Abstract – Agile Methods are designed for customization; they offer an organization or a team the flexibility to adopt a set of principles and practices based on their culture and values. While that flexibility is consistent with the agile philosophy, it can lead to the adoption of principles and practices that can be sub-optimal relative to the desired objectives. We question then, how can one determine if adopted practices are “in sync” with the identified principles, and to what extent those principles support organizational objectives? In this research, we focus on assessing the “goodness” of an agile method adopted by an organization based on (1) its adequacy, (2) the capability of the organization to provide the supporting environment to successfully implement the method, and (3) the method’s effectiveness. To guide our assessment, we propose the Objectives, Principles and Practices (OPP) framework. The design of the OPP framework revolves around the identification of the agile objectives, principles that support the achievement of those objectives, and practices that reflect the “spirit” of those principles. Well-defined linkages between the objectives and principles, and between the principles and practices are also established to support the assessment process. We assess the adequacy of an agile method by traversing the linkages in a top-down fashion. That is, given the set of objectives espoused by the agile method, we follow the linkages downward to ensure that the appropriate principles are enunciated, and that the proper practices are expressed. We assess the capability of an organization to implement its adopted method and the effectiveness of that implementation by using both a top-down and bottom-up traversal of the linkages. The bottom-up assessment, however, is predicated on the identification of people, process, project and product properties associated with each practice that attest to the presence and implementation of that practice. We refer to each practice, property pair as an indicator. By following the linkages upward from the indicators, we can infer the use of proper principles and the achievement of desired objectives.

Key words: Agile Assessment; Assessing Adequacy, Capability, and Effectiveness; Linkages between Objectives, Principles, and Practices; Indicators

1. INTRODUCTION

Currently, the number of organizations adopting agile methods is increasing - some of the reasons being (1) the ability to accommodate change throughout the development lifecycle, (2) improved quality, (3) greater return on investment, (4) shorter development periods, (5) improved customer satisfaction, (6) better team morale, (7) reduced waste and (8) better predictability [1-3]. Agile adoption in an organization is guided primarily by its culture, values and the types of systems being developed by the organization. More specifically, when an organization decides to adopt an agile method, we ask the following questions:

1. Does the agile method adopted have the potential to satisfy the values (various goals) of the organization? That is, does the method have the principles and practices in place to achieve the touted values?

2. Does the culture of the organization support the adoption and application of the agile method? Does the organization’s environment have the ability to support the implementation of the method? For example, if the people of an organization are resistant to change, getting them to adopt agile methods is a difficult undertaking that may be futile.

3. Is the agile method suited to handle the types of systems (small-, medium-, and large-scale, mission and life-critical, etc.) that are being developed by the organization? For example, can the method support the development of a larger scale system that would be built over the period of three years?

An organization’s objectives are reflective of its culture and values. However, how can one determine if the adopted agile method is consistent with the organizational objectives?

The agile philosophy provides an organization or a team the flexibility to adopt a selected subset of principles and practices based on their needs. More often than not, the agile principles associated with the practices are not reflected by the customized methods. Also, organizations lack the supporting environment to effectively implement the adopted practices. As a result, the benefits afforded by agile practices are not fully realized [4]. Hence, once again, we question the extent to which an agile method or a customized approach satisfies the needs of an organization. In effect, we question the “goodness” of that approach.

Existing methods to assess the “goodness” of agile methods focus on a comparative analysis, or are limited in scope and application. The agile philosophy places utmost importance on “working software” being the primary measure of progress. Hence, most assessment approaches for agile methods focus on assessing the working software and process artifacts. In particular, they place emphasis on the product and
predominantly ignore potential measures reflecting process, project, and people characteristics. Nonetheless, there are selected approaches that assess the process. There exist Agile Process Improvement Frameworks such as the Sidky Agile Measurement Index (SAMI) [5, 6] and Agile Adoption and Improvement Model (AAIM) [7] that guide an organization’s agile adoption and improvement efforts. Both frameworks describe levels of agility modeled on similar concepts found in the Software Capability Maturity Model (SW CMM) [8] and Capability Maturity Model Integration (CMMI) [9]. That is, a set of practices is to be adopted by an organization at each level in order to be “agile” at that level. The primary disadvantage of these frameworks is that a set of practices is “forced” on an organization at defined levels, which compromises the flexibility offered by agile methods. Third party agility measurement tools such as Comparative Agility [10, 11] and the Thoughtworks Agile Assessment survey [12, 13] focus on assessing the extent to which an organization or a team is successful in adopting and using agile methods. These tools help determine the presence or absence of practices in an organization rather than the degree to which those practices are used. Hence, there is a need for a more comprehensive approach to assessing the “goodness” of agile methods.

We advocate the need for a more comprehensive agile assessment process that assesses the people, process, project, and product characteristics of organizations adopting agile methods. In this paper, we describe an approach for assessing the “goodness” of agile methods from three perspectives. More specifically, to assess the “goodness” of a given agile method, we address the following three questions:

- How adequate is the method with respect to achieving its objectives?
- How capable is an organization in providing the supporting environment to implement its selected method?
- How effective is the implementation of the method in achieving its objectives?

In response to the above questions, we propose the Objectives, Principles and Practices (OPP) framework to facilitate the assessment of the “goodness” of agile methods. The framework identifies desirable objectives embraced by the agile philosophy, and definitively links them to principles that support the achievement of those objectives. Similarly, accepted practices are identified and linked to the principles that they support (Figure 1).

The linkages between the objectives and principles, and between the principles and practices, guide the assessment process. We assess the adequacy of an agile method by traversing the linkages in a top-down fashion. That is, given the set of objectives espoused by the agile method, we follow the linkages downward to ensure that the appropriate principles are enunciated, and that the proper practices are expressed. In addition to a top-down examination, the capability of an organization to implement its adopted methodology and the method’s effectiveness are assessed using a complementary bottom-up traversal of the linkages. This begins, however, by identifying people, process, project, and product properties that attest to the use of particular practices. Then, by following the linkages upward from the practices, we can infer the use of proper principles and the achievement of desired objectives. Figure 1 below shows the core structure of the OPP Framework. The objectives, principles, practices, indicators, and the linkages between them are the foundational pieces of the Framework (Figure 1).

Figure 1. Components of the OPP Framework

The remainder of this paper is organized as follows. We provide an overview of some of the existing agile assessment approaches in Section 2. Section 3 provides an overview of the OPP framework and its components. Our approach to assessing “goodness” is discussed in Section 4. We present our proposed substantiation approach in Section 5. Section 6 summarizes our work.

II. BACKGROUND

The agile manifesto states that agile practitioners value “working software over comprehensive documentation” [14]. This value, in conjunction with the agile principle that states “our highest priority is to satisfy the customer through early and continuous delivery of valuable software” [14] primarily guide the choice of agile metrics devised and used [15]. Hence, most assessment approaches focus on the product. For example, the number of bugs reported [16], the number of tests written for maximum code coverage [17], the team velocity that indicates the number of story points delivered during each iteration [15], earned business value [18], etc. are some metrics used by agile teams that focus on the product.

While essential to assessing agile methods, the product metrics are by themselves not sufficient to provide a comprehensive assessment. Software Engineering involves people, process, project, and product (the 4 P’s) [19]. Hence, metrics used in the assessment of agile methods should incorporate characteristics of the 4P’s. The OPP Framework that we propose in this research addresses this issue. In this section, we review current agile assessment approaches and analyze their merits and demerits.

A. Agile Assessment Checklists

Agile practitioners are aware that in order to continuously improve an adopted agile method, it is necessary to assess both their process and the final product. As a rule, agile teams
are asked the question “How agile are you?” In effect, teams are inclined towards ascertaining the extent to which their process is agile. Predominantly, to assess the agility of their process, they use checklists to determine the presence or absence of practices that are considered “agile”. These checklists, however, ignore the principles reflected by the practices. Also, most of these checklists are tailored to one or more specific agile methods. Some checklists that are commonly used by agile practitioners are (1) the Nokia Test [20] for Scrum, (2) How Agile Are You (42-Point Test) [21], (3) the Scrum Master Checklist [22], and (4) the Do It Yourself (DIY) Project Process Evaluation Kit [23]. The DIY Project process Evaluation Kit is a generic checklist that can be adapted for use with any agile process. Additionally, these checklists do not assess the effectiveness of agile methods.

**B. Agile Adoption Frameworks**

With the increasing popularity of agile methods, more and more organizations are moving towards agility. However, researchers have realized that many organizations and teams adopt and use agile practices without a proper understanding of the agile philosophy. Moreover, many organizations proclaim themselves to be “agile” when in fact they are following what is considered “Agilefall” (using agile terms but essentially following the waterfall model) [20]. In order to mitigate this issue and guide organizations in their agile adoption efforts, many agile adoption and process improvement frameworks have been developed.

Barry Boehm in his famous book titled “Balancing Agility and Discipline – A guide for the perplexed” [24] provides a five step risk-based software development approach that is reflective of the characteristics of both agile and plan-driven development methodologies. This framework is helpful for organizations that require a hybrid approach combining the best aspects of agile and plan-driven software development methods. However, the primary disadvantage of this approach is that the Framework provides an overview of the method to be followed and not actual practices [5]. Organizations require a tangible approach to adopting agile methods. More specifically, they need more guidance about practices that are best suited for their requirements before transitioning to agility. In the next paragraphs, we discuss two frameworks that provide a structured approach to agile adoption and improvement. Both frameworks specify practices that an organization should implement in order to embrace agility. These approaches are not intended to assess the “goodness” of an agile method, but instead, to guide an organization’s transition to the agile software development paradigm.

**Sidky Agile Measurement Index (SAMI)**

SAMI was developed at Virginia Tech by Dr. Ahmed Sidky as an attempt to guide the agile adoption efforts of an organization [5]. The SAMI is based on the idea that the more the number of agile practices adopted by an organization, the greater its agility [5]. The number of agile practices adopted by an organization determines its agile potential. Recognizing that counting the number of practices adopted is a simplistic measure, Dr. Sidky has created five agile levels. The agile levels defined in SAMI are very similar to the levels of maturity in CMM and CMMI.

Each agile level has a set of objectives. These objectives reflect the focal values stated in the agile manifesto. Each level is associated with a set of principles stated in the manifesto and practices followed by the agile community [5]. At each level, a set of practices that are reflective of the objectives defined at that level have been identified.

An organization can choose to achieve any of the specified levels of agility by adopting all the practices at that level and the levels below. That is, for an organization to maintain their agility at level 3, all the practices identified for levels 1, 2 and 3 have to be adopted.

SAMI outlines a systematic and structured approach to guide organizations in their agile adoption efforts. The primary disadvantage of the SAMI is that it compromises the flexibility afforded by agile methods. A set of practices for each level is predefined and is “forced” on the organization and thus reducing the flexibility offered by agile methods. Moreover, the established levels may not be reflective of the culture and values of the organizations.

**Agile Adoption and Improvement Model (AAIM)**

Quemer’s AAIM [7] is very similar to SAMI in that it provides an agile adoption and improvement framework that specifies varying levels of agility. The intent of AAIM is to measure the degree of agility of an agile method. Agility is defined by five parameters, namely “flexibility, speed, leanness, responsiveness and learning” [25].

Six levels of agility are defined and are further grouped into three agile blocks. Each block and level has an associated set of objectives. At each block, the degree of agility can be measured quantitatively using the agility measurement modeling approach – the 4-DAT (4 Dimensional Analytical Tool) [25, 26].

The 4-DAT has been designed to examine agile methods from four different dimensions: (1) determining the scope of application of the method, (2) agility characterization based on the five parameters mentioned previously - flexibility, speed, leanness, responsiveness and learning, (3) value-based characterization – identifying practices based on the focal values stated in the agile manifesto, and (4) software process characterization – identifying practices covering the SDLC phases, project management, configuration management, and process management [25].

Dimensions 1, 3 and 4 involve a qualitative assessment; dimension 2 involves a quantitative assessment. In dimension 2, the presence or absence of the practices is recorded and the overall score serves as a measure to check the existence of agility in agile methods.

AAIM is modeled along similar lines as the SAMI with respect to the CMMI-like agile levels. As mentioned earlier, the disadvantage is reduced flexibility. The degrees of agility
are measured by analyzing the adoption of a set of practices. Also, the predefined levels may not be ‘in-sync’ with the organizational objectives. Additionally, the AAIM and SAMI do not provide an indication of the effectiveness of the agile approach under consideration.

C. Agility Measurement Approaches

After transitioning to agility, most organizations are concerned about how “good” their agile adoption been - that is, are they achieving what they set out to by adopting the agile philosophy? Also, the organizations are interested in identifying problem areas and issues, and take adequate measures to solve them. Retrospective meetings at the end of each iteration or release cycle help an organization or team assess their progress, and “fine-tune” their agile approach. In addition to retrospection, teams can employ external consultants or tools to help assess their agile process. Most third-party assessment tools/frameworks are proprietary and information about them is not readily available. Here, we discuss two independent agile assessment tools that can be used by agile practitioners to assess the agility of their adopted method. These tools are available for free on the web.

Comparative Agility

Some organizations focus on being more agile than their competition rather than striving to be “perfectly agile” [11]. The Comparative Agility (CA) assessment tool (developed by Kenny Rubin, Mike Cohn, and Dr. Laurie Williams) is used to help organizations assess their agility relative to other organizations or teams that responded to the tool [11]. CA is a survey-based assessment tool. “Any agile practitioner can visit the CA website <http://comparativeagility.com/>, answer the survey questions, and receive a free report that compares their results to the complete industry dataset” [11]. The answers are recorded on a five point Likert scale. Additionally, practitioners could request a customized survey.

At the highest level, CA identifies seven dimensions that form the basis for the agility assessment. The seven dimensions are: teamwork, requirements, planning, technical practices, quality, culture and knowledge creating [10, 11]. Each dimension is composed of three to six characteristics. Each characteristic has four statements that are assessed by the survey respondents [11]. “Each statement is a practice for which the respondent indicates the truth of the statement relative to their team or organization” [11]. By utilizing a combination of dimensions, characteristics, and statements, a team or an organization, can gauge their agility relative to that of their competitors or themselves at an earlier time.

Through close analysis of the formulated survey questions (available from [10]), it is evident that the statements require an indication of presence or absence of a practice rather than how well is it being used. Also, the answers to the survey questions are subjective. Moreover, when comparing the agility of two or more organizations, it is unclear if the tool factors in the differences in their organizational objectives.

Thoughtworks Agile Assessment

Thoughtworks is a leading agile development and consulting company. They have developed an agile assessment survey which is available on their website <http://www.agileassessments.com/>. Agile practitioners can complete the survey to get a report on the level of agility within their organization or team, and also identify opportunities for improvement [13]. The survey is composed of twenty questions covering development and management practices [12, 13].

The Thoughtworks Agile Assessment survey questions are intended to gather information about the existence and usage of the practicesthis approach, like CA, does not address assessing the effectiveness of agile methods in the survey. However, the creators of the tool recognize and state that the survey is intended to offer preliminary insights into the agile method being followed by a team or organization and is not a replacement for a customized assessment approach.

Summary

The checklists, the agile process improvement frameworks, and the agile assessment tools discussed in this section primarily focus on the presence or absence of practices (binary values), which is similar to the concept of adequacy that we define in our assessment approach. However, “adequacy”, or any adequacy-like criteria, is not sufficient to provide a comprehensive assessment of an agile method. Adequacy is not indicative of the ability of an organization to implement an agile method or the effectiveness of that method. Hence, we introduce two additional criteria or perspectives for assessing the “goodness” of agile methods, namely capability and effectiveness. The three perspectives combine to provide a comprehensive approach to assessing the “goodness” of agile methods.

III. EVOLVING THE ASSESSMENT FRAMEWORK

Our research is motivated by the lack of a comprehensive approach to assessing agile methods. We assess the collective “goodness” of an agile method adopted by an organization based on (1) its adequacy, (2) the capability of the organization to provide the supporting environment to implement the method, and (3) the method’s effectiveness. We define adequacy, capability and effectiveness as below (definitions adapted for current context from [27-29]):

- **Adequacy** - Sufficiency of the method with respect to meeting stated objectives
- **Capability** - Ability of the organization to provide the supporting environment conducive to the implementation of the method - which is dependent on its people, process and project characteristics.
- **Effectiveness** - Producing the intended or expected results - which is dependent on process artifacts and product characteristics.
We have designed the Objectives Principles and Practices (OPP) Framework to assess the “goodness” of an agile method from the three perspectives described above. The construction and design of the OPP Framework has been motivated by McCall’s Factor/ Criteria/ Metric Framework [30], the Objectives Principles and Attributes (OPA) Framework [28, 29, 31], and the Evaluation Environment (EE) Methodology [32-35]. This section provides an overview of the OPP Framework and its formulated components.

**A. The Framework**

Figure 2 provides an overview of the OPP framework. The OPP framework identifies (1) objectives of the agile philosophy, (2) principles that support the objectives, (3) practices that are reflective of the principles, (4) the linkages between the objectives, principles and practices, and (5) indicators for each practice to assess the effectiveness of the practice and the extent to which the organization supports its implementation.

The culture of an organization, its values and desired characteristics of the systems that it builds, determine the objectives, principles and practices that it adopts. Our assessment of an agile method is carried out with respect to satisfying those stated objectives. Figure 2 illustrates the relationships among the objectives, principles, practices and properties. This relationship is central to our assessment process and is common to the assessment of adequacy, capability, and effectiveness.

**B. Formulated Components of the OPP Framework**

At the heart of the OPP framework are the objectives, principles, practices, and the linkages that tie them together. Indicators are identified and are required for the assessment of capability and effectiveness. The tasks necessary to sufficiently define the components of the OPP framework are as follows:

1. **Deriving the objectives and identifying the supporting principles and the practices**

   We recognize that each agile method embodies a set of objectives, which are supported by a set of underlying principles. Also, there are practices adopted that are reflective of those identified principles. However, these objectives are not explicitly stated.

   **Figure 3. Objectives Principles, and Practices**

   The agile manifesto provides four focal values and twelve principles that define the agile philosophy. Our work involves deriving objectives reflective of the agile philosophy from the focal values, identifying principles that support the defined objectives, and recognizing practices that reflect the principles.
As illustrated in Figure 3, we have identified an initial set of objectives based on the agile philosophy. A supporting aggregated set of principles has also been identified from sources including, but not limited to, the agile manifesto, books, research papers, experience reports, white papers, and discussions with industry experts. Example sources are [3, 14, 25, 36-40]. Likewise, we have identified a list of practices endorsed by the agile community.

The objectives, principles and practices are the foundational pieces used to assess the “goodness” of an agile method.

2. Establishing definitive linkages between the identified objectives, principles and practices

Linkages between the objectives, principles and practices have to be defined in order to assess the adequacy, capability and effectiveness. These linkages represent definitive relationships between the foundational pieces.

For example, let us assume that an organization lists maximal adaptability (see Figure 3) as one of its objectives. Our working definition for maximal adaptability is “flexibility, ability to accommodate change and having the freedom to choose practices with respect to the people, process, project, and product”. Hence, one underlying principle that supports maximal adaptability is accommodating change.

Figure 4. Example linkages in the OPP Framework

Subsequently, as shown in Figure 4, there exists a linkage between the objective “maximal adaptability” and the principle “accommodating change.” We then have a set of practices such as evolutionary requirements [38], iterative and incremental development [41], on-site or co-located customer [42], continuous feedback [43], and minimal Big Requirements Up Front (BRUF) [38] that help realize the principle of accommodating change (also shown in Figure 4).

Following the same systematic process described above, we have identified a candidate set of linkages between all objectives, principles and practices. The complete set of the identified linkages is shown in Figure 5. We have used learning, experience reports, white papers, books, etc., to identify all and confirm some of those relationships.

Figure 5. Candidate set of linkages in the OPP Framework

Although not shown in Figures 3, 4, and 5, the OPP framework supports an additional level of linkages between every practice and a set of properties that are germane to the implementation of that practice. Those indicators and linkages are discussed next.

3. Identifying indicators

As discussed previously, to assess (i) the capability of an organization to support the implementation of an agile method and (ii) the effectiveness of the method itself, we propose a bottom-up traversal of the established linkages. At the lowest level of the OPP framework we have the practices and hence we begin our assessment of capability and effectiveness from the practices. However, how do we determine if the organization has the supporting environment to effectively implement a practice and/or if the practice has produced the intended results? The answer lies in the identification of observable properties of the practices. These properties are characteristics of the people, process, project, and product, and are specific to each practice. A practice and property pair forms an indicator. The first step in defining the indicators is to identify the observable properties of the people, process, project, and product associated with each practice.

Capability

We define the capability of an organization as its ability to provide the supporting environment conducive to the implementation of an agile method. In assessing the capability of an organization, we are concerned with the characteristics of its internal environment. The internal environment of an organization is primarily composed of its resources and
properties of process artifacts and the product: We as members of the team. Indicators of constant velocity can be obtained by observation of the work done by a team during an iteration [15]). Velocity is reflective of the efficiency and effectiveness of the team. Indicators of constant velocity can be obtained by studying Velocity, Burn-Up and Burn-Down charts.

The output is the code itself developed in a modular fashion.

4. Defining metrics for the indicators

Once the observable properties are identified, our next step is to define assessment metrics for each indicator. The measures obtained will be indicative of the capability of the organization to support the implementation and the effectiveness of the practices. For example, the number of bugs reported is a metric associated with continuous code review. As mentioned above, continuous code review is a product property associated with pair programming. Hence, the number of bugs reported can be used to assess the effectiveness of pair programming. If the measure is less than the average number of bugs reported, then we can conclude that pair programming is effective with respect to continuous code review.

IV. ASSESSING “GOODNESS”

Given the Framework described in Section III, we assess the “goodness” of an agile method by assessing its adequacy, the capability of the organization to provide the supporting environment to implement the method, and the effectiveness of that method.

A. Assessing Adequacy

Adequacy is defined by the sufficiency of an agile method with respect to meeting stated objectives. It is independent of an organization. More specifically, we can assess the adequacy of standalone agile methods such as eXtreme Programming (XP) [37, 44, 45], Scrum [37, 44], and Feature Driven Development (FDD) [37, 44, 46] with respect to the agile values and principles each espouses. That is, given an objective of a method, are the necessary principles also present that are prescribed by the framework? Then, for each principle enunciated by the framework, are practices that are prescribed by the framework present within the agile method? If necessary principles and practices are missing, then adequacy is suspect.

We begin assessing the adequacy of an agile method by analyzing and identifying its objectives, principles, and practices and establishing the linkages between the components. The adequacy assessment process is a top-down approach that does not involve indicators. Here, we ascertain...
the existence of the objectives, principles, and practices stated by a method. From the linkages in the OPP Framework, we ascertain the expected number of linkages between each objective and its associated set of principles, and each principle and the practices that are reflective of that principle. We then determine the linkage coverage for each objective and principle. Linkage coverage is the ratio between the actual number of linkages found and the expected number of linkages. We map the linkage coverage to a Likert scale to determine the adequacy of the method under consideration with respect to its objectives and principles. Based on the Likert scale values, we determine the adequacy of a method with respect to its objectives.

We examined the adequacy for two standalone methods – XP and FDD, and for Method A that is an instantiation of XP in an organization. XP is an agile method that almost completely embodies the agile philosophy. Method A is an XP variant implemented in an organization. FDD is intended for medium to larger scale systems development and hence touts a blend of agile values and conventional software engineering principles.

Applying the adequacy assessment process, we have determined the following:

- XP is more adequate than FDD and Method A with respect to supporting its objectives, and
- Method A is more adequate than FDD with respect to supporting its objectives.

That determination is based on a ranking scheme for assessing the adequacy of XP, FDD and Method A with respect to their stated objectives.

**Ranking adequacy**

We employed the Evaluation Environment (EE) Methodology [32, 35] for ranking the adequacy of the three methods mentioned previously. The EE methodology has been designed to conduct evaluations on different types of projects classified under various domains. Also, there exists a web-based client-server software system that enables users to apply the EE methodology to evaluate projects. For more information about the Evaluation Environment, please visit [http://www.oracomputer.com/ee](http://www.oracomputer.com/ee).

Our statement about XP being more adequate than Method A and FDD, and FDD being the least adequate with respect to their stated objectives, is substantiated by the ranking approach. The EE Methodology places XP to be the most adequate with respect to its objectives among the three methods under consideration, and Method A in between XP and FDD.

Method A is an instantiation of XP within an organization. As discussed previously, the culture of the organization dictates the objectives, principles, and practices that are adopted. When comparing XP and Method A using the ranking scheme, we observed that certain aspects of XP are not supported by Method A. The composition of Method A is different from the composition of XP because the composition of Method A is influenced by an organization. Hence, it is less adequate with respect to its objectives than XP.

**B. Assessing Capability and Effectiveness**

Unlike adequacy, both capability and effectiveness are assessed from an organizational perspective. Hence, we cannot assess the capability and effectiveness of a standalone agile method that is independent of an organization. Assessing the capability of an organization to support the implementation of a method and the effectiveness of that method require a bottom-up traversal of the linkages from the indicators to the principles and from the principles to the objectives. The difference between the assessment of capability and effectiveness lies primarily in the type of indicators used. More specifically, we use people, process and project indicators to assess the capability, and process artifacts and product indicators to assess effectiveness. In this subsection, we outline our proposed approach to assessing capability and effectiveness.

It is required to ensure the existence of a practice before proceeding to assess the extent to which it is implemented in an organization. Also, it is necessary to confirm that the practice is supported by the organization before determining the degree to which it is being used. Hence, within an organization, we assess the adequacy of the adopted agile method, followed by the capability of the organization to implement that method, and finally the method’s effectiveness.

Our bottom-up approach to assessing the capability and effectiveness follows the process outlined by the EE methodology [32, 35]. Given a practice, we first identify multiple observable properties (people, process, project and product characteristics) that attest to its implementation. Then, for each practice, property pair, i.e. for each indicator, we evolve a metric. To determine the extent to which that practice is being used, we aggregate the values of those metrics associated with all the practice, property pairs specific to that practice. The aggregated values are indicative of

- the extent to which the implementation of the practice is supported by the organization, and
- the effectiveness of the practice itself.

After determining the extent to which the practices of a method are effectively employed, we assess the extent to which the principles touted by the agile method are indeed reflected by the practices. This is achieved by a further aggregation of the degree to which the set of practices associated with each principle are used. Similarly, a further bottom-up analysis from the principles to the objectives is carried out in order to assess the extent to which the stated objectives are achieved.

We recognize that the metrics to be defined for each indicator would yield values that maybe subjective, objective, numerical, binary, range values, etc. Hence, we need to map the different types of values obtained onto a uniform scale of
measurement to perform the aggregation. However, we have not yet defined that necessary mapping approach. Current research is underway to identify an appropriate uniform scale of measurement.

V. SUBSTANTIATING THE ASSESSMENT FRAMEWORK
The OPP framework guides the assessment process. Our goal is to substantiate both the components of the OPP framework and our process for assessing adequacy, capability and effectiveness. The research outlined in this section is work in progress.

A. Substantiating the components of the OPP Framework
The objectives, principles, practices, and the linkages between them, form the core of the OPP framework. The framework also identifies people, process, project and product characteristics that are necessary to assess the capability of the organization and the effectiveness of the method under consideration. We outline the following 2-step approach to substantiating the components of the OPP Framework:

Step 1: Gathering evidence from literature and other sources to

- Substantiate the linkages between objectives, principles and practices

We are currently involved in gathering evidence from literature to validate the existence of the proposed linkages. Our efforts in research, learning and interactions with members of the agile community provide us with the necessary evidence for the existence of the identified linkages. We have currently substantiated approximately 50% of the identified linkages.

- Confirm the indicators

We are in the process of identifying all the practice - property pairs that form the indicators. We then propose to substantiate the indicators by gathering evidence from literature and discussions with members of the agile community.

Step 2: Validate the components of the OPP framework by obtaining feedback from agile practitioners using survey instruments.

We propose to gather feedback from members of the agile community about the OPP Framework and its utility. We have identified four target organizations around the Blacksburg, VA area where we intend to present our work and request the practitioners to complete a survey that would provide us with feedback. The survey questions would focus on the utility of the OPP Framework, its components and the assessment process.

We have spoken to representatives from the target organizations and they have been very receptive to participating in our substantiation efforts.

B. Substantiating the assessment process
We address the assessment of agile methods from three perspectives – adequacy, capability and effectiveness. We realize that in order to effectively substantiate our assessment approach, the OPP framework has to be applied within an organization. We envision a two-step process for substantiating and validating the assessment approach.

Step 1: Using the OPP framework, we first propose to assess the adequacy of multiple agile methodologies endorsed by the agile community (XP, Scrum, Lean, etc.).

Currently, we have assessed the adequacy of XP, FDD and Method A. Method A is an instantiation of XP within an organization. Our preliminary assessment results indicate that XP is more adequate than FDD and Method A with respect to its stated objectives. Also, FDD is the least adequate with respect to its touted objectives.

We propose to assess the adequacy of two other standalone methods namely Lean, and Crystal.

Step 2: Secondly, we intend to apply the OPP framework within multiple organizations to assess

1. the adequacy of its agile method
2. the capability of the organization to provide the supporting environment to implement that agile method, and
3. the effectiveness of its agile method

Assessing the “goodness” of agile methods adopted by organizations is a validation process. Method A is an instantiation of XP in an organization. Hence, our adequacy assessment for Method A is an actual validation of our approach to assessing adequacy.

In addition to gathering feedback about our assessment approach, we propose to assess the adequacy and capability of agile methods adopted by our target organizations. We intend to interview project managers and request that they give us a walkthrough of their process. This would provide us with key insights about the process followed and facilitate the assessment.

While validating our approach to assessing the effectiveness of an agile method is necessary, it requires a longitudinal study that falls beyond the scope of our immediate validation goals.

VI. SUMMARY
Our research has been motivated by the need for a comprehensive approach to assess the “goodness” of agile methods. We assess “goodness” of an agile method based on (a) its adequacy, (b) the capability of an organization to provide the supporting environment for implementing the method, and (c) the method’s effectiveness. The OPP framework defines objectives, principles, practices and indicators, and linkages between them to support the assessment process. Our proposed substantiation approach
includes a study of one or more organizations to assess the “goodness” of their agile methods, at least from an adequacy and capability perspective.

References


