Hybrid Software and System Development in Practice: Initial Results from Austria

Michael Felderer[1(✉)], Dietmar Winkler[2], and Stefan Biffl[2]

[1] University of Innsbruck, Innsbruck, Austria
michael.felderer@uibk.ac.at
[2] Vienna University of Technology, Vienna, Austria
{dietmar.winkler,stefan.biffl}@tuwien.ac.at

Abstract. The application of software process models in industry includes traditional processes, agile processes, and process variants that aim at balancing traditional and agile with focus on specific industry needs. To investigate the characteristics of such hybrid software and system development approaches that combine agile and traditional approaches the HELENA project was initiated. HELENA is based on a large international survey. Based on the first HELENA survey, conducted in 2016, in 2017 a second round of surveys has been launched. This paper focuses on initial results and discussions of the data from Austria where 22 persons participated. Results showed a good balance of small and medium enterprises and large organizations. Iterative development processes and Scrum are widely spread in these organizations where traditional approaches are often combined with some agile practices.

Keywords: Agile software development · Hybrid development approaches · Software process · Survey

1 Introduction

The adoption of suitable software and system development methods and practices has become essential for business success in the age of digitalization. There are many agile, e.g., Scrum, or traditional approaches, e.g., Waterfall, with a high number of different methods and practices available, which are often combined ad-hoc in industry. However, systematic investigations for their combination in a specific context to a so-called hybrid software development approach are missing. A hybrid software development approach (short: hybrid approach) is any combination of agile and traditional (plan-driven or rich) approaches that an organizational unit adopts and customizes to its own context needs [1].

To investigate characteristics of hybrid approaches, the research project HELENA[1] (Hybrid DEveLopmENt Approaches in software systems development) was initiated. The first round of surveys has been scheduled in 2016 in a large-scale international context [1]. The main outcome was that organizations typically use some combinations

[1] Helena Survey: https://helenastudy.wordpress.com/.

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where traditional processes serve as a framework for agile practices. These combinations are independent of the size of an organization. The authors concluded that such hybrid approaches are the results of a natural process evolution, driven by experience and pragmatism [1, 3]. Based on lessons learned and feedback in 2017 a second round of improved surveys have been launched. By August 15, 2017 more than 500 participants from around 20 participating countries all over the world have contributed to this replicated survey.

In this paper we provide initial results and discussion of the data received from Austria, where 22 persons participated in the survey. This paper provides a contribution to in-depth discussions on HELENA at the 2nd Workshop on Hybrid Software and System Development Approaches collocated with PROFES 2017.

The remainder of this paper is structured as follows. Section 2 presents initial survey results collected in organizations, located in Austria with focus on organization demographics, personal roles of respondents, and applied software engineering frameworks and methods. In Sect. 3 we discuss the results and provide candidate next steps.

2 Initial Results

In this section we provide an overview of the demographics and initial results from Austria. Initially, we invited 55 selected individuals covering 40 different organization in Austria. Organizations include small and medium enterprises as well as large organizations. Overall, we received 22 responses, which corresponds to a response rate of 40%.

2.1 Company Size, Business Sector, and Industrial Sector

Figure 1 shows demographical data on the size of organizations based on collected data from Austria.

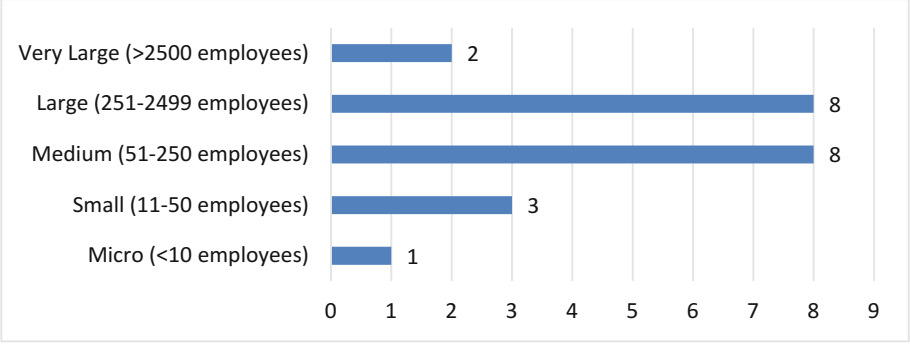

Fig. 1. Company data: distribution of the company size [number of organizations].

Results include 1 micro organization (5%), 11 small and medium enterprises (50%), and 10 large and very large organizations (45%). Thus, there is a good balance of very large/large and small/medium enterprises.

Figure 2 illustrates the share of business areas of the related organizations. The respondents reported 49 different business domains in their organizations. Please note that multiple business areas are covered especially by large and very large organizations. The top-three rated business areas are: (a) Customer-specific Software Development (15 responses), (b) Standard Software Development (10 responses), and (c) System Development (8 responses). Furthermore, some organizations focus on supporting and consulting business areas, such as Project Management Support (5 responses), IT Consulting, Training, and Services (5 responses), and Software Process Management (3 responses). One organization declares Research & Development as a core business area and 2 responses did not provide any details on their businesses.

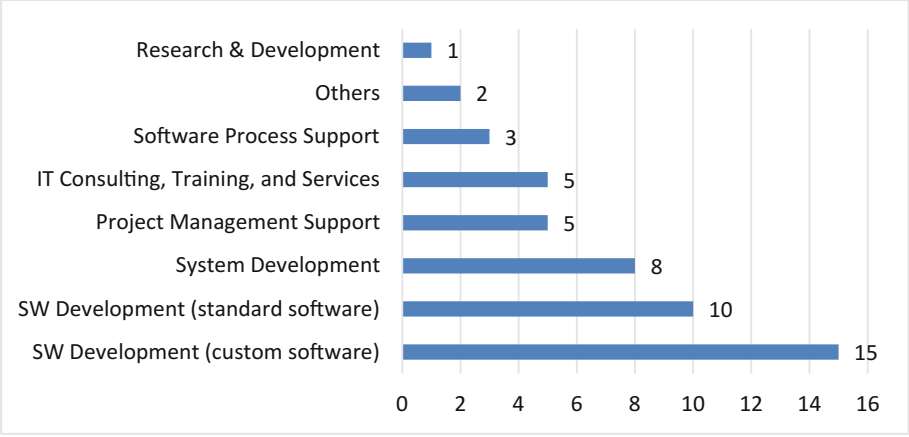

Fig. 2. Company data – distribution of business areas [number of business areas, multiple answers accepted].

Figure 3 presents the distribution of the industrial sector. Similar to business areas, multiple answers were possible. The Austrian result set includes 50 industrial sector nominations. The six most reported industry sectors include (a) financial services (8 nominations), (b) Public Sector, (c) Medical Devices, (d) Energy (6 nomination each), (e) Web applications, and (f) Automotive Software and Systems (4 nominations each). In the Austrian results, none of the respondents work in organizations who see Telecommunication, Media and Entertainment, Defense Systems, Cloud Applications and Services, and Aviation as targeted industry sectors.

These analysis results are typically biased by the selection of the survey participants and responses. However, in context of the application of software processes and practices the industry sector this limiting factors have to be considered in the analysis.

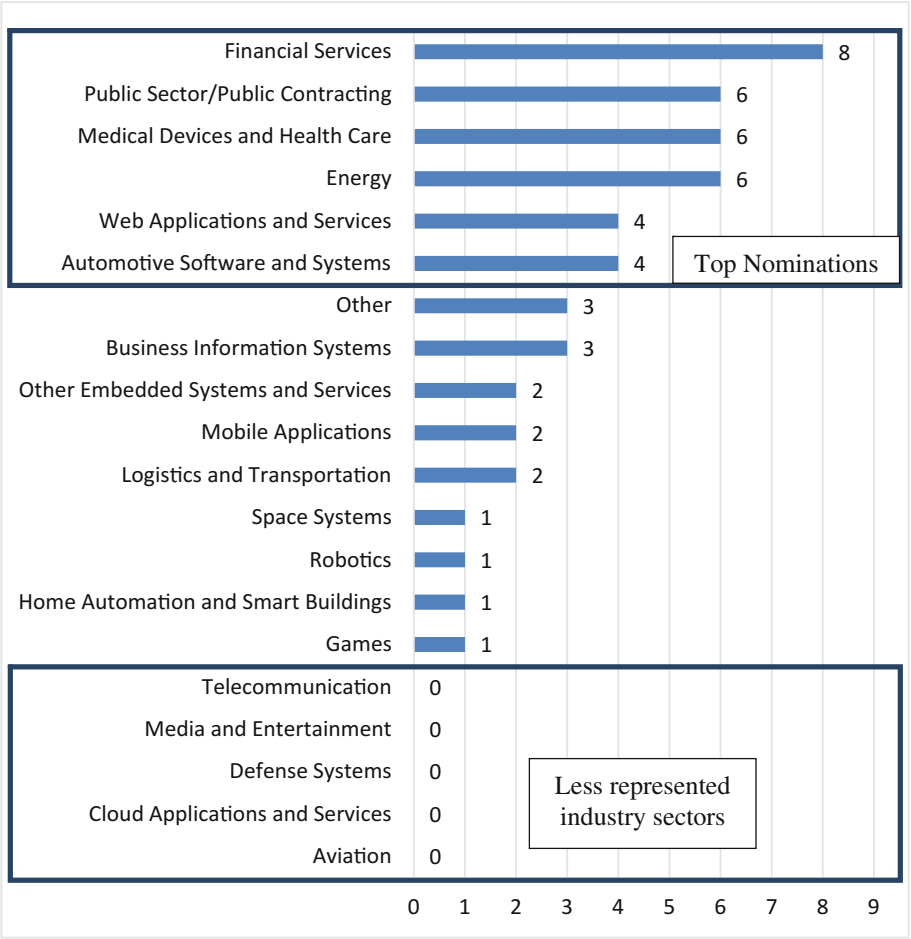

Fig. 3. Company data – distribution of industrial sectors [number of industrial sectors, multiple answers accepted].

2.2 Roles and Experiences

To complete the demographic analysis, this section summarizes individual roles and experiences of respondents. Figure 4 illustrates the distribution of the main role of the respondents based on 22 responses. Note that participants had to declare their main role in typical projects. Thus, multiple answers were not possible.

The main roles of the respondents are (a) Project/Team Manager (5 nomination = 23%), (b) Quality Manager, (c) C-Level Manager, (d) Product Manager/Owner, and (e) Developers (3 nominations = 14% each). Note that the respondent group does not include Analysts/Requirements Engineers and Testers. Again, these results are biased by the selection of the survey participants and responses.

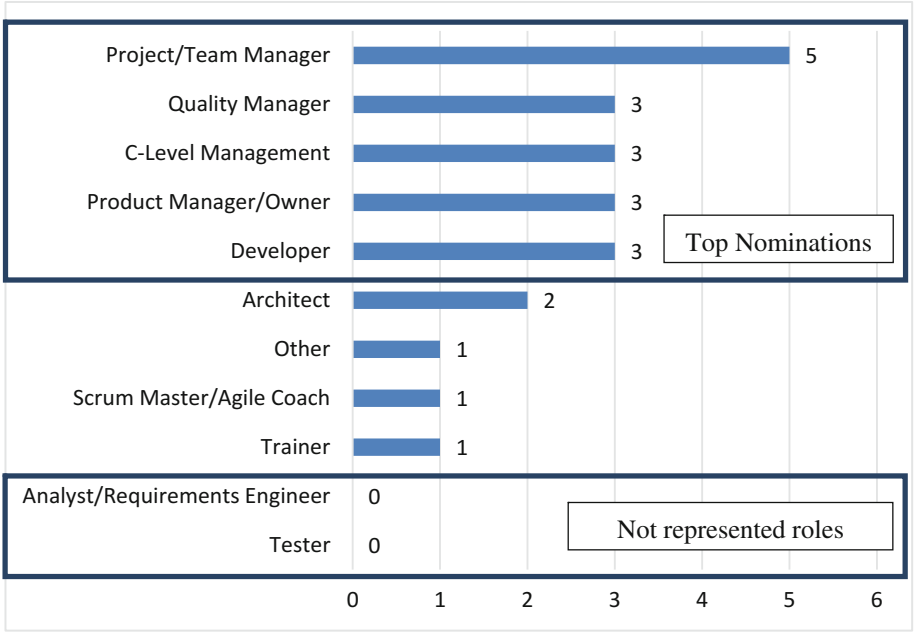

Fig. 4. Respondents data: distribution of project roles [number of main roles of respondents].

In addition, we captured the experience level of the respondents. The results showed highly experienced survey participants in Austria, i.e., 4 participants (i.e., 18%) with 6–10 years of professional experience and 18 participants (i.e., 82%) with more than 10 years of experiences.

These experience levels corresponds to the main roles of the respondents as typically more experienced participants take management tasks and roles.

2.3 Application of Traditional/Agile Software Engineering Best-Practices

Based on standard project activities according to the SWEBOK [2], Fig. 5 presents the distribution of best-practice nominations of respondents of industry practice data in Austria. Note that we received an overall number of 17 survey responses (some participants did not provide any data for this evaluation).

The results show a balance of traditional and agile software engineering best-practices. Traditional approaches are mainly used for architecture and design, configuration management, and risk management. Agile approaches are focused on integration and testing, change management, quality management, and project management. It is also observable that for architecture and design, requirements analysis/engineering, quality management, and project management hybrid approaches are used to overcome limitations of traditional and agile approaches. For transition and operation, change management, and risk management, we received responses, that these best-practices seem to be

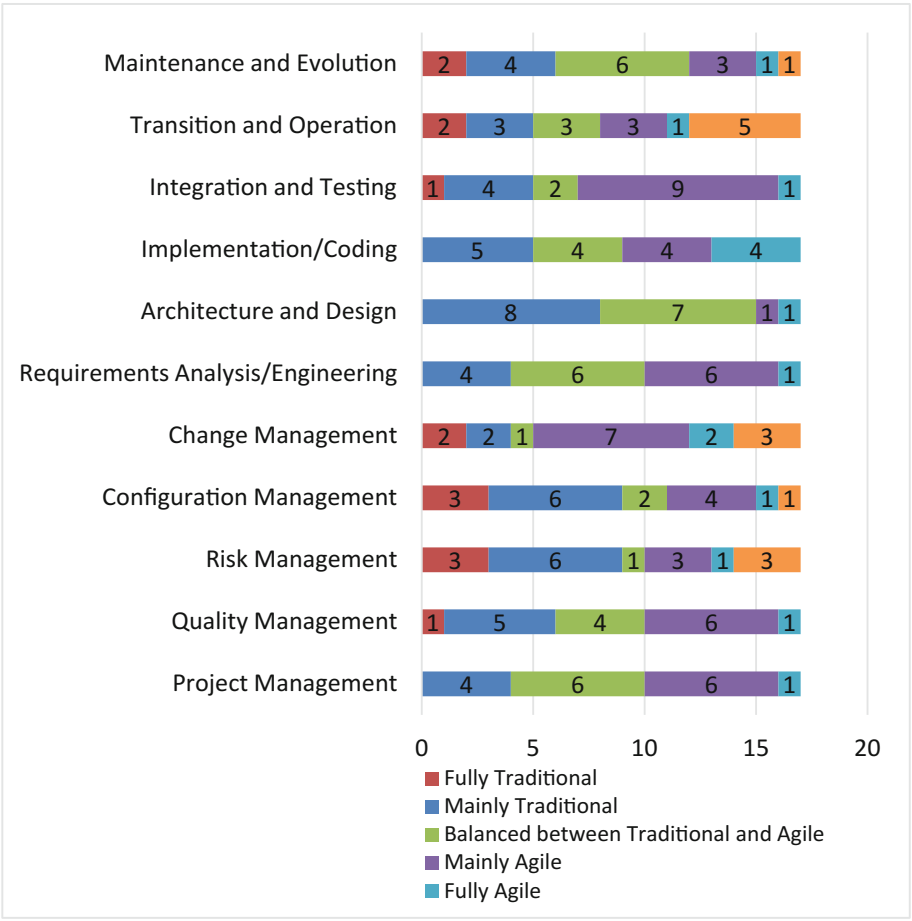

Fig. 5. Software engineering phases – traditional vs. agile approaches [number of the application of agile practices]

unknown or it is unknown to the respondents how these approaches are applied. Detailed analysis of these results require further investigations.

2.4 Software Engineering Frameworks/Methods

Figure 6 shows the industrial relevance of different software engineering frameworks and methods. In the survey response sample from Austria iterative development approaches and Scrum are widespread and frequently used. Kanban, the waterfall process approach and the V-shaped process model are also used to some extent. Other process models (both agile and traditional approaches) are either unknown or less frequently used.

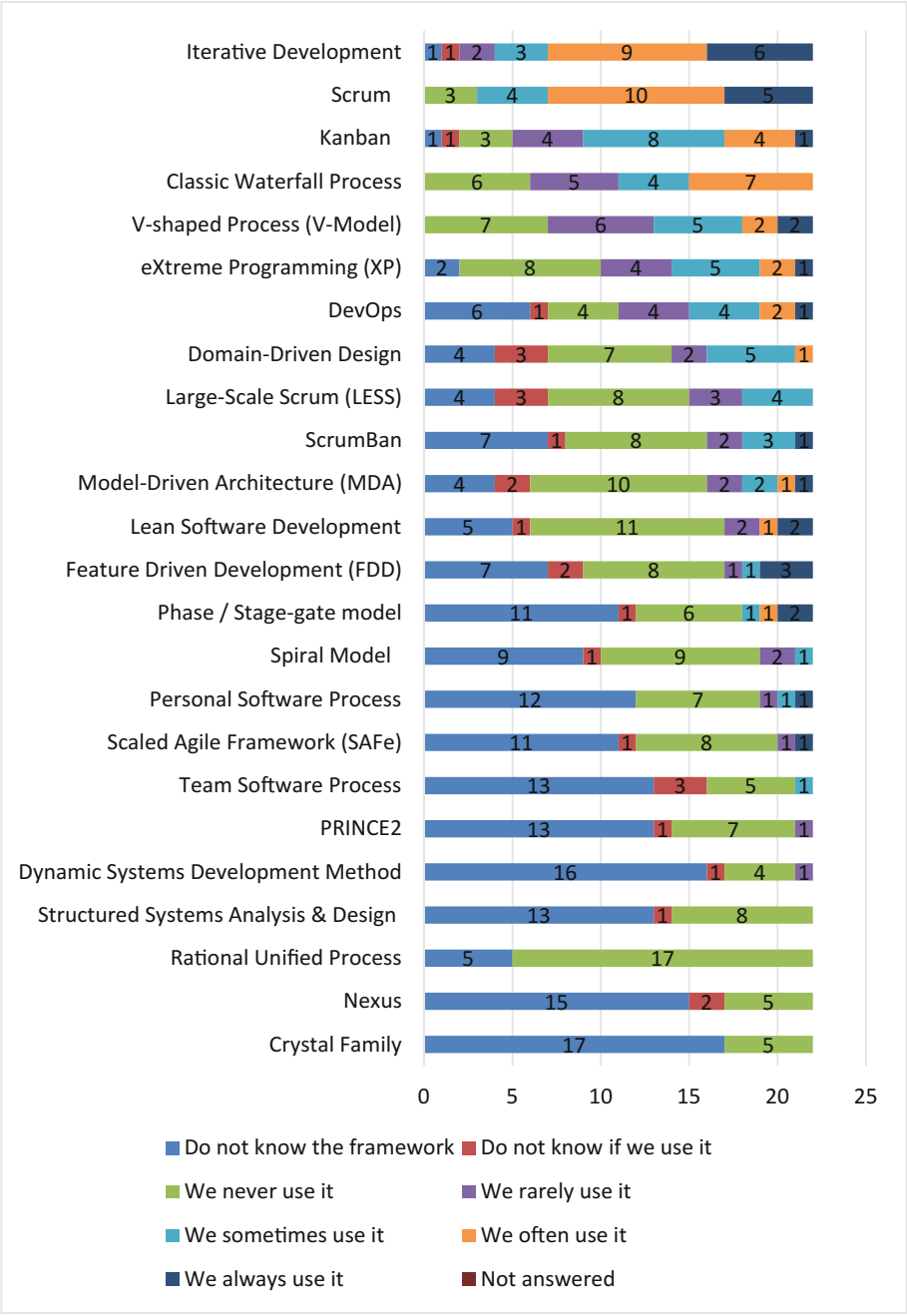

Fig. 6. Used software engineering frameworks and methods [number of applied frameworks/methods].

3 Conclusion and Future Work

In this paper we summarized some descriptive statistics of the second phase of the HELENA study based on data collected from 22 respondents in Austria. Note that we sent out 55 invitations in selected organization which corresponds to a response rate of 40%. The analysis results focus on (a) *Company Size* where the results showed a balanced distribution of small/medium and large/very large organizations; (b) *Business Areas* with a majority of respondents that focus on custom/standard software and systems development; (c) *Industry Sectors* with a focus on financial services, public sector, medical, energy, web application, and automotive sectors; and (d) *Roles and Experiences* of respondents. Most of the respondents work in a management role, e.g., project/team management, quality management, C-level management, and (senior) development. This is also supported by the analysis of working experience, where we observed more than 80% with more than 10 years of working experience.

In context of the application of traditional, agile, or hybrid models, we focus on the applications of software engineering approaches in individual life cycle phases. For architecture and design, configuration management, and risk management traditional approaches or combinations with agile practices are favored, while core agile approaches are used for integration and testing, change management, quality and project management. In context of the usage of software engineering frameworks and methods, most of the respondents are familiar with iterative development and Scrum, while other approaches are used if required by the customer.

Based on available data points further analysis is planned, especially with focus on possible correlations on the usage of practices, methods and frameworks in context of business area, industry sectors, and company size. In addition, the results represent a starting point for further analysis in different countries and even continents [3] to investigate the impact of software engineering best-practice processes and methods in industry.

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