013]; [Parizi et al., 2014]
Understand the context of agile adoption	2	[Hoda et al., 2010b]; [Ng, 2016]
Building trust among team members	1	[Dorairaj and Noble, 2013]
Collect data on the activities carried out by the team	1	[Pacheco et al., 2019]
Help in creating guidelines and setting roadmaps	3	[Paasivaara et al., 2014]; [Paasivaara, 2017]; [Paasivaara et al., 2018]
Pilot selection	1	[Gandomani et al., 2013]

Table 4.5: Themes in reviewed studies addressing RQ2

In total 28 studies are found from literature that can help to answer the RQ2. Table 4.5 summarizes the results. (Themes emerged from these studies, number of studies that support a theme i.e. frequency and reference to the study that report a theme). Next, I will present the results in detail.

#### **4.3.1 Develop or train the teams**

In the words of Steven Fraser in [Fraser et al., 2003], “Coaches help team members become a cohesive unit, understand the rules-of-the-game, facilitate interaction, optimize skills, and build motivation towards common goals”. The primary role or duty of an agile coach is to build teams by providing realistic support during implementation of agile processes [Paterek, 2017], ensure to lead the team towards self-organization [Hoda et al., 2012], help team to explore their potential and knowledge [Santos et al., 2013], teaching agile methods, techniques and related tools [Pacheco et al., 2018], providing guidance by conducting workshops and trainings on agile methods [Drummond et al., 2008, Gren et al., 2017, Pavlič and Heričko, 2018] and support team members in acquisition of entrepreneurial and agile mindset [Stettina et al., 2018], coaches can help in designing the steps to the targets, and support the teams in implementing the agile practices [Paasivaara and Lassenius, 2014]

#### **4.3.2 Support all stakeholders to understand and apply agile methods**

The tasks of an agile coach are not only limited at the team level. A good coach communicates and collaborates with all the stakeholders involved in the agile transition process such as top management [Gren et al., 2017] and directly coaching the people who are involved in the transition by teaching them what they need to be familiar with their new roles and responsibilities

[Parizi et al., 2014]. Supporting Scrum Masters and distributed Scrum teams [Raith et al., 2017], supporting product owners [Bass, 2013], visiting different sites and providing frequent demos, retrospectives [Hobbs and Petit, 2017]. Agile coaches were typically based within a tribe and working with several squads (teams) within the tribe while also supporting the tribe as a whole in collaboration with other coaches and leaders [Bäcklander, 2019].

#### **4.3.3 Facilitate and monitor effective implementation of agile**

An agile coach facilitates and monitor effective implementation of Scrum practices [Senapathi and Srinivasan, 2014], identify and discuss issues, potential suggestions and innovations [Jovanović et al., 2017], present solutions to teams to help them think about what to do next and to make them take responsibility for their own actions [Santos et al., 2013]. An agile coach facilitates the adaptation of agile methods and practices by proposing the required adjustments and helps all the practitioners to overcome their problems during the transition process and facilitate the change process [Parizi et al., 2014].

#### **4.3.4 Understand the context of agile adoption**

Successful agile adoption depends on context. An important task of an agile coach is to understand the context of agile projects. Understanding the context will help agile coaches to adapt development processes to fit their project's contexts [Hoda et al., 2010a]. “Our experiences taught us that context evolves as agile coaches interact with development organization and teams, and the context description evolves and converges to the team's desired way of working after the agile coach leaves the scene. It is also the basis for drawing upon past experiences and building experiences for the next agile

adoption engagement” [Ng, 2016].

#### **4.3.5 Building trust among team members**

Another important task of agile coach is to develop a relation of trust with the team he or she is coaching and also improve trust between individuals on the team by regular communication and exposing expertise of team members, particularly through knowledge sharing activities, has been effective to build trust across different sites [Dorairaj and Noble, 2013].

#### **4.3.6 Collect data on the activities carried out by the team**

In order to perform an effective Agile coaching, it is necessary to collect data in the form of metrics on the activities carried out by the team in order to let it know the way it works using different tools such as Actionable agile [Pacheco et al., 2019].

#### **4.3.7 Help in setting the road map**

Agile coaches and management work together on defining common values for an organization, creating a roadmap of where they want to see their organization in coming years and how they would work to achieve the goals [Paasivaara et al., 2014], creating agendas and instructions for software teams [Paasivaara, 2017] and developing guidelines for full-scale agile roll-out [Paasivaara et al., 2018].

### 4.3.8 Select a pilot project for agile transformation

Another important task of an agile coach is to select a pilot project during agile transformation process [Gandomani et al., 2013]. Pilot project plays a critical role in agile transformation process as it is the initial project or a training project which during it, a company tries to adaptation to agile methods or practices. Pilot projects help to predict future challenges. Organizations need to consider critically, duration, size and required resources while selecting a pilot [Gandomani et al., 2013].

## 4.4 RQ3: What are the skills required by an agile coach?

An agile coach needs to have numerous skills to effectively manage agile adoption process. The studies reviewed here reveal that the skills of an agile coach can be wide ranging; such as, leadership skills for guiding and motivating teams and organizations, technical skills for help individuals and teams to design and develop software, systematically dealing with the transition or transformation of an organization's goals, processes or technologies, identifying risks in the system, knowledge management skills, expertise in multiple agile methods and processes, etc.

In total nine studies are found from literature that can help to answer the RQ3. Table 4.6 summarizes the results. (Themes emerged from these studies, number of studies that support a theme i.e. frequency and reference to the study that report a theme.) Next, I will present the results in detail:

Theme	Frequency	Reporting studies
Leadership skills	7	[Santos et al., 2013]; [Silva and Doss, 2007]; [Paasi-vaara and Lassenius, 2014]; [O'Connor and Duchonova, 2014]; [Gren et al., 2017]; [Ganesh and Thangasamy, 2012]; [Fraser et al., 2003]
Project management skills	3	[O'Connor and Duchonova, 2014]; [Muntés-Mulero et al., 2018]; [Pavlič and Heričko, 2018]
Technical skills	2	[O'Connor and Duchonova, 2014]; [Pacheco et al., 2018]
Expertise in agile methods and processes	2	[Silva and Doss, 2007]; [O'Connor and Duchonova, 2014]
Other	2	[O'Connor and Duchonova, 2014]; [Senapathi and Srinivasan, 2014]

Table 4.6: Themes in reviewed studies addressing RQ3



#### 4.4.1 Leadership skills

The most important set of skills an agile coach must possess is the leadership qualities and skills. An agile coach needs strong social skills rather than only technical skills [Santos et al., 2013]. A coach needs to have good communication skills [Silva and Doss, 2007, Paasivaara et al., 2014], understanding of teamwork and team dynamics [O'Connor and Duchonova, 2014], conflict management and team building [Gren et al., 2017] and a range of soft skills such as positivity, persistence and patience [Ganesh and Thangasamy, 2012, O'Connor and Duchonova, 2014]. It should be noted that leadership skills are often more important than technical skills for an agile coach. According to Jutta Eckstein (a professional agile coach, speaking in a panel discussion): “If you seek a coach, I absolutely recommend one with strong social skills rather than simply technical skills. I have never seen a project fail because of technical reasons”. [Fraser et al., 2003]

#### 4.4.2 Project management skills

An agile coach needs to have some project management skills to achieve goals and meet success criteria at the specified time such as skills in change management [O'Connor and Duchonova, 2014], expertise to be able to identify and manage risks in the system [Muntés-Mulero et al., 2018] and knowledge management skills [Pavlič and Heričko, 2018].

#### 4.4.3 Technical skills

An agile coach needs to have technical skills as well. This includes diversity in IT skills [O'Connor and Duchonova, 2014] and software design and development skills [Pacheco et al., 2018].

#### **4.4.4 Expertise in agile methods and processes**

An agile coach needs to have knowledge and expertise in agile methods and processes [Silva and Doss, 2007, O'Connor and Duchonova, 2014]. However, it should also be noted that certification in agile or professional coaching is not critical [O'Connor and Duchonova, 2014].

#### **4.4.5 Other**

Other skills include adequate experience in team coaching and agile transformation projects and a good number of professional references [O'Connor and Duchonova, 2014] and business skills [Senapathi and Srinivasan, 2014].

## 5 Discussion and limitations

It is interesting to note that a big majority of the studies which ended up being reviewed after passing the inclusion criteria belong to various conferences ( $\approx 70\%$ ) whereas a smaller number of studies are journal articles ( $\approx 26\%$ ). This is because a larger number of journal articles were excluded (due to one or more exclusion criteria) from the initial Scopus results of the search query, which had  $\approx 51\%$  conference publications and  $\approx 29\%$  journal articles. However, both before and after exclusion the proportion of conference publications in the search results was greater which is not surprising due to a larger number of conference venues and publication frequency.

Most of the studies reviewed here have used case study or grounded theory research approaches. Both are well-established research methodologies from social sciences, which emphasize investigating a phenomenon in its real-world setting [Laws and McLeod, 2004]. This highlights that researchers have acknowledged that agile methods, their adoption in software development organizations and agile coaching are in fact social processes which need to be investigated and understood within their real-life settings. It also reinforces the message that people and processes are more valued than tools and technologies [Beck et al., 2013].

Although case-study and grounded-theory based studies together make up  $\approx 50\%$  of the studies reviewed, it is equally important to note that the remaining of studies are based primarily on interviews, surveys, their combination, panel discussions, and experience reports involving agile practitioners, agile coaches, industry experts, and similar. It is significant that nearly half of the studies are based on these latter methods, including studies from the last 5 years which highlights that the body of literature acknowledges the need for such studies. On the one hand, the advantage of such studies is that knowledge and opinions from practitioners and experts provide valuable input and

insight for understanding current trends and challenges in agile adoption and the need for agile coaching. They could also provide potential directions for future research leading to more real-world empirical studies. On the other hand, these type of studies are likely to be opinionated, biased, and therefore hard to validate and generalize.

Over half of the studies are from the last five years (and 59 out of 66 studies are from the last 10 years) which is a strong indication of the fact that the topic of agile coaching and issues directly or implicitly related to it are being actively studied. This indicates that agile coaching and the role of agile coach in agile adoption are currently evolving and gaining popularity in research community.

## **5.1 Agile coaching and the role of the agile coach**

The rest of this chapter discusses how the studies reviewed in this systematic review help in understanding the role of agile coach in agile adoption, and how can agile coach help to address overcome some of its challenges

Even though it seems that the industry would tend to think of agile coaching as a dedicated “job description”, surprisingly none of the studies provide an explicit definition of either the term “agile coaching”. Only a few (6 out of 66) have either indicated or described the purpose of agile coaching. The published studies reviewed in this SLR have variously described agile coaching and agile coach in terms of numerous functions, purposes, tasks and goals, etc. However, there is not a lot of agreement in published literature on agile coaching and its primary purpose in a software development organization. This could be largely due to the fact that in its original form the Agile Manifesto did not envision agile coaching. The role of agile coach has naturally evolved overtime which has led to a variation in its primary

purpose as evidenced in the literature. I feel that the lack of a standard definition/description leads to ambiguity around the proper role of an agile coach in agile adoption.

Outside of the published primary studies, a web search revealed several professional agile coaching certifications targeted at prospective agile coaches. It seems that research literature does not generally acknowledge these professional certifications giving an impression that there is a disconnect between agile-coaching practitioners and research studies about agile coaching. Interestingly, agile coaching or other professional coaching certifications are of non-critical importance in the skill set of an agile coach [O'Connor and Duchonova, 2014].

There is no doubt that the literature reviewed demonstrates that agile coaching is highly beneficial for software development organizations, because in principle it seeks to facilitate the process of agile adoption.

Agile adoption in large organizations and projects is challenging due to organization size, multiple teams, uncertainties and complexities [Dybå and Dingsøy, 2008]. One of the challenges is a general resistance to change [Dikert et al., 2016] coming from different employees involved, which agile coaches can help overcome to some extent by motivating and making the employees understand that the change in their roles, tasks and way of working is necessary using their leadership skills (see Sec. 4.4) having been reported by a number of studies. Another challenge is difficulty in implementing agile methods [Dikert et al., 2016]. Often, software teams can get lost in the application of agile techniques. This can be addressed by agile coaches by properly guiding and explaining the teams on agile principles and techniques using their communication skills and expertise in agile methods and processes (see Sec. 4.4). This role of agile coach is recognized as a success factor in large-scale agile transformation [Dikert et al., 2016].

Team autonomy in large-scale agile projects is challenging to achieve because of shared resources and dependencies on external environment which creates a lot of unnecessary or preemptive communication. Having someone shield the team from external surroundings is important and relieving for the developers who feel that getting interrupted while focusing on tasks makes them more time consuming than necessary [Moe et al., 2019a]. This shielding role primarily requires someone having leadership qualities [Moe et al., 2019a]. An agile coach can be a good candidate to fulfil this role, and can shield the team from external pressures with the help of their project management skills and leadership qualities (e.g., [Santos et al., 2013, Shamshurin and Saltz, 2019, O'Connor and Duchonova, 2014], also see sec. 4.4). This may lead to an impression that in this case the agile coach might be expected to take on the role normally expected of a project manager. However, it should be noted that an agile coach is not a replacement for a project manager [Miller, 2019].

Conducting daily stand-up meetings in a way that benefits the whole team can be challenging. According to Stray et al. [Stray et al., 2018], the value of daily stand-up meetings is greatly impacted by how these meetings are facilitated. Often daily stand-up meetings are seen as just status reporting meetings which doesn't add much value to the team performance. Moreover, ineffective meetings can have a negative impact on job satisfaction and trust among co-workers. One way to increase the effectiveness of daily stand-ups is to encourage shared leadership within the agile team by allowing selected team members to share in the responsibility of facilitating the daily meetings [Stray et al., 2018]. Agile coach and Scrum Master both are valuable roles in making the meeting much more effective. Agile coach along with Scrum Master can play a role in making the status reporting meeting as a discussion meetings which is more focused on problem solving and building mutual adjustments and trust. Furthermore, the agile coach can guide and mentor different team members in acquiring appropriate skills for effectively

conducting the daily stand-up, and generally train scrum teams to acquire and improve leadership and communication qualities, thereby empowering the team members to effectively play their role in shared facilitation of meetings. Agile coach can help in overseeing, monitoring and guiding on how to make team meetings more effective by smartly bending the conventional Scrum guidelines. Conducting daily stand-up meeting is primarily the responsibility of Scrum master, but in some cases if Scrum master is absent, team simply skip the meeting.

## 5.2 Recommendations for practice

If a company were going to hire an external agile coach, based on my results and findings from this systematic review, a recommendation is to hire one who has strong leadership qualities, strong communication skills, problem solving and decision making capabilities and patience. A coach need to have knowledge of agile values and principles, expertise in agile methods and some experience in agile transformation projects is a plus. If it is a large company, investment in development of internal agile coaches is valuable. Coaching certifications are of secondary importance.

## 5.3 Limitations

This section identifies and discusses a few limitations of this systematic literature review. These should be taken into consideration when working with the results and findings of this report.

**Studies retrieved from single source** Ideally, the review should include studies from multiple sources [Kitchenham and Charters, 2007]. In

this review the final search query was applied only on a single source database, namely Scopus, and the studies retrieved from there were collected for further screening. The reason for limiting the final selection to Scopus only is explained in Sec. 3.2.3. The preliminary search queries were also applied on two other sources, i.e., Google Scholar and Web of Science (see Table 3.1), however they were not considered for the final result selection. Even though many results from these two sources were also available on Scopus, there may have been some primary studies that were not indexed by Scopus and have therefore not been considered.

**Completeness of primary studies** During the selection process I have tried my best to be thorough in the selection of all relevant primary studies. However, there is no guarantee that all the existing primary studies were selected for screening, due to human error and the limitation of being a single researcher conducting a systematic literature review.

**Selection bias and inclusion/exclusion decisions** As this review is conducted by a single researcher (i.e., the author) with the aid and advice of her research supervisor, there may be potential for selection bias. In order to minimize this, first the search query was incrementally built in stages (as explained in Sec. 3.2.3). Then, the included and excluded primary studies were discussed and double-checked together with the supervisor to check for consistency in inclusion/exclusion decisions.

**Correctness of extracted data** For a single-researcher systematic review, where checking by multiple other researchers is not possible, one of the guidelines suggests contacting the author(s) of the primary studies to validate the extracted data [Kitchenham and Charters, 2007]. However, this was not done due to feasibility and time constraints.



## 6 Conclusion and future work

This thesis presents a systematic literature review to understand the role of the agile coach in agile adoption. The review follows well-known and highly cited guidelines for systemic reviews in software engineering [Kitchenham and Charters, 2007]. The rationale for conducting this review research is that agile coaching is a rapidly growing area. There are a number of professional training programmes and certifications aimed at training prospective agile coaches. It was felt that there is a lack of understanding what agile coaching is, what agile coaches do and how they can help in adoption of agile methodologies in software development organizations. This motivated the need for systematically looking at published evidence in relevant literature. The final search query resulted in 209 studies, out of which 66 studies are selected as primary studies and the remainder (143 studies) are excluded based on an number of inclusion and exclusion criteria. The included studies were thoroughly analysed to extract relevant information against these three research questions formulated during the planning phase of the review. After the data extracted from the primary studies against each of these questions was closely analysed, various themes emerged that provided categorizations under each of the following research questions.

- RQ1: What is agile coaching and its purpose?
- RQ2: What are the tasks or responsibilities of an agile coach?
- RQ3: What are the skills required by an agile coach?

The thematic analysis/synthesis provided valuable insights into understanding the value of agile coaching and the role of agile coaches in a number of areas. Agile coaches can help in overcoming challenges in large-scale agile adoption such as resistance to change and difficulty in understanding and

implementing agile methods at scale. They can also play a role in removing barriers to team autonomy such as pressure from external surroundings by shielding the team using their leadership qualities and project management skills. In addition they can help in making daily stand-up meetings more effective by mentoring for and encouraging sense of shared leadership within the agile team, so that multiple team members can share in the responsibility of facilitating the meeting.

Some of the limitations of this systematic literature review are that the studies are retrieved from single source database, namely Scopus. I tried my best to include all relevant primary studies, but this is not guaranteed due to limitation of being a single researcher.

As part of future research work I suggest conducting interviews with agile coaches and observing them in their real life settings so that others can relate the findings and results of this review with what is happening in the practice.

One aspect that could not be investigated in this review are the inherent challenges of agile coaching itself. It would be interesting to find what issues and problems hinder effective agile coaching and what could agile coaches do to overcome these problems and make their work more effective. Also what tools and techniques are used by agile coaches to aid them in their work.

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